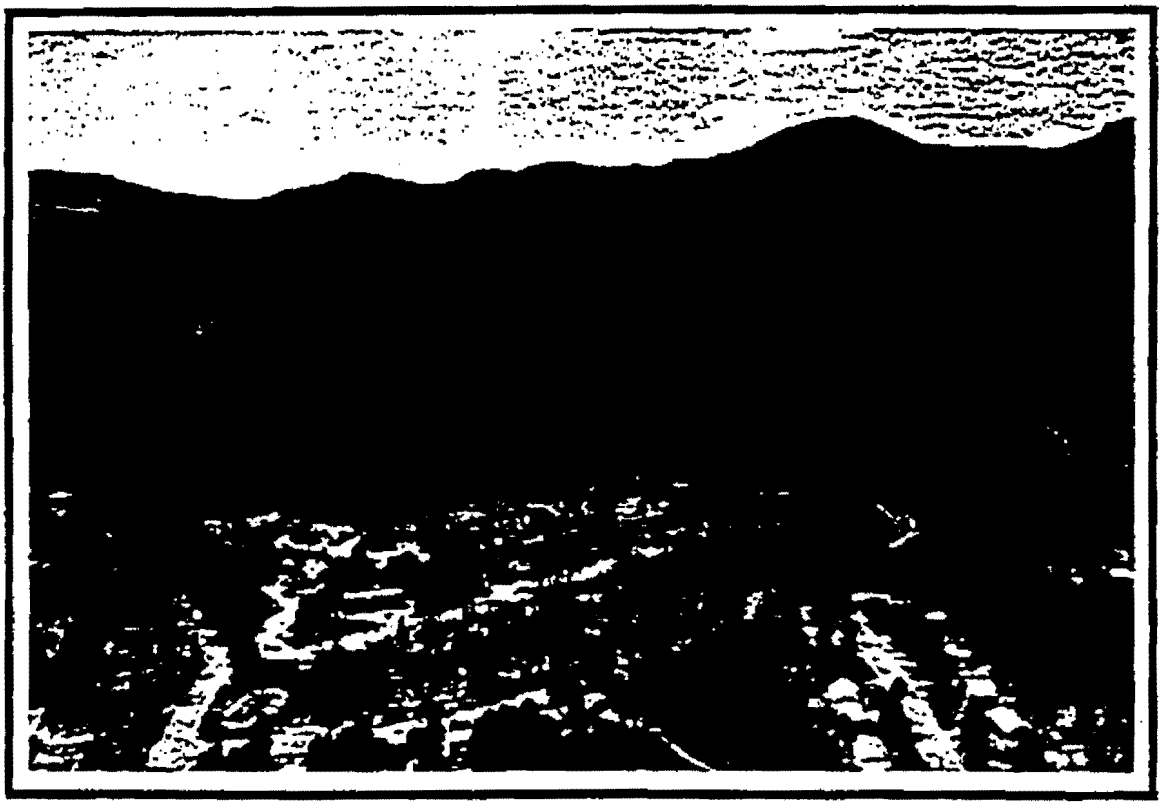
#68662

May-June, 2000
Los Alamos, N.M.

Cerro Grande Fire

BURNED AREA EMERGENCY REHABILITATION PLAN



U.S. FOREST SERVICE
SANTA CLARA PUEBLO
SAN ILDEFONSO PUEBLO
BUREAU OF INDIAN AFFAIRS
NATIONAL PARK SERVICE
LOS ALAMOS COUNTY / CITY
LOS ALAMOS NATIONAL LABORATORY
DEPARTMENT OF ENERGY

Prepared By
Interagency
Burned Area Emergency Rehabilitation Team

6/9/2000

JAN 22 2001

30737

Cerro Grande Fire

BURNED AREA EMERGENCY REHABILITATION (BAER) PLAN

AGENCY/UNIT:

Bureau of Indian Affairs
Pueblo of Santa Clara, Pueblo of San Ildefonso

Department of Energy
Los Alamos National Laboratory

City and County of Los Alamos, NM

National Park Service
Bandelier National Monument

U.S. Forest Service
Santa Fe National Forest

LOCATION: Los Alamos, New Mexico

DATE: June 9, 2000

PREPARED BY: Interagency BAER Team

Submitted By: _____ Date: _____
Erv Gasser, USDI, National Park Service

Submitted By: _____ Date: _____
Wayne Patton, USDA, Forest Service

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

ACKNOWLEDGEMENTS

A special *thank you* to these companies, organizations, and communities who donated goods and services to our effort:

- American Red Cross
- Compaq Computer Corp
- ESRI
- LANL
- Los Alamos City/County
- Salvation Army
- San Ildefonso Pueblo
- Santa Clara Pueblo
- TRK
- U.S. West Communications

We apologize for anyone we may have inadvertently omitted.

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART A FIRE LOCATION AND BACKGROUND INFORMATION

Fire Name	Cerro Grande	Date Controlled	
Fire Number	NM-SNF-42	Jurisdiction	Acres
Agency Unit	USFS Santa Fe NF BIA (Santa Clara Pueblo, San Ildefonso Pueblo	BIA Santa Clara Pueblo	6695
Region	USFS - Region 3 BIA - SW Region	BIA San Ildefonso Pueblo	294
State	New Mexico	NPS	842
County(s)	Los Alamos, Santa Fe, Sandoval	USFS	25,633
Ignition Date/Manner	Escape Prescribed Fire	DOE	7439
Zone	SW	Private	2067
Date Contained		TOTAL ACRES	42,878

PART B NATURE OF PLAN

I. Type of Plan (check one box below)

	Short-term Rehabilitation (Complete Parts A, B, C, and H only)
	Long-term Rehabilitation (Complete all parts)
v	Both Long and Short-term Rehabilitation (Completed all Parts)

II. Type of Action (Check One box below)

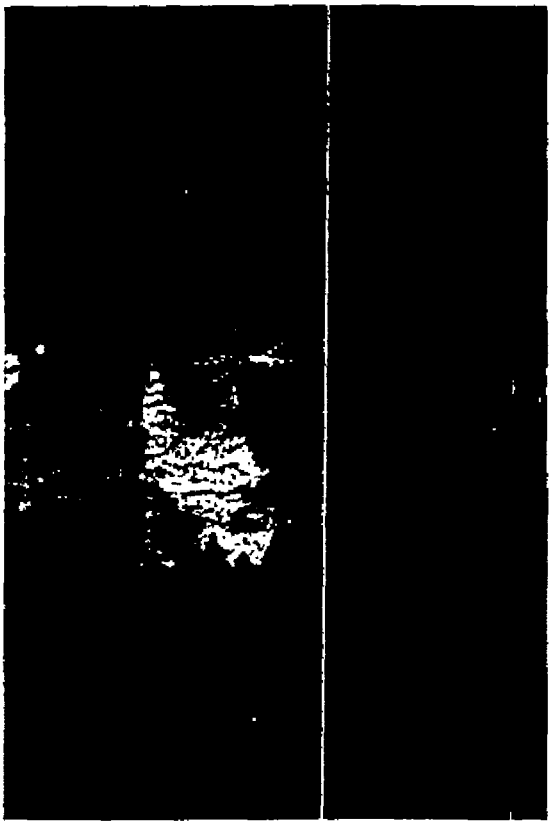
v	Initial Submission
	Updating Or Revising The Initial Submission
	Supplying Information For Accomplishment To Date On Work Underway
	Different Phase Of Project Plan
	Final Report (To Comply With The Closure Of The EFR Account

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

PART C REHABILITATION ASSESSMENT

I. Rehabilitation Objectives:

- Locate and stabilize severely burned slopes which pose a direct threat to human life, property or critically important cultural and natural resources.
- Recommend post-fire rehabilitation prescriptions which prevent irreversible loss of natural and cultural resources.
- As practical and necessary, restore natural conditions to areas disturbed by fire suppression actions.
- Conduct immediate post-burn reconnaissance for fire suppression related impacts to threatened and endangered (T&E) species, and cultural sites.
- Implementation of treatments, and short-term treatments to be in place by July 1,2000
- Provide long-term monitoring recommendations intended to ensure the success of rehabilitation efforts.



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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

PART D TEAM ORGANIZATIONS, TEAM MEMBERS, RESOURCE ADVISORS

I. MULTI-AGENCY COORDINATION GROUP

MEMBER	AGENCY REPRESENTATIVE
Bobby Kitchens	USFS, Team Leader
Erv Gasser	NPS, BAER
Wayne Patton	USFS, BAER
Hal Luedtke	BIA-SWRO
Leonard Atencio	USFS
Mat Johansen	DOE
Gilbert Gutierrez	Santa Clara Pueblo
Leon Roybal	San Ildefonso Pueblo
Dave Riker	Los Alamos County
Alan Cox	NPS-Bandelier National Monument
Ken Mullen	Los Alamos National Laboratory
Nancy Neskauskas	NMSF-Bernalillo

II. BAER COORDINATION TEAM

TEAM MEMBER	POSITION
Bobby Kitchens	Team Leader
John Bruin	Liaison
Steve Emercik	Safety Officer
Ken Palmrose	Public Information
Jerry Elson, Pat Farrell(D)	Planning
Randy Larson	Operations

Stan Henderson	Logistics
Debbie Charlie	Finance

III. BAER TEAM MEMBERS

POSITION	TEAM MEMBER / AGENCY
Team Leader	Erv Gasser, NPS Wayne Patton, USFS
Operations	Randy Larson, NPS (LEAD) Donald Serrano, SFNF Chris Holbeck, NPS George Long, Carson NF Gavin Lovell, BLM
Information	Ken Palmrose, USFS Tom Lavagnino, USFS Sonya Capek, NPS Peter Davis Gerri Barela, SFNF Samuel Lopez
Archaeologists	Mike Boynton, USFS (LEAD) Suzanne DeCoursey, NPS Peter Dudley, NPS Mike Bremer, SFNC Rory Gauthier, NPS Michael Elliott, SFNF Linn Gassaway, NPS Chuck James, BIA
Foresters	Fred Von Bonin, BIA (LEAD) Merlin McDonald, BIA Regis Cassidy, SFNF Wayne Waquiu, BIA
Watershed Specialists	Greg Kuyumjiam, USFS (LEAD) Mark Story, USFS Judy Hallisey, USFS Annette Parsons, BLM/USFS Dean Sirucek, USFS Steven Reneau, LANL Marsha Davis, NPS Grant Loomis, USFS Bruce Sims, USFS
Vegetation Specialist	Dave Smith, BIA (LEAD) Brian Jacobs, NPS
Wildlife Biologist	Karen Hayden, USFS (LEAD) Mary Orr, USFS
Environmental Protection Specialist	Richard Hadley, FWS
Recreation / Scenic	Ruth Doyle, USFS Miles Standish, USFS Jim Beard, USFS

GIS	Luther Arizana, BIA (LEAD) Carl Hardzinski, BIA Chris English, BIA Steve Larrabee, BIA Scott Bradshaw, BIA Rachel Endfield, White Mountain Apache Tribe Bobby Beckwith, BIA
Computer / Documentation	Richard Inman, BIA (LEAD) Kari Brown, Contractor Jay Lamberth, Private Reggie Fletcher, USFS Janet Orona, USFS

Miscellaneous Support Personnel

Safety	Don Tienhaara, BLM Steve Emerick, CDF
Administration / Finance	Shelly Nolde, USFS Tammy Gallegos, NPS Debbie Charley, BLM
Liaisons	John Bruin, SFNF Hal Luedtke, BIA Ken Mullen, LANL

IV. **Resource Advisors:** (Note: Resource Advisors are individuals who assisted the BAER Team with the preparation of this plan. See Part H of this plan for a full list of agencies and individuals who were consulted or otherwise contributed to the development of this plan.

AFFILIATION	NAME
U.S.FOREST SERVICE	Allison Dean Sue Cannon Craig Allen
BUREAU OF RECLAMATION	Blair Greimann Tony Wahl Rod Wittler
SANTA CLARA PUEBLO	Joseph Michael Chavarria Gov. Denny Gutierrez Walter Dasheno Dale Baca Bilbert Gutierrez Calvin Tafoya Eddie Tafoya Joe Chavena Michelle Tafoya

AFFILIATION	NAME
SAN ILDEFONSO PUEBLO	Gov. Perry Martinez Elmer Torres Myron Gonzales John Gonzales Leon Roybal Michael Taylor Neil Weber

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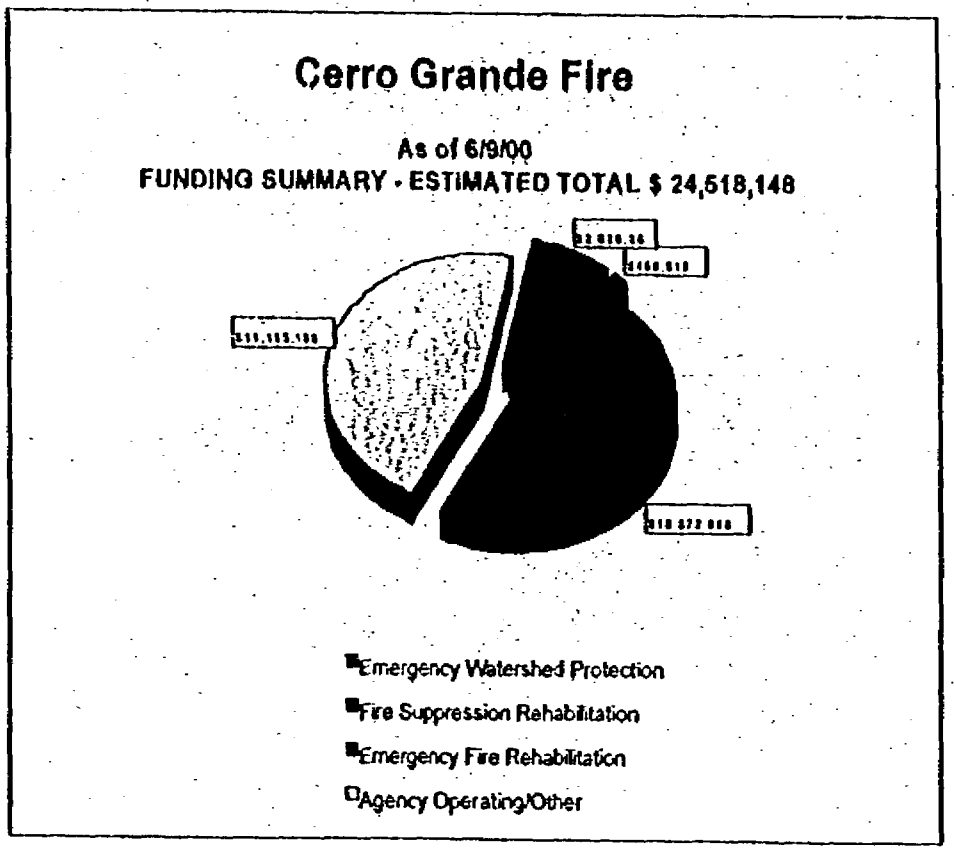
INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART E SUMMARY OF ACTIVITIES

The SUMMARY OF ACTIVITIES table identifies *trackable* rehabilitation costs charged or proposed for funding from fire suppression rehabilitation, emergency fire rehabilitation, emergency watershed protection, agency operations, and other. Only trackable expenditures are displayed in the total cost column. They are coded with the appropriate cost authority. The total cost of the rehabilitation effort to date, excluding the costs absorbed by the fire (fire crew, labor and associated overhead) is displayed as either Fire Suppression Rehabilitation (F), Emergency Fire Rehabilitation (EFR), Emergency Watershed Protection (EWP), or Agency Operations/Other (OP/O)



INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Log Erosion Barriers	JURISDICTIONS:	USFS, LA Co.
PART E: LINE ITEM:	#1 W-4a Check Dam Structures	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Log runoff no longer has a straight path down the slope. These barriers are an effective treatment for hydrophobic soils, low ground cover density, and high intensity burned areas.

B. Location (Suitable) Sites: Location Criteria: Areas with low ground cover density, high intensity burn, slopes from 40% to 60%, unbroken ground free of extensive surface rock which would inhibit continuous log contact with the ground. The sites must also have adequate standing trees size (6-14 inch d.b.h.) and adequate tree numbers per acre (20 to 40).

C. Design/Construction Specifications:

1. Tree Size – The preferred tree is 8" to 12" dbh. Down logs may also be used if they are solid enough to act as an erosion barrier.

2. Species – Straight conifer trees will be used. Only dead trees will be cut for logs

3. Construction Process – First, the appropriate tree is fallen parallel to the contour of the slope (perpendicular to the fall line of the slope). Second, The underside of the tree is limbed, starting at the lowest limbs to an upper tree diameter of 4 inches. This allows for the tree bole to make contact with the ground. Third, secure stump end of tree behind the uphill side of the stump. Fourth, if the upper portion of tree is not locked behind other standing trees, then secure that portion of the tree with wooden pegs driven into the soil.

4. Stumps – Stumps should be at least 12" high, but on steeper slopes can be up to 18" high.

5. Logs – Logs should be as long as possible and down to 4" in diameter. Logs may need to be shortened to 10' to 15' in dissected terrain. The entire length must be in contact with the soil, and positioned on the contour, perpendicular to the slope.

6. Bedding – Each log is bedded in a shallow trench, with an upslope backfill to seal the log to the soil such that water does not flow beneath the log. Both the trench and backfill are made with a hazel hoe or Polaski scalping tool. Logs must be level, and positioned perpendicular to the overland flow path of water. Where the log cannot be leveled against stumps or natural features, a short stake may be driven into the soil to keep it from rolling. The stake can be a tree limb, rock or sawn stake.

7. Density – The preferred density is 40 logs per acre, but can go as low as 30 logs per acre if trees are scarce. To judge when an acceptable density is achieved, use a spacing of 20' X 20'.

8. Progress – It is best to begin at the top of the unit and work down. That way the person bedding the logs can stay out of the way of falling trees.

9. Equipment – Chain saw with safety equipment; Hazel Hoe or Polaski for bedding logs; a single bit axe is sometimes used to cut and pound stakes; use small (8") carpenter level to level the logs.

10. Protection of Cultural Resources – The workers must protect all cultural resources by not dropping trees or bedding logs on these sites. Each site must be reported to the team leader.

11. Bypass Areas – There will be islands within each designated treatment block that are low priority for log terraces, including:

a. Where surface rock will not allow for bedding of the log erosion barrier, move to the nearest suitable location.

b. Slopes greater than approximately 60% are usually offer poor footing and can be bypassed. Slopes less than 40% will be treated by mechanized equipment.

c. Where surface rock, 4" diameter and larger cover over 60% of the soil surface.

d. Where trees are greater than 12" diameter, then there are no candidate trees, and the area should be bypassed.

e. Openings where trees do not grow should be bypassed.

f. If not enough suitable trees are available, only those trees that meet the selection criteria are felled.

D. Purpose of Treatment Specifications: The primary intent is to delay overland runoff long enough so that it can infiltrate into the soil instead of running overland. This can effectively prevent hillslope erosion, rills and loss of ashes. An equally important intent is to store sediments upslope of each log.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
4 Person felling teams @ $825 / day X 8 teams X 5 days	$33,000
TOTAL PERSONNEL SERVICE COST	$33,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Wood stakes @ $0.32 each X 5,000	$1,600
Miscellaneous expenses (fuel, hammers, saws, etc.)	$500
TOTAL MATERIALS AND SUPPLY COST	$2,100
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	ACRES	$797	44	$35,100	EFR	FC
FY 1	ACRES	$799	50	39,950	EWP	C
TOTAL			94	$75,050	EWP, EFR	FC,C

FUNDING SOURCES:

F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:

P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	44 Acres	$35,100
LA Co.	50 Acres	$39,950
TOTAL COST	94 Acres	$75,050

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Contour Raking	JURISDICTIONS:	USFS, SCP, LA Co.
PART E: LINE ITEM:	#2 W-6a Disturbed site rehabilitation, upslope of Town of Los Alamos and Santa Clara Pueblo	FISCAL YEAR (S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Hand rake areas of hydrophobic soils in approximately 600 acres of Los Alamos lands on the west edge of the town of Los Alamos, NM.

B. Location (Suitable) Sites: Suitable sites are areas of moderate or high burn severity that have hydrophobic soil conditions. East facing slopes on the west side of the Town of Los Alamos from Los Alamos Canyon north to Rendre Canyon; specifically in Township 19 N., Range 6 E., Sections 4, 5, 7, 8, 13, and 18 below 8,500 ft. elevation to the west and northwest edges of town adjacent to Sante Fe National Forest lands. See attached BAER treatment area map.

C. Design/Construction Specifications:

1. Break up hydrophobic surface soils using a McCloud or other similar hand rake tool to increase precipitation infiltration rates. Construct grooves to maximum depth of rake tines on the contour to trap maximum surface runoff. Percent and size of rock fragments may alter effective treatment depths.

2. Maximum hillslope gradient to apply this treatment with hand crews is 45 to 50%.

3. After the contour raking is accomplished, then one of the seeding specs and mulching specs will be applied to the same area.

D. Purpose of Treatment Specifications: Reduction of overland flow; increased retention and infiltration of precipitation events. Also, this will allow for better seeded grass establishment.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Type II Crew @ $3,300 / day 8 day (Note: assumes production rate of 100 acres / day = 800 acres)	$26,400
300 person volunteer crews @ no cost / day x 2 days	$0
TOTAL PERSONNEL SERVICE COST	$26,400
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

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

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres	$25.07	1,369	$34,321	EFR Volunteer	FC Volunteer
FY 1	Acres	$25.07	610	$15,294	EWP	C
FY 1	Acres	$25.07	74	$1,855	DOE	C
TOTAL			2,053	$51,470	EWP, DOE, EFR, Volunteer	FC, C, Volunteer

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	969 Acres	$ 24,293
DOE	74 Acres	$ 1,855
Baca Ranch	10 Acres	$252
LA County	600 Acres	$15,042
Santa Clara Pueblo	400 Acres	$10,028
TOTAL COST	2053 Acres	$51,470

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Tree Hazard Mitigation (Imminent)	JURISDICTIONS:	USFS, LA Co., SCP
PART E: LINE ITEM:	#3 S-8a Hazardous Trees	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Felling trees damaged or killed by fire which pose an immediate threat to public safety or property.

B. Location (Suitable) Sites: Trees within one tree length of State Highway 4.

C. Design/Construction Specifications:

1. Trees within one tree length of the paved roadway that have been designed by using the DOI BAER Field Reference guidelines with a rating of 5 or greater.

2. Designated trees are marked with orange "KILLER TREE" plastic flagging.

3. Directionally fall trees away from road wherever possible.

4. Stumps will be flush cut as low as possible. (slightly angled face away from road is acceptable). Lower stumps from suppression activities within the highway right-of-way.

5. On NPS lands (south side of highway), cover stumps with dirt or debris to reduce visibility.

6. Leave all trees tree length (no bucking), limb the tree bowl, and cut and scatter limbs in lengths no more than four feet and to a minimum diameter of three inches. Prevent slash accumulations by spacing trees throughout the right-of-way and limit slash to no more than 18 inches maximum. Burn excess slash.

7. If trees cannot be safely felled they are to be left.

D. Purpose of Treatment Specifications: To provide public safety.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
5 felling crews for 1.5 weeks- 12 GS-9 Fellers on each crew	$40,540
TOTAL PERSONNEL SERVICE COST	$40,540
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
	N/A
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$ 0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
	$6,000

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TOTAL MATERIALS AND SUPPLY COST	$ 0
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A
TOTAL TRAVEL COST	$ 0
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A
TOTAL CONTRACT COST	$ 0

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Trees	$50	920	$46,000	EFR	EFC,FC,P
FY 1	Trees	$221	180	$39,780	EWP	FC,P
TOTAL			1,100	$85,780	EFR, EWP	EFC,FC,P

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Forest Assessment. See Appendix III, Hazard Tree Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	800 Trees	$40,000
Santa Clara Pueblo	120 Trees	$6,000
LA Co.	180 Trees	$39,780
TOTAL COST	1,100 Trees	$85,780

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Contour Tree Felling	JURISDICTIONS:	USFS, DOE, SCP, LA Co.
PART E: LINE ITEM:	#4 W-6b Contour Tree Felling	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description:

B. Location (Suitable) Sites: The contour tree falling should be done on two types of slope conditions. Situation 1: Moderately sloping to steep slopes that have hydrophobic soil conditions (moderate/high burn severity), and there are few down trees or surface rock to protect the soils surface. The sites must also have adequate standing trees size (6-14 inch d.b.h.), adequate tree numbers per acres (30 to40),. The land surface must be smooth and not broken (e.g. uneven surface, few rock outcrops or boulders). Situation 2: Steep to very steep slopes where erodable soils occur, few down trees are present, standing trees number/size are present, and putting the minimum crew people on the slope due to safety concerns is a priority.

C. Design/Construction Specifications:

1. Tree Size – The preferred tree size is 6 to 14 inches d.b.h.
2. Species – Any available standing dead, straight conifer species of the approximate correct size can be used.
3. Construction Process – First, the appropriate tree is fallen parallel to the contour of the slope (perpendicular to the fall line of the slope). Second, The underside of the tree is limbed, starting at the lowest limbs to the limbs at a tree diameter of 3 to 4 inches. This allows for the tree bole to make contact with the ground. Third, if due to uneven slope surface or curved tree bole, then under-cuts of the tree bole will allow it to make better contact with the soil.
4. Density – The density of the fallen trees depend on the tree length, and hillside slope gradient. On 20 to 40 percent slope the spacing is approximately 35 to 40 feet apart on the fall line of the slope. On 40 to 60 percent slope gradient reduce the spacing to approximately 25 feet spacing. If possible some overlap of the fallen trees in a row by the trees in the uphill and/or downhill row (shingling) is desirable.
5. Safety – Standing dead trees that are a hazard to the chainsaw operator during the falling process should be avoided, or the hazard tree should be fallen first if it can be done safely. If the tree cannot be fallen safely then avoid the area affected by the hazard tree.
6. Progress – Typically, it is best to begin at the top of the unit and work down. The tree faller needs to make this determination based upon ground and overstory characteristics.
7. Equipment – Chainsaw with safety equipment, single bit ax, and wedges.

D. Purpose of Treatment Specifications:
The primary purpose of the practice is to reduce the overland flow of rainfall thereby reducing the amount runoff and potential of overland flow to initiate surface soil erosion (rills). Secondary, the contour logs on the ground trap sediments, and aid in vegetation reestablishment.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
4 Person felling team @ $825 / day X 16 teams X 26 days	$343,200
TOTAL PERSONNEL SERVICE COST	$343,200
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM

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TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Chain, saw gas, wedges, etc.	$ 500
TOTAL MATERIALS AND SUPPLY COST	$ 500
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Helicopter @ $1,000 / hour X 4 hours / day X 4 helicopters X 26 days	$416,000
TOTAL CONTRACT COST	$416,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Acres	$356	2,131	$759,700	EFR	FC,C
FY2	Acres	$356	100	$35,600	EWP	C
TOTAL			2,490	$886,440	EFR,EWP	FC,C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

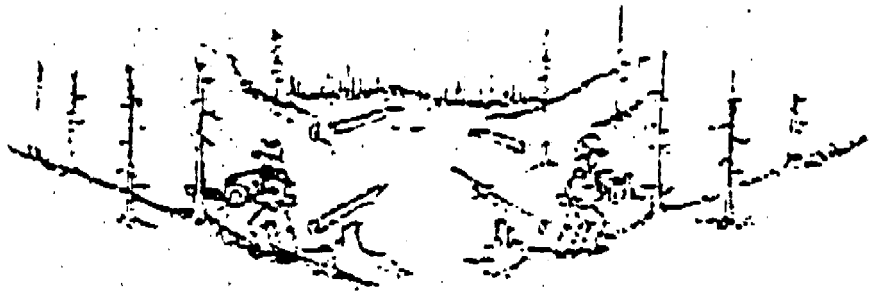
List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

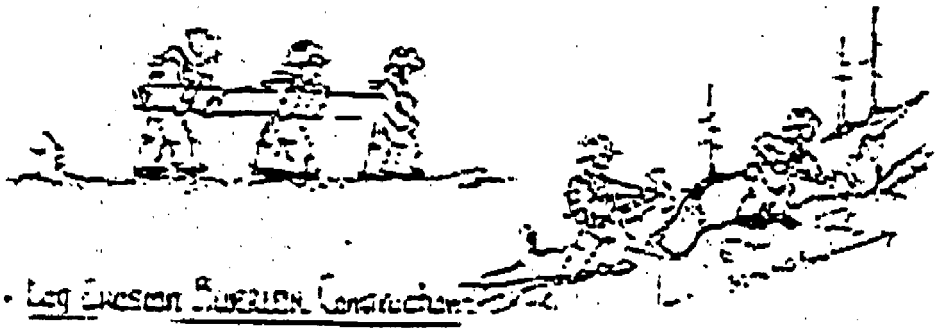
V. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1,736 Acres	$ 613,016
Santa Clara Pueblo	569 Acres	$ 202,564
DOE	85 Acres	$ 30,260
LA Co.	100 Acres	$35,600
TOTAL COST	2,490 Acres	$ 886,440

H

Contour Tree Felling

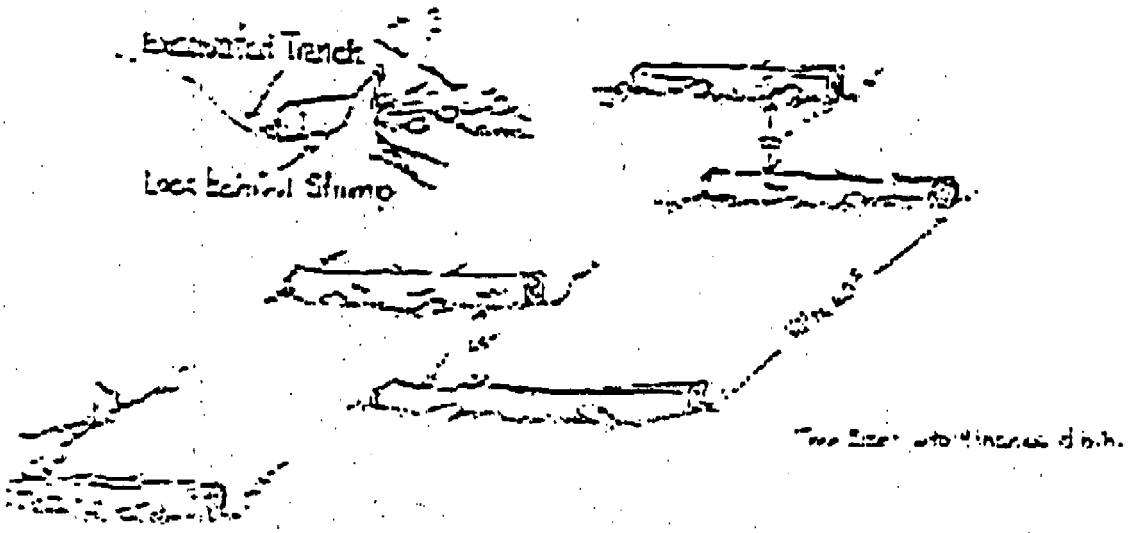




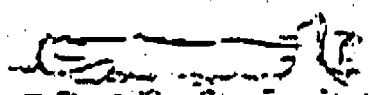
• Log Erosion Barrier Construction

Excavated Trench

Log behind Stump



Tree Size: 6 to 9 inches d.b.h.



• On 20 to 40 Percent Slope the Spacing is approximately 30 to 40 Feet apart on the fall line of the slope.

• On 40 to 60 Percent Slope gradient reduce the Spacing to approximately 25 Feet Spacing. Overlap of the fallen tree

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Straw Mulching	JURISDICTIONS:	USFS, LA Co, DOE
PART E: LINE ITEM:	#5 W-2a Straw Mulching	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Straw mulch is applied where the pre-burn ground cover was consumed by the fire and the expected overland runoff would threaten high values at risk. First year effectiveness includes, stabilizing ashes onsite, preventing loss of topsoil, improving infiltration rate and replacing organic litter consumed by the fire. All of these are usually associated with flood source areas, and therefore mulching has a secondary benefit of controlling flood peaks to an acceptable level. Each mulching area is flagged and indexed on a map. Mulching is implemented only on those slopes that are designated by watershed teams or operations staff.

B. **Location (Suitable) Sites:** Slopes behind residences in west Los Alamos in the area of Arizona and 45th. Street. Slopes adjoining Los Alamos Ski Area access road.

C. **Design/Construction Specifications:**

1. **Site Selection:** Suitable sites are designated on the BAER treatment map and in the field by either watershed or operations staff. Suitable sites should generally be well-drained soils on gentle slopes that are protected from wind.

2. **Type of Straw:** Straw must be from a field that is certified free of noxious plants listed in the Forest Service noxious plant handbook. Suitable straw includes barley, wheat, pasture grasses, rice, bean and prairie grasses. Species selected should be neutral or compatible with the botanical community where they are being introduced. Size of straw bales must be such employees do not suffer injury from handling the bales, usually 80 pounds or less.

3. **Application:** The rate of application is determined by qualified individuals who have been trained in the principles of BAER Treatments. Mulching strips on hillslopes are usually 100' to 300' wide. Strips are usually mulched by hand crews. The rate of application is a minimum of 2,000 pounds per acre. This is about 25 bales per acre, spread 2 inches deep, if evenly distributed. Maximum amount of straw is 4,000 pounds per acre, or about 50 bales per acre when spread 4 inches deep.

D. **Purpose of Treatment Specifications:** The basic purpose of straw mulch is to replace only the natural ground cover density (GCD) that was consumed by the fire. If there was little natural GCD before the fire, then mulch probably will not improve the site conditions after the fire. Straw can effectively control overland runoff due to bare soil, hydrophobic soils and compacted soils. By controlling the overland runoff, the top soil is also protected. Especially important is to stabilize the ashes onsite, because they represent the nutrient capital. Straw mulch can also: 1) Break the impact of raindrops and prevent soil compaction; 2) maintain a favorable moisture regime for sprouting seeds that are either stored in the soil, or applied as an emergency treatment; 3) Protect and often prevent frost heave of topsoils, which can damage root systems of annual plants; 4) Insulate the topsoil from solar isolation, and provide a more favorable temperature range for new plants; 5) Provide a growing medium for soil biological activity including soil flora, fauna, and fungal complex; and 6) Effectively control sediment loss from a burned area. By treating the source of floodwaters after a burn, the immediate downslope area can also be effectively protected. Rills and gullies that originate on extremely hot burns can migrate downslope from the place of origin and scour the slope for several hundred feet. Therefore small areas of less than one acre can often be mulched to protect much larger, downslope areas from the cumulative effect of hillslope runoff.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Type II crew @ $3,300 / day x 3 days x 2 crews (Santa Fe National Forest)	$19,800
2,000 volunteers @ no cost / day x 3 days (private lands	$0

TOTAL PERSONNEL SERVICE COST	$19,800
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Straw bales @ $3.75 each (FOB) X 25 bales / acre X 1198 acres = 29,325 bales	$ 112,313
TOTAL MATERIALS AND SUPPLY COST	$ 112,313
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres	$110	1,198	$ 132,113	EFR	FC Volunteers
FY 2	Acres	$120	600	$72,000	EWP	C
TOTAL			1,798	$ 204,113	EFR, EWP	FC Volunteers

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	84 Acres	$ 9,240
DOE	1,114 Acres	$ 122,540
LA Co.	600 Acres	$72,000
TOTAL COST	1,798 Acres	$203,780

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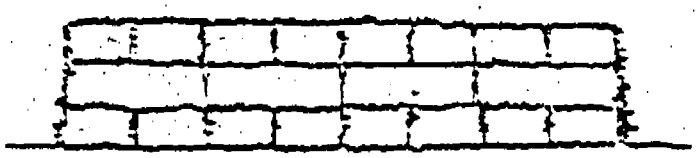
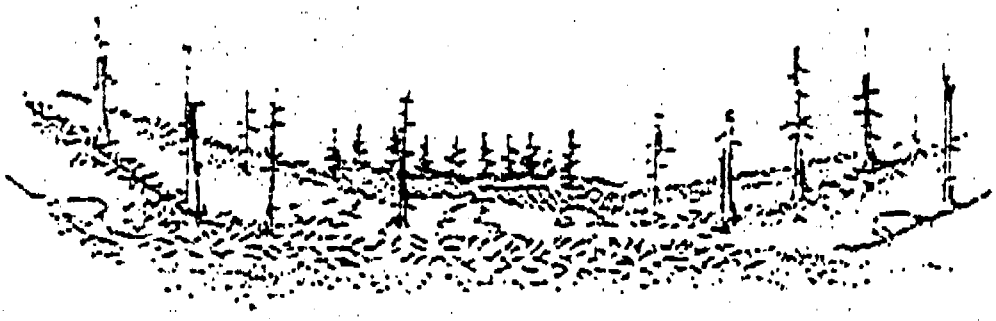
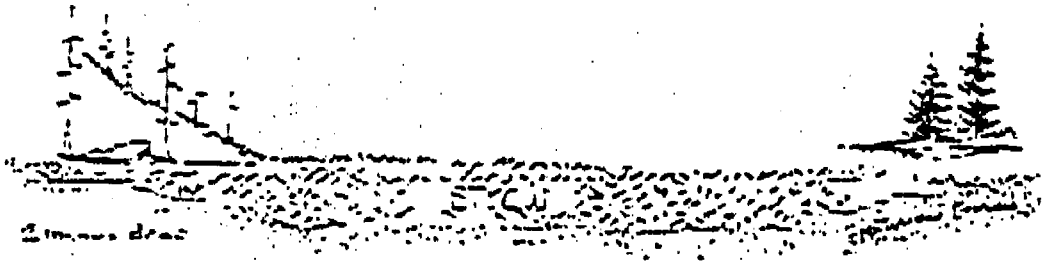
Straw Mulching



2 bales per acre

Spread 2 inches deep





2 inches deep

Soil

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Stream Grade Control Structures – Log, Rock, & Straw Dams	JURISDICTIONS:	USFS, SCP, La Co.
PART E: LINE ITEM:	#6 W-4d Control Structures	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Install various types of stream channel grade control structures using available onsite or imported materials (logs, rock, straw waddle etc.) The purpose of these structures is to reduce the water velocity, thereby reducing the in-channel erosive force to prevent down cutting and capture sediment of the stream-flow.

B. **Location (Suitable) Sites:** These in-channel structures need to be located within the stream-channel where the materials can be keyed into the streambed/streambank in such a way as to prevent the failure of the structure if at all possible.

1. **Site Selection:** All locations for stream grade control structures need to be identified by either a hydrologist or hydro-tech. On the stream reaches where grade structures are needed the frequency of the structure will vary depending on valley bottom gradient and sites where a structure can be keyed into the streambed and streambanks. The criteria for the type of structure depends on the stream gradient, the streambed materials, and the amount and type of natural materials available on each installation site.

2. **Rock Structures:** Rock structures are more appropriate in 1st-order channels on steeper side slopes (with valley bottom gradient <25%). Also the stream channel or the surrounding uplands must have a source of the cobble/stone/boulder size rock materials available within a short distance. When 10 to 16 inch d.b.h. trees are available the log in-channel grade control structures can be built.

3. **Log Structures:** Log structures work best on 5–20% valley bottom gradient, with streambed materials that have a percentage of large gravel/cobble materials. This is so that the log can be bedded into the stream bottom, so that water does not erode under the log as will occur if bedded in sand or finer materials.

4. **Straw Wattles:** Straw wattles can be pegged down and used as grade control structures in stream channels with flatter gradients, finer streambed materials, or in streams with uneven bottoms.

C. **Design/Construction Specifications:**

1. **Rock Structures:** On USFS land, rock structures are constructed by embedding the first layer of stones into streambed in a semi-circle, pointing downstream. Then additional layers of rock are built up behind and on top of the first layer, until the height of the rocks is approximately one half bank-full stream depth. The more the stream flow the larger the rock size needed to prevent failure of the structure. (See figure 1). On tribal land, rock structures are constructed by embedding 3 to 5 rows of head-sized rocks into streambed in rows across the channel. End of rows need to be keyed into the side slopes (e.g. tree trunk or boulder). Place a flat rock on the downstream side at the lowest point to function as a splash pad. (See figure 2).

2. **Log Structures:** Log in-channel grade control structures are constructed by first picking a site where a log can be keyed into the streambank and stream-bottom. Excavate in the streambed 3 to 4 inches deep preparing a flat site to rest the log. Second, excavate into the streambank 6 to 8 inches on each side of the stream. Next, measure the length between the excavated streambanks. Cut a log from a nearby tree 10 to 16 inches d.b.h. to the appropriate length, and lay the log into the trench. Drill a ¾ inch hole vertically through each end of the log. Pin the log into the channel bottom on each end with a ¾ inch re-bar that is 14 to 16 inches longer than the log diameter.

3. **Straw Wattles:** Dig shallow trench (3-6 inches deep) and approximately 18" wide perpendicular to the channel. Install two straw wattle rolls side by side in trench and a third roll in the gap between the bottom two logs. Ends of rolls should be keyed 16" to 18" inches into the slopes and should be 12" to 18" inches above the top of the rolls at the center of channel. Install stakes into each roll at three foot intervals (see diagram).

D. **Purpose of Treatment Specifications:** The primary purpose of this practice is to reduce the amount of in-channel erosion caused by the additional stream-flow the following the fire. This practice also reduces the amount of re-deposition of eroded sediments in downstream stream channels.

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II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Type II Crew @ $1,300 / day X 13 days X 4 crews (note: estimated production rate is 8 dams / hour for 20 person crew)	$171,600
TOTAL PERSONNEL SERVICE COST	$171,600
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Straw or Aspen Wattles-Rolls 8 to 12 inch diameter X 20 to 25 feet long, with wood stakes @ $60 / roll X 5,000 rolls	$300,000
TOTAL MATERIALS AND SUPPLY COST	$300,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	DAMS	$134	3,520	$471,600	EFR	FC
FY1	DAMS	$134	200	$26,800	EWP	C
TOTAL			3,720	$498,400	EFR, EWP	FC,C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Watershed Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	2,482 Dams	$ 332,588
Santa Clara Pueblo	1,038 Dams	$ 139,092
LA County	200 Dams	$26,800
TOTAL COST	3720 Dams	$498,480

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Figure 1.

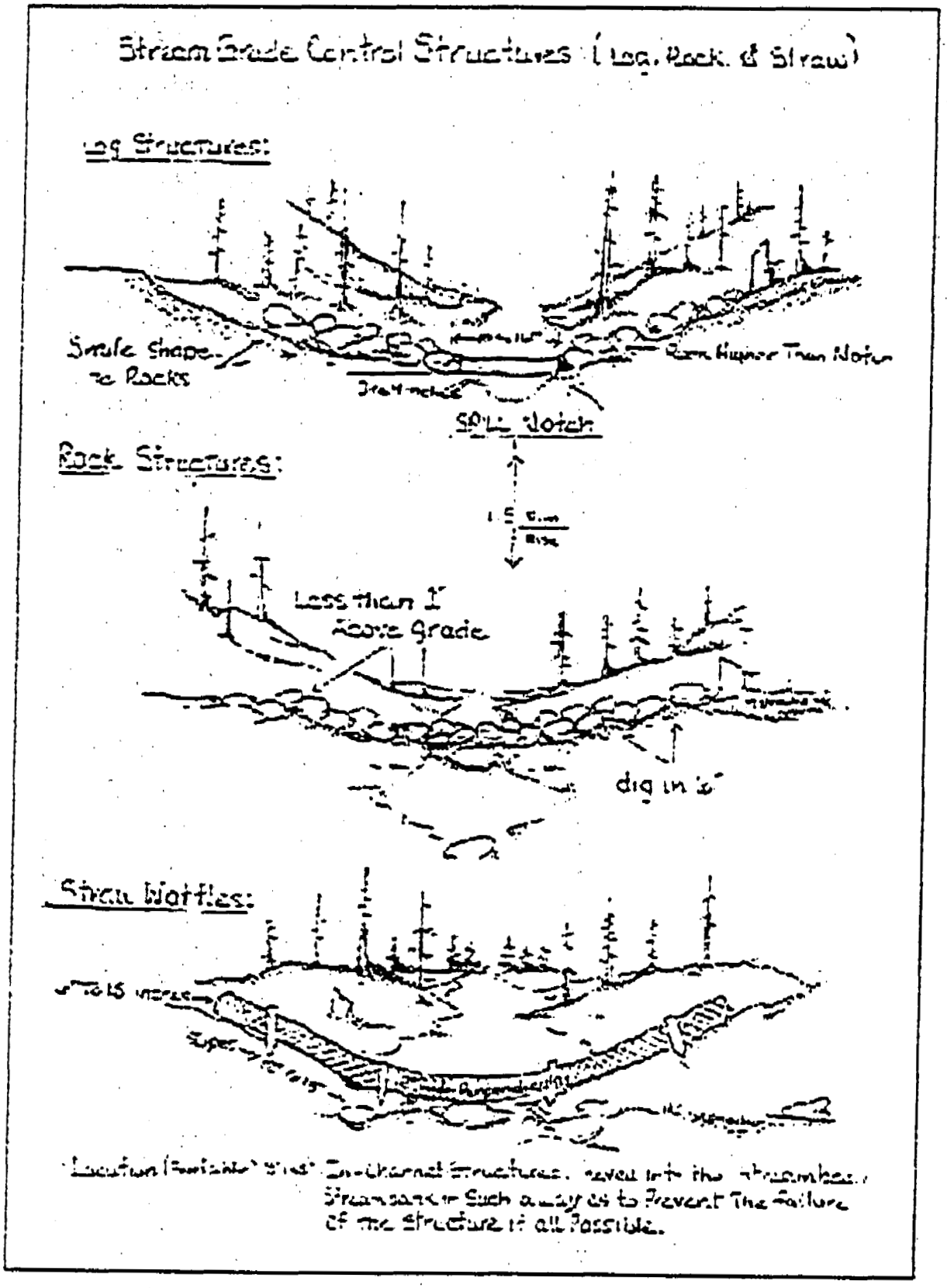
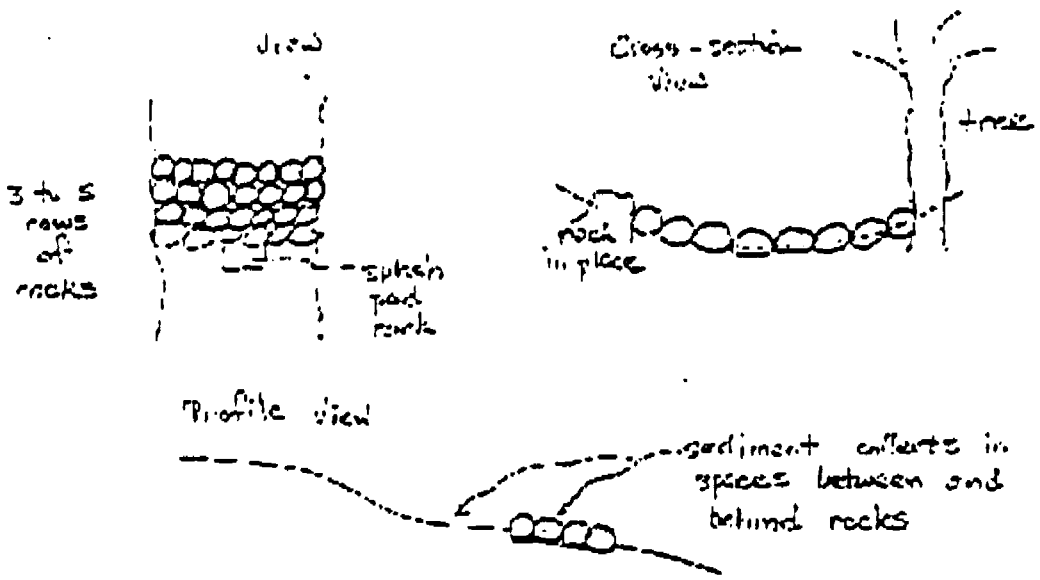

Stream Grade Control Structures (Log, Rock, & Straw)
Log Structures:
Smale Shape
Rocks
Rock Structures:
Less than 1'
Above Grade
dig in 6"
Straw Wattles:

Figure 2.



Purpose: Santa Clara Pueblo recommends this method of construction because it is more effective over time than a single row

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Contour Straw Wattle - Slope Treatment (High and Low Density)	JURISDICTIONS:	USFS, SCP, LA Co.
PART E: LINE ITEM:	#7 W-6c Straw Wattle	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Straw wattles can be used on slopes to act as terraces to prevent slope erosion and facilitate revegetation.

B. **Location (Suitable) Sites:** Slopes susceptible to sheet and rill erosion, slopes producing dry ravel, slopes susceptible to freeze/thaw activity, or slopes difficult to vegetate because of soil movement. See treatment maps for stream channels and slopes proposed for treatment.

C. **Design/Construction Specifications:** Slope Treatment

1. **On slope:** Wattles should be installed on contour with slight downward angle at the end of the row to prevent ponding at mid-section. No overall slope preparation is needed prior to installation, however straw wattles should always be installed in shallow trenches according to the guidelines below. Wattles should be pinned securely to the ground.

2. **Spacing Down-slope:** Vertical spacing for slope installations should be determined by site conditions: slope gradient and soil type are the main factors. Recommended spacing is as follows:

Low Density Wattles = 20 to 30 / Acre (SEE ATTACHED SPECIFICATION DRAWINGS)

High Density Wattles = 40 to 60 / Acre

3. **Trenching:** Use a hand tool such as a Polaski or pick to score the ground. Using a shovel, dig the trench to the needed depth. Soil from excavating the trenches can be placed on the uphill, or flow side, of the trench to be used during installation. For soft, loamy soils dig a 3 – 5 inch trench. For hard, rocky soils dig a 2 - 3 inch trench.

4. **Installation:** Lay the first straw wattle snugly in the trench. No daylight should be seen under the wattle. Pack soil from trenching against the wattle on the uphill side. When installing running lengths of straw wattles, abut the second wattle tightly against the first. Do not overlap the ends. Stake the straw wattles at each end and four foot on center. For example:

25 foot wattle uses 6 stakes, 20 foot wattle uses 5 stakes, 12 wattle uses 4 stakes.

Purpose of Treatment Specifications: Slope Treatment: Straw wattles (rolls) are intended to capture and keep sediment on slopes. Straw rolls are useful to temporarily stabilize slopes by reducing soil creep and sheet and rill erosion until permanent vegetation can get established. Installed, straw wattles shorten the slope length, thereby interrupting the development of ravelling and rilling processes, and reduce the slope steepness. They catch soil material that moves down slope by the freeze/thaw processes. Organic matter and native seeds are trapped behind the rolls, which provide a stable medium for germination. Rolls trap fertile topsoil and retain moisture from rainfall, which aids in growth of tree seedlings planted along the up-slope side of rolls.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Type II Crew @ $3,300 / day X 16 days X 5 crews (note : 20 person crew production estimate is 6 acres / day)	$264,000
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Circus tent to store straw wattles @ $1,000 / day X 30 days	$30,000

TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$30,000
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
8 inch to 12 inch diameter X 20 to 25 feet long straw wattle rolls wrapped in biodegradable plastic netting with wooden stakes @ $60 / roll with stakes X 35,000 (FOB) delivered to Los Alamos, NM	$2,100,000
TOTAL MATERIALS AND SUPPLY COST	$2,100,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Contracted Helicopter @ $1,000 per hour X 8 hrs. X day X 16 days	$128,000
TOTAL CONTRACT COST	$128,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres	$1,816	1,389	$2,522,000	EFR	FC/C
FY 1	Acres	$1,816	40	$72,640	EWP	C
TOTAL			1,429	$2,594,640	EFR,EWP	FC/C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1,361 Acres	$ 2,471,576
Santa Clara Pueblo	28 Acres	50,848
LA Co.	40 Acres	$72,640
TOTAL COST	1,389 Acres	$ 2,594,640

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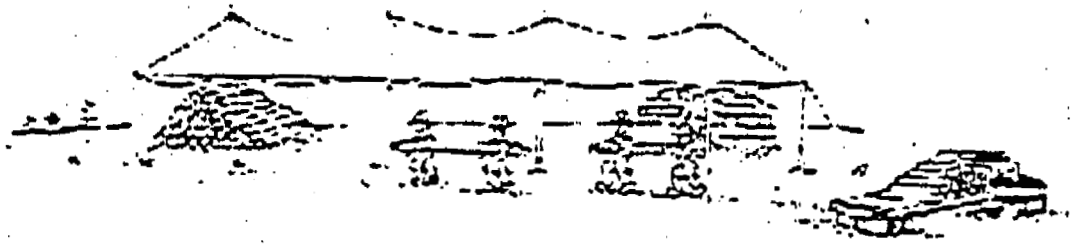
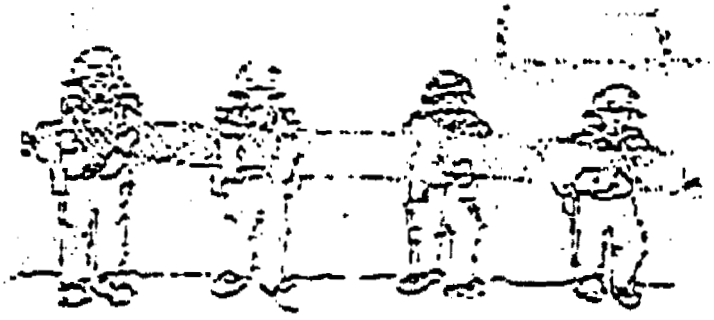
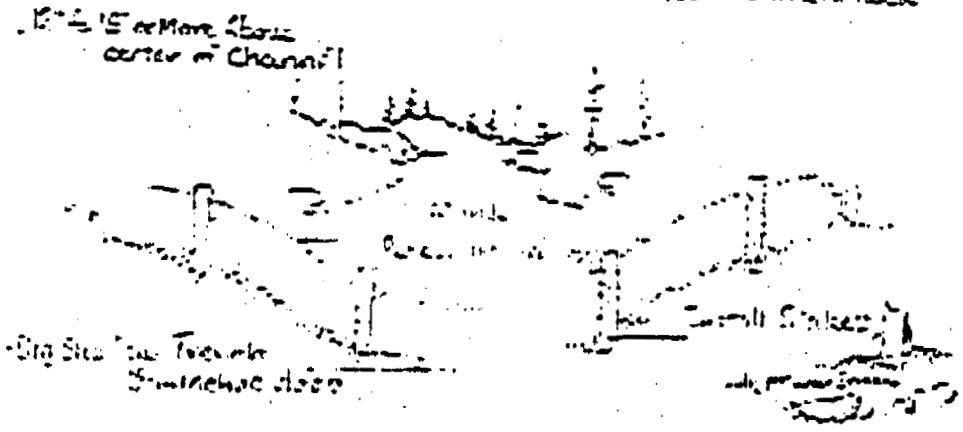


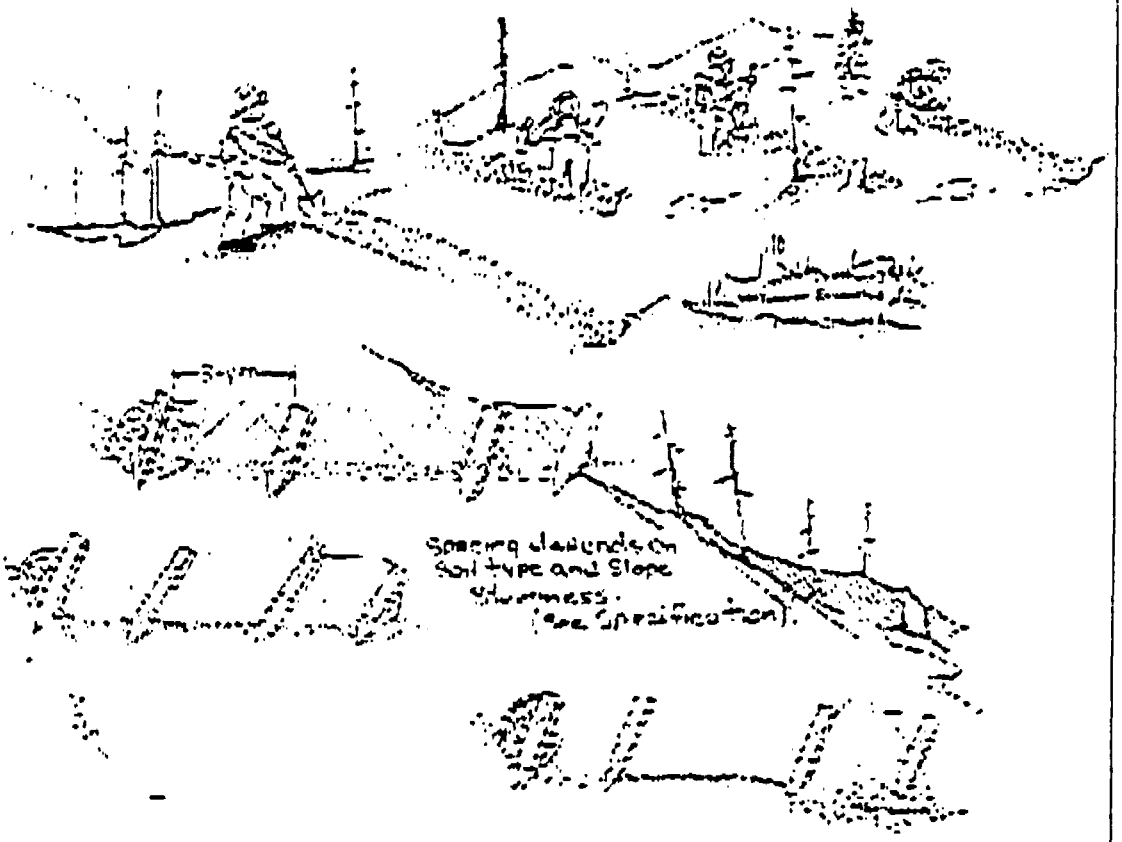


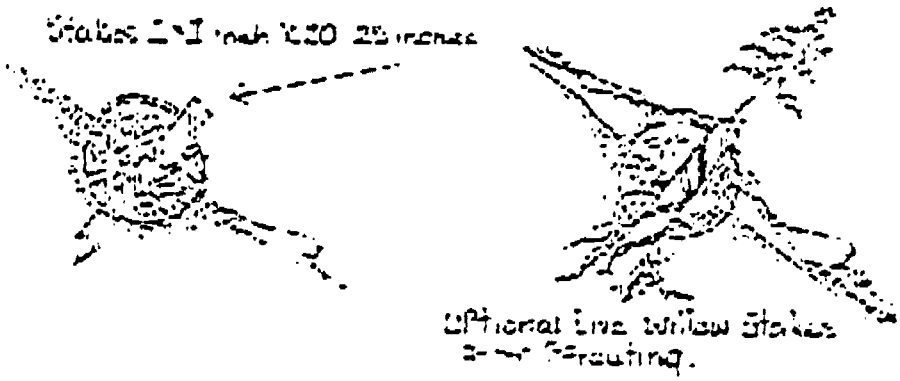
End of rails should be
keyed into Trap or Rock



Contour Straw Wattles (Fence)

Slope Treatment





- Low Density Wattles - 20 to 30 / acre
- High Density Wattles - 40 to 60 / acre
  - Dig a 3-6 inch trench for hard/rocky soil, dig 2-3 inch trench

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Suppression – Dozer lines	JURISDICTIONS:	USFS, SCP & SIP, LA Co.
PART E: LINE ITEM:	#8 W-8a Rehabilitate Dozer Line	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Rehabilitation of suppression constructed "Dozer Lines" is necessary to avoid excessive soil erosion and restore natural landscape surface water flows. Rehabilitation will also serve to restrict unintended/undesired access by 4 wheeled drive and "All Terrain Vehicles" (ATV's), provide for re-establishment of pre-incident road closures where affected by Suppression access needs and to re-establish administratively desired roadway widths to pre-disturbance widths (usually 12 ft. running surface).

B. **Location (Suitable) Sites:** See incident "BAER" map for location of known dozer lines. Additional lines should be rehabilitated as they discovered in the field. All discoveries will be subsequently mapped.

C. **Design/Construction Specifications:**

1. Return soil side cast berms, and recover "fill" materials and replace in "cut" banks along dozer lines blending disturbed areas to fit the natural contours. Accomplishment of this specification is best achieved with use of an excavator with a 2 to 3 cubic yard bucket with an opposable thumb, with capabilities of working on steep sloped (50 to 60%) and capable of having a 30 to 35 ft. reach, combined with the use of a 4 wheeled drive heavy duty backhoe. Dozers are excellent tools to "push" dirt to establish fire control lines. Dozers, however, are also very inefficient in the rehabilitation process to recover side cast material and can cause twice the disturbance if used for rehabilitation in moderately steep to steep terrain and in timbered vegetation types. For this reason, dozers should only be used to perform final construct of waterbars on the dozer line, followed by an excavator and/or a heavy-duty backhoe to pull berms and redistribute sidecast fills and woody debris. If large rock is to be moved to facilitate dozer line reshaping or re-establishment of road closures then a bucket with an opposable thumb should be used with the excavator.

2. Compacted soils associated with suppression staging areas, helipads, and "intensively used" areas from suppression equipment should be ripped to a depth of 12 to 18 inches (or less in the presence of underlying rock or sandstone formations).

3. Waterbars spacing should be installed according to the following standards depending upon slope and soil susceptibility to erosion with waterbar spacing decreasing on steeper slopes.

Generally...

a. Waterbars are to be built on slopes greater than 5%
b. Waterbars should be skewed horizontally from the fall line of the slope (not the dozer line) approximately 15 to 20 degrees from horizontal and drained away from the fire burned area if possible.
c. Utilize natural rolls and dips whenever possible.
d. Scatter branches, wood, rock, sod or other material to naturalize the fire line and further retard mineral soil movement, (best done with an "excavator or heavy duty backhoe" not hand crews). Scattered material should be randomly placed along the dozer line. In grassy areas, replace soil and sod, waterbar as necessary and scatter rocks or limbs to naturalize the dozer line location.
e. Dozer line seeding is not necessary unless required for specific and uniquely sensitive areas such as highly erodible soils or other critical areas and concerns.
f. Hand crews may be used to augment scattering of wood debris/slash to naturalize the dozer line and further retard soil erosion, striving to achieve a minimum of 65% surface cover.
g. Hand crews may be used to construct waterbeds on slopes greater than 50% (with little to no rock) or in areas too hazardous for safe dozer operation, or in areas where dozer use may create additional surface disturbance.
h. Remove all trash and equipment associated with dozer equipment maintenance.

4. Fill material will be cleaned or removed from established drainages and live watercourses, (best done with an "excavator or heavy-duty backhoe" not hand crews. Dozer may be used for rehabilitation on slopes of 4% or less.
5. In areas designated for road or access re-closure, re-contour road prisms to original slope contours and/or construct road or dozer line closure structures (berms) to eliminate undesired vehicular access in sensitive areas or previously closed areas, unless specified otherwise by other resource concerns.
6. Re-establish original road widths to no greater than 12 feet on National Forest lands and other jurisdictions as approved or otherwise specified.
7. Berms shall not be used in "Recreation Zones" (see attached maps) to eliminate undesired vehicular access. Use boulders or other natural materials to close roads. Place boulders in a random, non-linear fashion, and partially bury

boulders to appear natural. Recreation Zones include the following areas (refer to attached Map Pages): Map page 1. Rec Zone A; Map page 2. Rec Zone B; and Map page 3, Rec Zone C.

8. A 4 x 4 road runs north from Camp May and Los Alamos Canyon toward the divide of Canada Bonita and Quemazon Canyon. This area is The Canada Bonita Research Natural Area (RNA) which had successfully closed this 4 x 4 trail from ATV and other motorized access. This road was opened up by use of a D7 dozer to facilitate suppression access activities. Per instructions from Mary Orr (Wildlife Biologist, Espanola Ranger District – Resource Advisor) this trail is to be re-closed. Successful closure of this road will entail use of a "Excavator" (Track hoe) to put the road to bed and blend road to the natural contours. DO NOT USE A DOZER on this segment (see attached map) ! Threatened and Endangered species are also a concern on portions of the road as well as Visual Quality "Recreation" objectives (see item # 7 above). Please view the attached maps and recreation specs for more detailed information. The essence of the recreation specs states that "berms" are unacceptable for road closure structures.

9. Jemez Salamander habitat should not be impacted by dozer line rehabilitation and stabilization actions. Consult with the Wildlife Spec for concerns with Jemez Salamander habitat relative to dozer line rehabilitation in Divisions E and U (see the incident planning maps for locations of these divisions).

D. **Purpose of Treatment Specifications:** Prevention of surface and gully erosion by stabilizing disturbed lands associated with dozer suppression line impacts. Dozer line waterbars are designed to retain sediment and become inconspicuous over 4 to 6 year timeframe, limit unauthorized vehicular access, and provide long-term stabilization to existing adjacent roads. Dozers are not suited to re-contour dozer suppression lines on moderate to steep slopes or in timbered vegetation types and may (if used) increase soil/vegetation disturbance by double when used in such conditions. Dozers are also not suited to replace large woody debris back onto the dozer line when re-contouring, excavators and back hoes are more efficient in this effort.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
	F/FC
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
	F/EFC
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
	F/FC
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
	F/EFC
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1					F	EFC
TOTAL					F	EFC

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Operations Assessment. See Appendix III, Fire Suppression Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	12.3 Miles	$98,400
NPS	.5 Miles	$4,000
Santa Clara Pueblo	2.7 Miles	$21,600
San Ildefonso Pueblo	3.2 Miles	$25,600
DOE	15.4 Miles	$123,200
Private/ Baca Ranch	5.9 Miles	$35,400
TOTAL COST	40 Miles	$308,200

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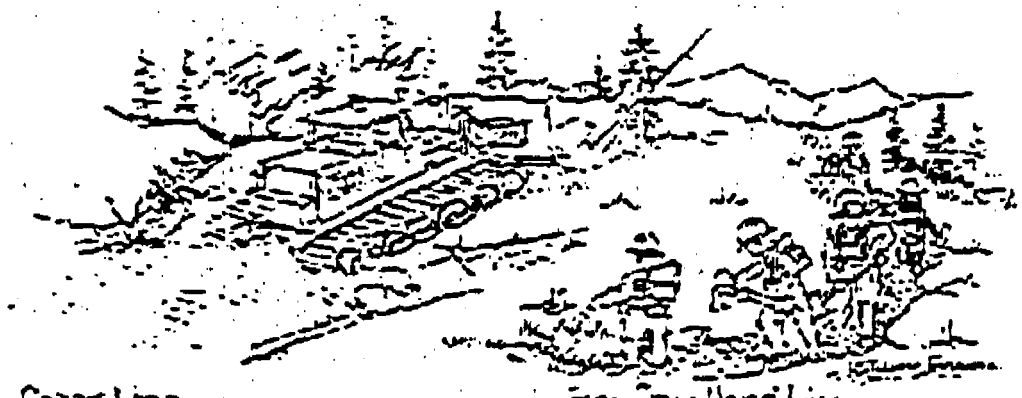
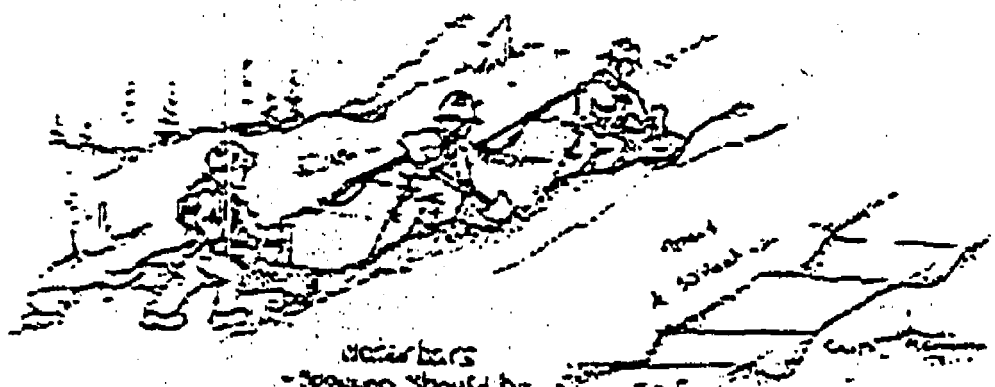
Suppression Dozer Lines:



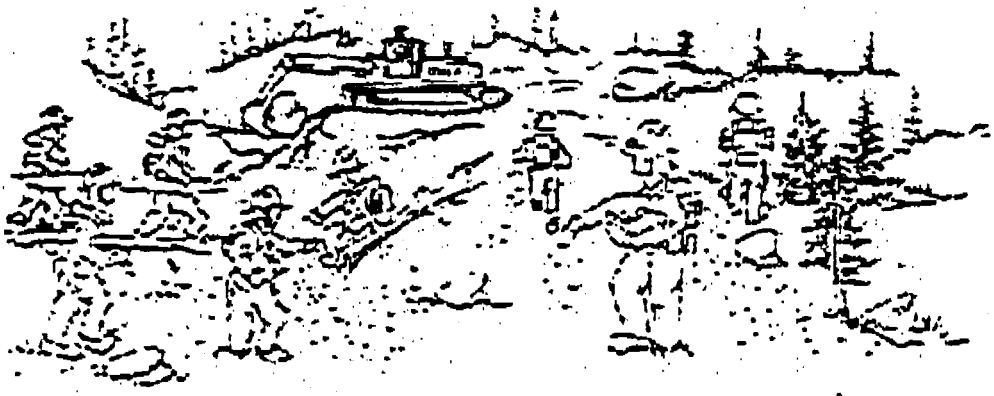
- Dozer Line
- Fire Crew Hand Line

- Depth of 12 to 18 inches.



Waterbars

- Spacing should be every 50 feet depending upon Slope and Soil Susceptibility to erosion with waterbar Spacing



- Scatter trenches, wood, rock, Sod or Other Material to Naturalize the fire line and further retard erosion

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Suppression- Hand Lines	JURISDICTIONS:	USFS, SCP, LA Co., NPS, DOE
PART E: LINE ITEM:	#9 W-8b Rehabilitate Hand Line	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Rehabilitation of suppression constructed "Hand Lines" is necessary to avoid erosion that would result in gullies and to restore natural landscape surface water flows.

B. Location (Suitable) Sites: See incident "BAER" map for location of known hand line maps. Additional hand lines should be rehabilitated as they are discovered in the field. Includes reseeding of the drop points and staging areas. All discoveries will subsequently mapped.

C. Design/Construction Specifications:

1. Use hand tools only; chainsaws included.

2. Trenching (if any) should be filled in and the hand line restored to blend with the undisturbed soil contours. Berms, topsoil, and organic matter should be pulled back onto the hand line. Green trees/branches, dead limbs and cut downed logs are to be re-scattered onto the hand line to obliterate evidence of the line as much as practical.

3. Waterbar spacing should be every 50 feet depending upon slope and soil susceptibility to erosion with waterbar spacing decreasing on steeper slopes. Generally...
   a. Waterbars are to be built on slopes as follows:

Slope	Spacing
0-5	400 ft.
6-10	300
11-20	200
21-40	100
41-60	50 ft. or less.

   b. Waterbars should be skewed horizontally from the fall line of the slope (not the hand line) approximately 15 to 20 degrees from horizontal and drained away from the fire burned area if possible.
   c. Utilize natural rolls and dips whenever possible.
   d. Scatter branches, wood, rock, sod, pine, needles or other material to naturalize the fire line and further retard mineral soil movement. Scattered material should be randomly placed along the hand line. Strive for 65% to 85% ground cover on areas treated with scattered material to prevent mineral soil movement/channeling of the hand line. In grassy areas, replace soil and sod, waterbar as necessary and scatter rocks or limbs to naturalize the hand line location.
   e. Seeding of hand lines is not necessary unless required for specific and uniquely sensitive areas such as highly erodible soils or other critical areas. See "Unique Situations/ Locations" section for more detail.
   f. Remove all trash, equipment, and flagging.

D. Purpose of Treatment Specifications: To prevent surface and gully erosion along the length of or in association with the presence and handlines. Waterbars are to be constructed on the hand lines to restore natural surface runoff patterns and to provide adequate drainage of the hand line. Waterbars should not prevent the natural drainage of the adjacent landscape and should be constructed nearly perpendicular to the contour of the slope. Waterbars are only intended to stabilize disturbance. Waterbars should gradually disappear, blending with the adjacent terrain within a 2 to 4 year timeframe

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
	F/FC

TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
	N/A
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
	F/FC
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1					F	FC
TOTAL					F	FC

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Func
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Operations Assessment. See Appendix III, Fire Suppression Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	2.3 Miles	$18,400
NPS	6.3 Miles	$50,400
Santa Clara Pueblo	.7 Miles	$18,000
DOE	1.3 Miles	$10,400
Baca Ranch	3.4 Miles	$20,400
Private	1.5 Miles	$10,000
TOTAL COST	15.5 Miles	$127,600

Suppression - Hand Line.

Fire Line Handline.

Hand Line rehab: - Scatter stones, wood, rock, soil, pine needles, or other material to naturalize the fire line and further retard mineral soil movement.

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Clean and Replace Culverts	JURISDICTIONS:	USFS, LA Co., SCP & SIP, DOE
PART E: LINE ITEM:	#10 S-5b Clean culverts	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Sediment, rock, garbage and dense vegetation is currently blocking and compromising culvert ability to pass flood flows also replace Diamond St. Fill Bridge culvert.

B. Location (Suitable) Sites: Primarily within City of Los Alamos, White Rock, Santa Clara Pueblo and USFS lands (see culvert map and culvert survey with GPS locations.

C. Design/Construction Specifications:

1. Crews should use hand tools to clean, sediment, debris, trash, etc., from around the entrance and exists of all culverts.

2. Crews should use chain saw to remove small trees and vegetation in channel where applicable.

3. Crews should use engine pump and hose to flush culvert.

D. Purpose of Treatment Specifications: To minimize the threat of debris collecting in the culvert creating debris jams and backwater which could cause water to leave the channel and erode roads and driveways. Typically, this project would not have been funded by EFR on private lands however, the local resources where not available to complete this emergency treatment.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
4 person engine crew @ $825 / day X 4 engine crews X 3 days X 2 years (Note: Estimated production rate is 21 culverts / day / crew)	$19,800
TOTAL PERSONNEL SERVICE COST	$19,800
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

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

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Culvert	$40	335	$13,300	EFR	C
FY 1	Culvert	$40	470	$18,800	EWP	C
FY 1	Culvert	$2,200,000	1	$2,200,000	COE	C
FY 1	Culvert	$39	150	$5,900	DOE	C
TOTAL			956	$2,238,000	EWP, EFR, COE, DOE	C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Infrastructure Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	235	$ 9,400
LA Co.	470	$ 18,800
LA Co. Diamond St. (Fill Bridge)	1	$2,200,000
DOE	150	$ 5,900
SCP	50	$ 1,950
SIP	50	$ 1,950
TOTAL COST	956	$2,238,000

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Aerial Seeding	JURISDICTIONS:	USFS, SCP & SIP
PART E: LINE ITEM:	#11 W-1a Reseeding	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Aerial reseeding will be completed with contract aircraft and pilots. The need for reseeding, seed selection and application rates were developed in consultation with the local staff from the USFA, BIA, LANL, Santa Clara and San Ildefonso Tribes land management staff. Reseeding serves as an immediate, temporary ground cover to decrease erosion potentials.

B. **Location (Suitable) Sites:** Reseeding locations will be mapped by the BAER Team Vegetation Specialist in consultation with local agency staff and with the concurrence and approval of the Pueblos. All areas of high and moderate burn severity areas, dozerlines, and handlines should be mitigated (affected area approximately 20,00 acres). Hand seeding should be conducted around residences in concert with other rehabilitation, treatments (mulching, contour, straw bale placement).

Cerro Grande Fire Seed Mixture

Common Name	Scientific Name	Mix Ratio %
Annual Ryegrass	*Lolium multiflorum*	30%
Barely	*Hordeum vulgare*	10%
Mountain Brome	*Bromus marginatus*	30%
Slender wheatgrass	*Elymus trachycaulus*	30%

C. **Design/Construction Specifications:**

1. The seed mixture for the Cerro Grande Fire was complied by the BAER Team Specialists in consultation with local agency staff based on agency policies, regulations and mandates. Seed should be tested for purity and germination rates. Before accepting delivery of seed shipment the contractor must provide written evidence (seed label and letter) to the BAER Contracting Officer that the seed conforms to the purity and germination requirements in the specification. Test methods specified in *Rules for Testing Seeds, Proceedings of the Association of Official Seed Analyst* will be acceptable for determining the germination rate.

2. Delivery: Deliver pre-mixed certified noxious weed-free seed solid on a pure live seed basis. Deliver to Los Alamos, New Mexico.

3. Storage: Seed should be applied as soon as possible after delivery. If immediate application is not possible the seed should be stored as follows:

   On-site stored seed must be protected from dew and rain. Seed must be stored under cover near a selected airport or helibase site and protected from theft, vandalism, and damage caused by livestock, wildlife, etc.

4. Application Rate: Seed should be applied at approximately 36 pounds per acre (60 seeds/sq. ft.)

5. Application Method: Pilot will utilizing Global Positioning System Equipment during application and according to line-of-sight and personal discretion; will utilize visible markers as necessary for swath continuity within the high moderate burn severity areas. All applications will be done under the guidance of the Incident Command Air Operations Divisions.

D. **Purpose of Treatment Specifications:** Reseeding can be an effective erosion control technique provided a consistently uniform cover is obtained prior to the advent of erosive rains. Subsequent establishment is dependent upon prior to the advent of erosion rains. Subsequent establishment is dependent upon favorable precipitation patterns and the effectiveness is directly related to cover density. Where site conditions are dry, sandy, or otherwise harsh, reseeding may not be as successful. Monitoring should be considered to determine the relative effectiveness of reseeding. Supplemental seeding requests may be warranted should be monitoring determine that initial seeding did not meet resource protection objectives. Reseeding is being conducted to protect downstream values of life and property. Watersheds should be treated as a whole without regard for ownership in order to protect downstream life and property values.

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II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Hand-seeding Crew 20 people X $96/day/person X 10 days	$19,200
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Hand seeders $50 each X 20	$1,000
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$1,000
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Seed cost @ $1.04 per PLS LB X 720,000 PLS LBS.	$748,800
TOTAL MATERIALS AND SUPPLY COST	$748,800
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Aerial Application of Seed on 20,000 acres X $8.65/acre	$173,000
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres	$47.06	20,000	$941,200	EFR	C
TOTAL			20,000	$941,200	EFR	C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	M,C
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based upon government wage rates and material cost.	P,M

5. No cost estimate required – cost charged to Fire Suppression Account.	

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report. See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA- Santa Clara Pueblo	4,236 Acres	$ 199,346
BIA - San Ildefonso Pueblo	294 Acres	$ 13,836
USFS- Santa Fe N.F.	13,427 Acres	$ 631,875
Private	942 Acres	$ 44,330
TOTAL COST	20,000 Acres	$941,200

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Monitor Seeding Effectiveness	JURISDICTIONS:	SCP & SIP, USFS, DOE, LA Co.
PART E: LINE ITEM:	#12 C-2a Monitoring	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Conduct seeding monitoring in first year following treatment (2000-2001) to determine success of revegetation efforts on the Cerro Grande Fire in Los Alamos, New Mexico. Determine vegetation establishment and grass root penetration through the hydrophobic soils within a reasonable time after rains begin.

B. **Location (Suitable) Sites:** Establish monitoring transects within Moderate/ High burn severity areas in each plant association type reseeded in 06/2000. Final site selections to be made by Agency representatives.

C. **Design/Construction Specifications:** Monitoring transects should e established and methodologies designed to determine:

1. A minimum seeding establishment of 9-15 plants per square foot.

2. Sampling should determine species composition, root depth and area, plant height and vigor

3. Count seeding/square foot, -Seeded species/ Native Species/ Total # and compare to seeding rate per square foot (60 seeds per square foot) for treatment success.

4. Estimate root mass/ square foot- pull plants on representative area, measure diameter of root wad and test for hydrophobic layer (H2P) in root mass to estimate treatment effectiveness of grass roots in penetrating to H2P

5. Estimate effective root cover area due to grasses and other sources.

6. Sampling methodologies should represent all plant community types, all aspects, and all slope variations within the seeded areas. Photos should accompany data records as supporting documentation of findings

7. Observations should be documented to record other factors such as herbivory, surface erosion, etc.

8. A final report should be published that documents sampling methodologies, techniques, areas sampled and summary of findings.

D. **Purpose of Treatment Specifications:** Monitoring is required to ascertain reseeding success and effectiveness to meet the objectives that the BAER Team identified and mitigate the identified emergency to the degree anticipated. Ensure establishment of reseeded species for soil stabilization and watershed protection.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Gs-11 Vegetation Specialist/Botanist @ $250/day (10 hour days) X days per week X 4 weeks (1 day field time – day data compilation time/week? X 5 jurisdictions	$15,000
TOTAL PERSONNEL SERVICE COST	$15,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	

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TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Photographic Film and Processing 25 rolls X $15/roll	$375
TOTAL MATERIALS AND SUPPLY COST	$375
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
GOV – 100 miles/day X 2 days per week X 4 weeks X .33/mile X 5 jurisdictions	$1,320
TOTAL TRAVEL COST	$1,320
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Surveys	$417.38	40.0	$16,695	EFR,C	P
TOTAL			40.0	$16,695	EFR,O	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Func
- O= Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA- Santa Clara	8 Surveys	$3,339
BIA- San Ildefonso	8 Surveys	$3,339
USFS- Santa Fe N.F.	8 Surveys	$3,339
DOE	8 Surveys	$3,339
LA Co.	8 Surveys	$3,339
TOTAL COST	24 Surveys	$16,695

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Invasive Plant Species Monitoring	JURISDICTIONS:	SCP & SIP, USFS, DOE
PART E: LINE ITEM:	#13 O-2b Monitor Invasive Plant Species	FISCAL YEAR(S) (list each year):	2000-2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Monitor vegetative recovery within the burned area for the invasion of invasive/noxious weeds on roads, dozerlines, and handlines and other areas disturbed by suppression actions.

B. **Location (Suitable) Sites:** Refer to Appendix III-Suppression Treatment Map, dozer lines, safety zones, heliports, and Incident Command Post(s).

C. **Design/Construction Specifications:**

1. Conduct short-term monitoring (2 years) on areas disturbed within the fire on historic populations of known noxious weed populations to determine spread of invasive species and noxious weeds. Monitoring protocols will be established by each jurisdiction and will be implemented in accordance with current management plans.

2. Photo-document and GPS new weed occurrences within disturbed lands

3. Initiate Agency approved control measures on new weed occurrences where monitoring demonstrates the establishment or expansion of known weed populations that threaten the natural regeneration of native vegetation or establishment of effective ground cover.

4. Prepare final report of findings for submission to NIFC for inclusion in fire effects database.

D. **Purpose of Treatment Specifications:** Monitor disturbed areas within the fire area and known noxious weed populations to determine if suppression or rehabilitation actions have spread invasive species that may potentially threaten the long-term health of native plant associations or impact short term recovery of revegetation efforts.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-11 Botanist/Vegetation Specialist X 2 positions X $250/day X 4 weeks/year X 2 Fiscal Years X 4	$80,000
TOTAL PERSONNEL SERVICE COST	$80,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Film Purchase and processing 40 rolls X $15/ roll	$600
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$600
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Rebar, Office Supplies (Paper, Disks, etc.)	$800
TOTAL MATERIALS AND SUPPLY COST	$800
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

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Gov-100 miles/day X 5 days per week X 4 weeks X .33/mile X 4 jurisdiction X 2 years	$5,280
TOTAL TRAVEL COST	$5,280
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A
TOTAL CONTRACT COST	$0

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Sites	$270.88	160	$43,340	EFR	P
FY 2	Sites	$270.88	160	$43,340	EFR	P
TOTAL			320	$86,680	EFR	P

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA-Santa Clara Pueblo	50 Survey Sites	$13,544
BIA-San Ildefonso Pueblo	14 Survey Sites	$3,792
USFS- Santa Fe N.F.	182 Survey Sites	$49,300
NPS- Bandelier N.M	16 Survey Sites	$4,334
DOE	58 Survey Sites	$15,710
TOTAL COST	320 Survey Sites	$86,680

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Santa Clara Stocking Plot Damage Assessment	JURISDICTIONS:	SCP
PART E: LINE ITEM:	#14 O-5a Research & Continuous Forest Inventory Plots	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Measure uneven-aged growth study plots on the Santa Clara Pueblo Reservation to assess damage by Cerro Grande fire.

B. Location (Suitable) Sites: T20N, R6E Section 11

C. Design/Construction Specifications:

1. Visit all trees (3,810 total tress) on all plots to describe damage from fire assessing mortality, scorch height, crown damage and insects.

2. Visit regeneration plots to describe damage to regeneration form fire assessing survival and damage.

D. Purpose of Treatment Specifications: Assess damage to Santa Clara uneven-aged growth study plots

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
2 GS-9 Foresters @ $24.68/hr X 8 hrs/day X 11 days Overhead	$5,344
TOTAL PERSONNEL SERVICE COST	$5,344
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Per Diem for detailer @ $100/ day for 25 days	$2,500
Miscellaneous supplies to reestablish plot boundaries and tree numbers	$500
TOTAL MATERIALS AND SUPPLY COST	$3,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
2 persons @ $500/ round trip flight	$1,000
TOTAL TRAVEL COST	$1,000
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM

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TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Plots	$2,336	4.0	$8,000	EFR	P
TOTAL			4.0	$8,000	EFR	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

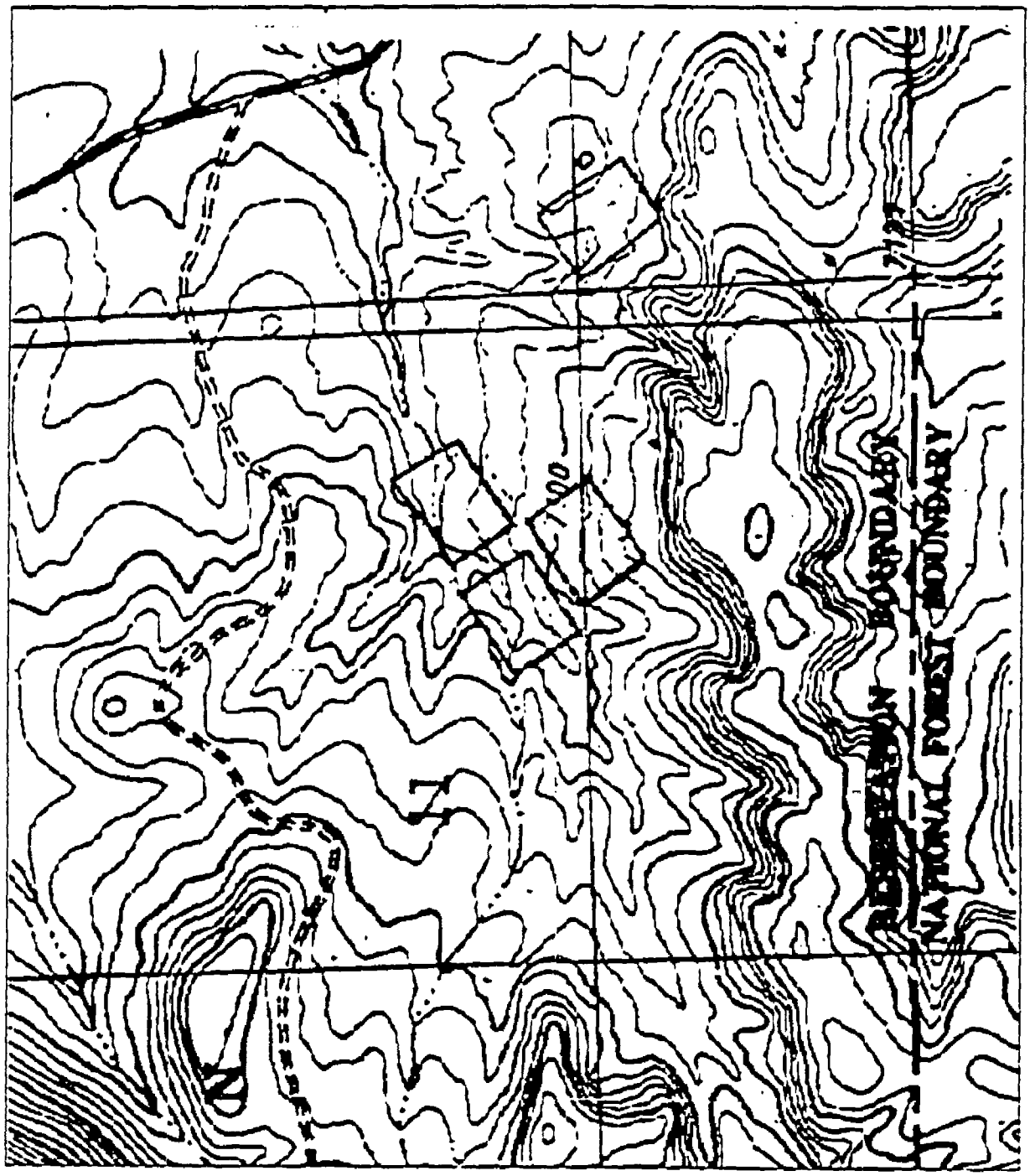
III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Forest Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
SCP	4	$ 9,344
TOTAL COST	4	$ 9,344

Santa Clara Pueblo - Uneven Age Growth Study Plots - T20N, R6E Section 11



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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Install Range Fence	JURISDICTIONS:	SCP
PART E: LINE ITEM:	#15 S-1a Protect Revegetation Efforts	FISCAL YEAR(S) (list each year):	2010

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Immediately repair and reconstruct with tribal labor, 3.5 miles of 4-strand barbed fence approximately ¾ miles east of Puye' Cliff Dwelling. Existing fenceline will be utilized to hold livestock out of the burn area in the lower rangelands. However, fence requires immediate repair to ensure reseeding effort is not compromised by livestock trespass.

B. Location (Suitable) Sites: See Watershed Treatment Map, Appendix III for fenceline location.

C. Design/Construction Specifications:

1. See fence diagram attached

D. Purpose of Treatment Specifications: Fence is required to keep livestock out of the burn area and Santa Clara Canyon for three seasons. Treatment is required to allow establishment of ground cover and prevent erosion from highly unstable watersheds. Fence is required to ensure the effectiveness of watershed treatments for the protection of life and property.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
N/A	
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
12 ½ gage, galvanized barbed wire @ $34.50/ roll X 56 rolls	$1,932
5 ½ foot Steel T-posts @ $2.10 per post X 1,120 posts	$2,352
Angle iron braces @ $41.89/ brace X 15 braces	$628
Sacks of pre-mix concrete @ $2.89/ sack X 50 sacks	$145
100 count bundles of wire fence stays (4ft. lengths) @ $22/ bundle X 22 bundles	$484
14 foot steel gates @ $65/gate X 4	$260

TOTAL MATERIALS AND SUPPLY COST	$5,801
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
N/A	
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Contract labor for fence construction $2,500/mile X 3.5 miles	$8,750
TOTAL CONTRACT COST	$8,750

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Miles	$4,157.43	3.5	$14,551	EFR	C
TOTAL			3.5	$14,551	EFR	C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Watershed Assessment, Appendix I and Watershed Treatment Map, Appendix III

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA-Santa Clara Pueblo	3.5 Miles Fenceline	$14,551
TOTAL COST	3.5 Miles Fenceline	$14,551

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Repair Boundary Fence	JURISDICTIONS:	SCP & SIP USFS, NPS
PART E: LINE ITEM:	#16 S-1b Repair Permanent Range and Boundary Fence	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Repair and replace wire posts and H-Braces approximately 10 miles of internal pasture and boundary range fence. Fencelines that are currently in disrepair as a result of the Cerro Grande fire will require repair to re-establish land ownership boundaries and range pasture integrity.

B. **Location (Suitable) Sites:** See Watershed Treatment Map, Appendix III for fencelines location.

C. **Design/Construction Specifications:**

1. See fence diagram attached
2. Patrol to ensure livestock closure

D. **Purpose of Treatment Specifications:** Fence is required to repair fire effects on physical land improvements owned by the Santa Clara and San Ildefonso Pueblos, National Park Service and the US Forest Service.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Patrol to ensure livestock closure	$1,000
TOTAL PERSONNEL SERVICE COST	$1,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
12 ½ gage, galvanized barbed wire @ $34.50/roll X 160 rolls	$5,520
5 ½ foot Steel T-posts @ $2.10 per post X 3,200 posts	$6,720
Angle iron braces @ $41.89/ brace X 40 braces	$1,676
Sacks of pre-mix concrete @ $2.89/sack X 100 sacks	$289
100 count bundles of wire fence stays (4 ft. lengths) @ $22/bundle X 64 bundles	$1,408
14 foot steel gates @ $65/gate X 20	$1,300

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TOTAL MATERIALS AND SUPPLY COST	16,913
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
N/A	
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Contract labor for fence construction $3,000/mile X 10 miles	$30,000
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Miles	$4,691.30	10.0	$46,913	OP	C
FY2	Patrol (SCP)			$1,000	OP	C
TOTAL			10.0	$47,913	OP	C

FUNDING SOURCES:
F = Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Watershed Assessment, Appendix I and Watershed Treatment Map, Appendix III

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA-Santa Clara Pueblo	5 Miles of Fenceline	$23,457
BIA- San Ildefonso	1 Mile of Fenceline	$4,691
USFS- Santa Fe National Forest	2 Miles of Fenceline	$9,383
NPS- Bandelier National Mon.	2 Miles of Fenceline	$9,382
TOTAL COST	10 Miles Fenceline	$46,913

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Jemez Mountains Salamander - Habitat Rehabilitation Create down Douglas-fir logs for emergency habitat restoration of Jemez Mountains Salamander.	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#17 N-1a Salamander Habitat Rehab	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Fell Douglas-fir snags greater than 18-24 inches dbh to achieve a density of 5 logs per acre. Cut disks from the cut end of each felled tree to create salamander cover boards.

B. **Location (Suitable) Sites:** The entire Salamander Essential Zone of the fire with moderate and high burn severity and slopes less than 60%. There are 3,825 acres meeting the criteria.

C. **Design/Construction Specifications:**

1. Log should be in contact with ground over at least most of its length. Lopping top and/or limbs may be necessary.

2. After each tree is felled, cut four disks from the cut end. Each disk should be 2 – 6 inches in thickness. The four disks should be placed flat on the ground in a square pattern in a relatively flat location within 20 yards of the tree stump.

3. Log length should be as long as possible. Do not buck into short blocks.

4. Where large Douglas-fir snags are not available, smaller snags or aspen should be felled. Do not fell live trees. If 5 down logs already exist, do not fell additional snags.

5. Work needs to be completed before the onset of summer rains (generally July) to the maximum extent possible.

6. Crew supervisor should use discretion to eliminate felling areas if unsafe.

D. **Purpose of Treatment Specifications:** Reestablish a critical habitat component of Jemez Mountains Salamander destroyed by the unnatural stand-replacing Cerro Grande Fire. Meet requirements of the Interagency Agreement and Cooperative Management Plan (USFS, USFWS, NM Dept. Game & Fish; January, 2000). This interagency agreement was in lieu of Federal listing of the species under the Endangered Species Act. Stand-replacing fire is considered the greatest threat to survival of the species (Cooperative Management Plan). 8,407 acres of all vegetation types in the total known habitat crucial for the long term maintenance of viable populations of Jemez Mountains Salamander on USFS lands (i.e., 28% of the Essential Zone as defined in the Cooperative Management Plan; map attached) are within the fire perimeter, of which 4,226 acres are in the High and Moderate burn severity areas (i.e., 14% of Salamander Essential Zone). Due to the severe habitat degradation resulting from the Cerro Grande Fire, Jemez Mountains Salamanders may not survive in these areas. Down decomposing logs, especially Douglas-fir, provide critical cover and habitat for Jemez Mountains Salamanders. This habitat component was consumed by the fire in the high and moderate fire intensity areas. Jemez Mountains Salamanders come to the surface to feed during the summer monsoon season, and large down logs that provide cover and invertebrate prey must be present for the species survival. Late stages of decomposition are the most important. Maximum contact between the log and the ground will speed the decomposition process. Research indicates very little horizontal movement (<10 meters) by salamanders. This makes the potential for re-colonization from distant areas unlikely for many decades. Survival of existing populations is imperative. Mitigation of the severe impacts to Jemez Mountains Salamanders from the Cerro Grande Fire may reduce the need for Federal listing of the species. This treatment has been reviewed by the Forest Archeologist and BAER Team Forester. It has been approved for implementation without mitigation. Attachment: 81/2 X 11 map. 1:24,000 scale map of units is available from BAER Operations Randy Larson.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Sawyers (faller qualified) GS-5 70 fallers x185.84 day (8 hrs + 6 hrs at OT rate) x 66 days x 1/8 x 1 FY = (1/8 used because this specification is only a portion of the total type of felling work done concurrently. This specs is for 5 trees per acre out of 40 so it is 1/8 of the total felling work. See Contour Felling spec).	$110,801

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TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Chainsaws 70 @/ $27/day x 66 days x 1/8 x 1 FY = (See explanation for fraction used under Personal Services)	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$16,100
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	N/A
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Five buses @ $1,000 day round trip x 66 days X 1/8 1 FY = (See explanation for fraction above under Personal Services)	
TOTAL TRAVEL COST	$42,586
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	N/A

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acre	$44.31	3,825	$169,487	EFR	FC
TOTAL			3,825	$169,487	EFR	FC

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Interagency Conservation Agreement for the Jemez Mountains Salamander, Map of "Jemez Mts. Salamander Essential Zone" with approximate fire perimeter, from Cooperative Management Plan.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
US Forest Service	3,825 acres	$169,487
TOTAL COST	3,825 acres	$169,487

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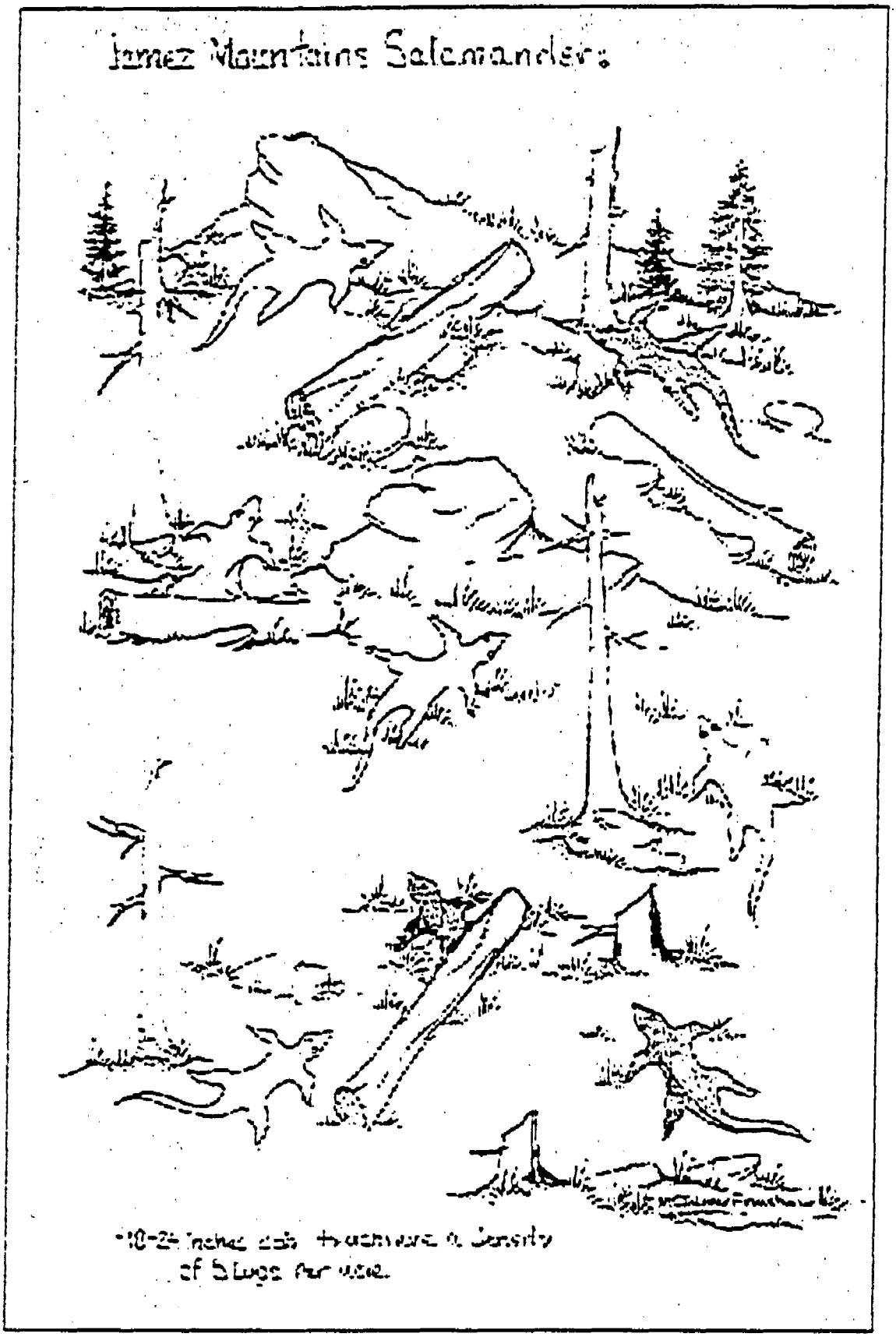
Jemez Mountains Salamanders
10-24 inches cob transverse a density
of slugs per acre.

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Wildlife Water Development	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#18 N-1b Wildlife water development	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Rebuild a wildlife water development that was destroyed by the Cerro Grande fire. It is the sole source of water for six miles.

B. **Location (Suitable) Sites:** Rebuild at the previous site. T.20 N , R 6E, Section 25 SW 1/4

C. **Design/Construction Specifications:**

1. Water collection apron of corrugated galvanized sheet metal 50 feet x 48 feet supported on posts, struts and braces, 2 feet above the ground.

2. At low end a gutter to collect runoff 48 feet long.

3. Pipe made of PVC or metal to deliver water to storage tank 80 feet long by 10 inches diameter, supported above ground on wood posts. Pipe is secured with metal straps to top of the posts..

4. Rebuild fence 216 feet by 126 feet by 174 feet by 132 feet (see sketch) surrounding collection apron and storage tank with five strand barbed wire fence, metal posts, metal h-braces, reinforced corners and wire gate with smooth wire closure.

5. Rebuild wood support box (drinker enclosure) outside of the fence.

6. Remove all damaged materials from the site for salvage, recycling or disposing of property.

D. **Purpose of Treatment Specification:** To provide a year round water source in a completely dry area for important economic big game species of elk, mule deer, and turkey. This is a sole source of water in a primarily winter range and a spring/fall transitional range.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-5 3 people @$10.00/hour X 10 hrs per day for 10 days X 1 (Fiscal year)	$3,000
TOTAL PERSONNEL SERVICE COST	

EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	

MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
48 6 ft railroad bes @ $7.99 ea $383.52	$384
30 6 in. x 8 in. x 10 in. beams @ $24.00ea = $720 00	$720
78 4 ft. x4 ft. x10 ft. cross joists @ $8.77 ea = $684 06	$684
8 6 in. diameter x 10 ft. sections water pipe @ $16.99 ea = $135.92	$136
8 2 in. x 12 in. x 10 ft. treated lumber @ $21.00 ea = $168.00	$168
4 6 in. x 6 ft. treated posts @$15.77 ea = $63.08	$63
108 26 in. x 10 ft. corrugated steel @$10.99 ea $1,186.92	$1,187

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27 26 in. x 12 ft. corrugated steel @$11.99 ea = $323.73 25 lbs 16 penny nails = $37.52 Corrugated steel screws = $25.29	$323 $38 $25
	$3,729
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Pick-up 20 mi X 50 mi X 10 X 1 Fiscal Year	
TOTAL TRAVEL COST	$100
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	ea	$6,829	1	$6,829	OP	P
TOTAL			1	$6,829	OP	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- C = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

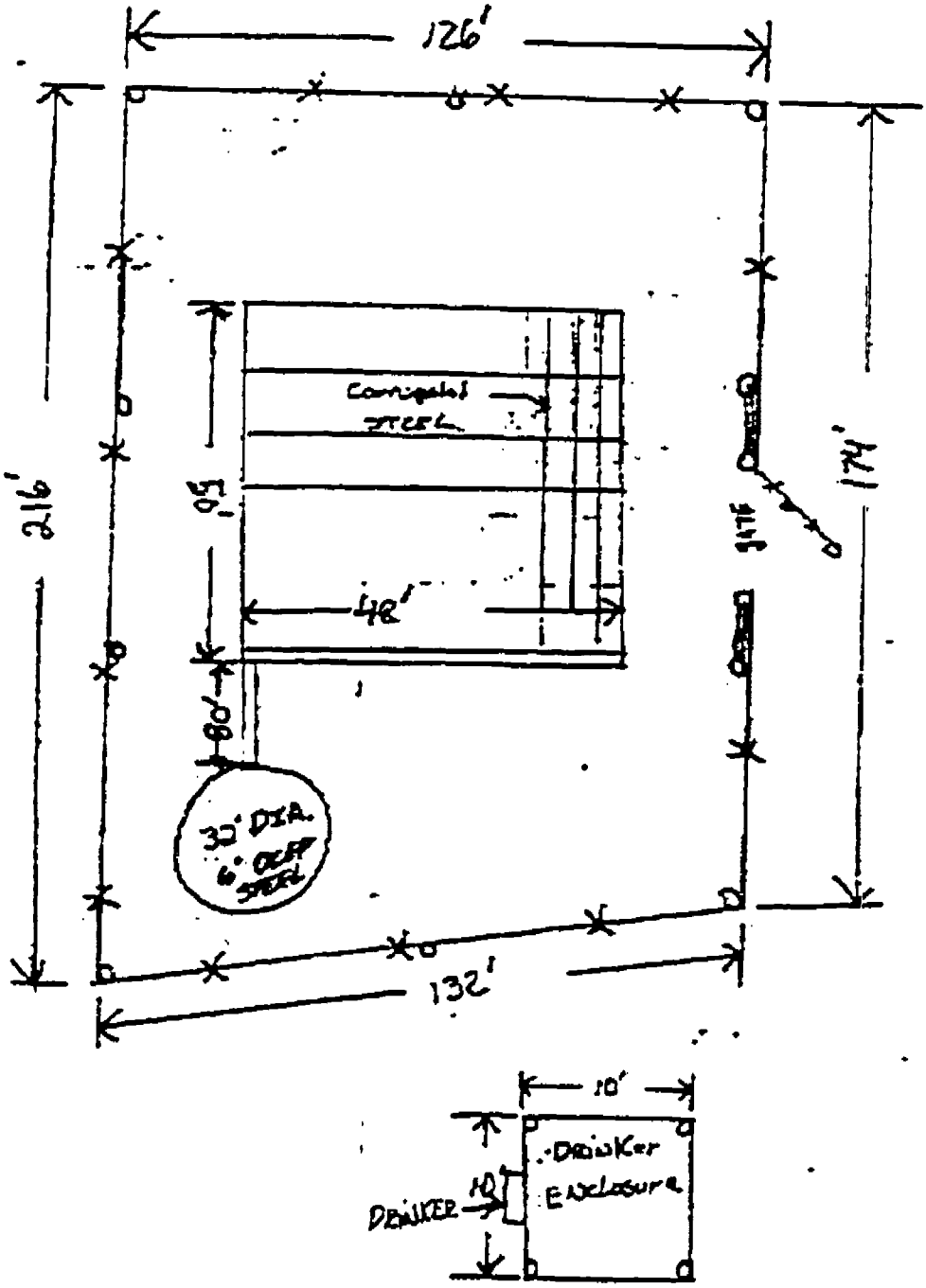
List Relevant Documentation and Cross-Reference Location within BAER Report:

Wildlife Assessment -other

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
US Forest Service	1	$6,829
TOTAL COST	1	$6,829

Wildlife Water Development



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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Power Pole Protection	JURISDICTIONS:	SCP, LA Co.
PART E: LINE ITEM:	#19 I-1a Power Pole Protection	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Placement of boulders for buffering flood flows around power poles to reduce scour and breakage. Rock source will be local. Access would be off local roads, within dry stream bottoms.

B. Location (Suitable) Sites: Bottoms of Santa Clara Creek and its tributary "Siouyaconçae" on Santa Clara Pueblo lands and bottoms of Rendija and Guaje Canyons within Los Alamos County.

C. Design/Construction Specifications:

1. Placement of medium to large size boulders, greater than 24 inches, around poles. Placement must be a minimum of 2 boulders in height (4 feet) and 2 boulders in depth (4 feet) and completely surrounding each pole.

2. Rock source may be local tuff and basalt, within vicinity of each canyon.

3. Equipment – track excavator hoe with 20-foot boom and clam-shell or thumb attachment.

D Purpose of Treatment Specifications: To protect power poles feeding water stations and pumps from scour of high flood events. Also to reduce the risk of breakage of poles from floating debris.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Inspector, GS-9 @ $15.52/hr. x 1 hr. x 1 yr.	$15.52
TOTAL PERSONNEL SERVICE COST	$15.52
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Excavator @ $105/hr x 1 hr. x 1 hr.	$105
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$105
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Rock on site	
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Transport on low boy @ $500/trip x .20 x 1	$100

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

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Pole	220.52	25	5513	EWP	P
TOTAL			25	5513	EWP	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA - Santa Clara Pueblo	5	$1,102.60
Los Alamos County	20	$4,410.40
TOTAL COST	25	$5,513.00

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Protection of well head and transformer	JURISDICTIONS:	SCP
PART E: LINE ITEM:	#20 I-1b Well head protection	FISCAL YEAR(S) (list each year):	2010

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Protect a well head and electrical transformer that supply water and electrical power to the Puye Cliffs visitor center and campground from floodwaters. Floodwaters can occur in Santa Clara Canyon from upper watershed runoff and/or from flows of "Siouyacongae". Sandbags will be placed around these structures and left in place for 3 runoff seasons.

B. Location (Suitable) Sites: Santa Clara Canyon at confluence with "Siouyacongae" tributary. See Watershed Treatment map in Appendix III

C. Design/Construction Specifications:

1. Sandbags will be filled on site from available sources of sand and gravels.

2. Sandbags will be manually placed around the perimeter of the well head and transformer to a height of at least 2 sandbags.

D. Purpose of Treatment Specifications: Protection of well head and electrical transformer from floodwaters.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-4 techs. @ $9.15 x 24 hrs. x 1 yr	$220
TOTAL PERSONNEL SERVICE COST	$220
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # or Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Sandbags @ $0.25 x 300 x 1	$75
TOTAL MATERIALS AND SUPPLY COST	$75
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
4x4 pick up @ .32 x 30 x 1	$10
TOTAL TRAVEL COST	$10
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM

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TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	ea	305	1	305	EWP	P
TOTAL			1	305	EWP	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment; see Appendix III, Watershed Treatments Map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA – Santa Clara Pueblo	1	$305
TOTAL COST	1	$305

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Enhance Catchment Basins	JURISDICTIONS:	SCP, LA Co.
PART E: LINE ITEM:	#21 W-4b Catchment Basins	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Catchment basins are small impoundments for the deposition of debris and sediment and for ameliorating volume and velocity of runoff. Existing stock ponds can be enlarged and armored to serve as catchment basins.

B. **Location (Suitable) Sites:** Two stock ponds on Santa Clara Pueblo lands located in T20N R6E S12 NW4 and T20N R6E S2 SE4, within drainage of small tributary to Santa Clara Canyon known locally as Soya Congea. Diamond Drive fill bridge and improvements in pueblo and school canyons in LA county.

C. **Design/Construction Specifications:**

1. Size – the preferred size would accommodate 10 acre feet of water. Current size ranges from 3-5 acre feet; therefore excavation of up to 1000 cubic yards may be needed.

2. Disposal of waste – spread excavated material on elevated flats to the north, a minimum of 50 yards from catchment basin, stream channel and other drainage network features. Site to be located by resource advisor. Other stable disposable sites may be identified. Seed disturbed waste sites.

3. Rock – for armoring of inlets and emergency spillways. 20 inch minus pit run rock or river rock.

4. Equipment – dozer no smaller than D-5, preferably D-6 for excavation and spreading of waste material. Front end loader and dump truck for load and transport of rock and waste materials. Chainsaw for clearing of trees and brush. All equipment must have appropriate safety and fire prevention equipment.

5. Protection of cultural resources – workers and equipment must protect all cultural resources by not spreading waste material on such sites.

D. **Purpose of Treatment Specifications:** Stormflow peak flows are predicted to be in excess of 25 times normal annual peak flows. Under such flows, in-channel erosion will generate up to 9,000 cubic yards of material. In addition ash and soil material from hillslope erosion will add over 550 cubic yards of material to the stream network. Powerlines and a waterline supplying a campground and visitor center are at risk downstream. Excess runoff will be stilled at these basins, ameliorating velocity and storing sediments generated by the hillslope erosion and in-channel scour, reducing risk to the power and water lines and reducing inputs to the Santa Clara creek. Armoring of the inlets and spillways will protect the integrity of the ponds and reduce chance of breaching. Ponds will need clean out after major runoff events to restore them to original purpose.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Inspector, GS-11 @ 18.77 x 24 x 1	$450
Feller, GS-6 @ 11.41 x 8 x 1	$91
Survey Crew, GS-7 @ 12.68 x 16 x 1 yr	$203
Resource Advisor, GS-9 @ 15.52 x 8 x 1	$124
Seeder, GS-3 @ 8.15 x 2 x 1	$16

4/6

TOTAL PERSONNEL SERVICE COST	$884
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Dump truck with operator, @ 50/hr x 16 x 1	$800
Front end loader with operator @ 60/hr x 16 x 1	$960
Dozer, D-6 with operator @ 90/hr x 16 x 1	$1,440
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$3,200
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Angular rock, delivered, @ 50/cy x 20 cy x 1	$1,000
Seed @ 1.80 x 40 lb/ac x 1	$72
Miscellaneous expenses (chainsaw chain, fuel, hand tools, wooden stakes)	$500
TOTAL MATERIALS AND SUPPLY COST	$1,572
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Transport with operator @ 500 per in/out x 2	$1,000
TOTAL TRAVEL COST	$1,000
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	basin	8366	2	$16,732	EWP	P
FY 1	Diamond Drive fill bridge	2,200,000	1	$2,200,000	COE PL 8499 Advanced Measures	C
FY 1	Embankment culvert	100,000	4	$400,000	EWP	C
TOTAL			2	$2,616,732	EWP, COE, EWP	P,C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:
See Appendix I, Watershed Assessment; see Appendix III, Watershed Treatments Map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
Santa Clara Pueblo (BIA)	2 (as needed)	$16,732
LA County	Upsize culvert in diamond Drive Fill Bridge	$1,500,000
LA County	Inlet & trash rack & fabric armour	$400,000
TOTAL COST	2	$1,916,732

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Catchment Basin Cleanout	JURISDICTIONS:	USFS, SCP, LA
PART E: LINE ITEM:	#22 W-4c Catchments	FISCAL YEAR(S) (list each year):	2000, 2001, 2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Clean out of debris and sediments from catchment basins after each storm flow event. Estimated 4 storm flow events per year for 3 years for 7 basins.

B. Location (Suitable) Sites: As identified on Watershed Treatment map (Appendix III), including existing reservoirs enhanced stock ponds and newly created basins. Work will be performed on county lands pueblo and school canyons- estimated cost $50,000 using EWP funds.

C. Design/Construction Specifications:

1. Sediments and debris are to be cleaned out and pre-runoff capacity restored to each basin. Integrity of the basin is to be maintained.

2. Disposal of waste – spread excavated soils on the backside of the earthen dam to reinforce. Do not waste material over rock-armored spillway. Debris (trees, root wads) should be separated out and placed outside of any hydrologic channels.

3. Equipment – dozer, D-5 or larger, and track excavator with 20 foot boom. Equipment must have appropriate safety and fire prevention equipment attached.

4. Protection of cultural resources – all cultural resources must be protected by not spreading soil and debris on such sites.

D. Purpose of Treatment Specifications: Removal of debris and sediment deposited within catchment basins after each runoff event to restore capacity for future events as a result of fire in the watersheds. Increased flows with associated sediments and debris are expected for 3 years following the fire. After 3 years, effects should ameliorate to the level where catchments will no longer need clean out.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Inspector, GS-9 @ 15.52 x 8 hrs/day x 5 days x 3 years	$1862
TOTAL PERSONNEL SERVICE COST	$1862
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Dozer, D-6, with operator @ $90/hr x 8 hr x 4 days x 3 yrs	$8,640
Excavator, track, 20 foot boom, with operator @ 120/hr x 8 x 4 x 3	$11,520
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$20,160
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM

TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Transport of dozer, in/out round trip @ 500 x 4 x 3 x 2	$12,000
TOTAL TRAVEL COST	$12,000
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Ea	2835	28	$129,380	EWP	P
FY2	Ea	2977	28	$83,356	EWP	P
FY3	Ea	3126	28	$87,528	EWP	P
TOTAL			84	$300,246	EWP	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment; see Appendix III, Watershed Treatment Map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA- Santa Clara Pueblo	4 basins x 4 x 3 yrs	$143,008
USFS	3 basins x 4 x 3 yrs	$107,256
LA County – EWP Funds	2 basins X 4 X 3 yrs	$50,000
TOTAL COST		$300,264

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Hydro-Mulch Los Alamos Canyon, Pueblo Canyon, and Rendija Canyon, and Road Slopes	JURISDICTIONS:	USFS, DOE, SCP, Priv.
PART E: LINE ITEM:	#23 W-2b Slope Stabilization	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Hydro-mulch accessible slopes of Los Alamos Canyon and road slopes that sustained high to moderate burn severity. Existing dirt roads along the southern rim of Los Alamos Canyon will be improved and extended to provide access for contracted hydro-mulching vehicles. New roads will be restored following hydro-mulch operation.

B. Location (Suitable) Sites: Contractors equipment must be capable of reaching slopes up to 450 feet either side of designated roads (see hydro-mulching treatment map for specific road slope locations)

C. Design/Construction Specifications:

1. Mulch and Tackifier Requirement: Contractor will utilize mulch and tackifier appropriate for 70 to 80 degree slopes.

2. Mulch Rate: Mulch rate should not exceed 2,000 lbs. Per acre.

3. Seed Mixture: All seed used by contractor shall have no less than 80% germination and 90% purity. Inert matter must not exceed 10%. Contractor will provide written certification that seed has been tested for noxious weed content and inert matter within the past 120 days. All seeds will be certified noxious weed free. No substitute species will be accepted.

Cerro Grand Fire Hydro-Mulch Seed Mix:

Species	% of Mix	Lbs. PLS / Acre
Cereal Rye (*Lolium multiflorum*)	40%	5
Mountain Brome (*Bromus marginatus*)	30%	10
Slender Wheatgrass (*Elymus trachycaulus*)	30%	6

4. Equipment and Transportation: Contractor is responsible for supplying all materials and equipment including transportation to and from the designated locations. Contractor equipment must be capable of applying mulch up to 450 feet on either side of road. Approximately 2/3's of roads will require use of 4 wheel drive equipment and 1/3 will be accessible by 2 wheel drive equipment

5. Road Improvements and Construction: Incident management team will grade existing dirt roads along the south rim of Los Alamos Canyon and clear tree limbs and hazard trees to allow semi-truck size hydro-mulcher to gain access. Construct new access roads to inaccessible portions of the canyon rim with cat.

6. Completion Date: Work must be completed by June 25, 2000

D. Purpose of Treatment Specifications: Purpose is rapidly established grass cover on steeps slopes with potential to contribute water and sediment to flood flows within Los Alamos Canyon, Pueblo Canyon, and Rendija Canyon and along road ways within and adjoining the burned area.

II. LABOR, MATERIALS AND OTHER COST:

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

TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Dozer to improve and construct temporary access road @ $55 / hour X 20 hours	$1,100
Contracted hydro-mulching including all materials, supplies, equipment, personnel and transportation @ $1,500 / acre X 2017 acres Aircraft application @ $2,500/acre est	$3,025,500 $3,500,000
TOTAL CONTRACT COST	$6,526,600

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres (Ground)	$1,500	2,017	$3,026,600	EFR	C
FY 1	Acres (Air)	$2,500	1,000	$2,500,000	LANL	C
TOTAL			3,017	$5,526,600	EFR/ LANL	C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED (GIS Acres)	COST
USFS	1,748 Acres (ground) 1,000 Acres (air)	$ 2,481,812 (ground) $90,000
DOE	268 Acres (ground)	$393,455 (ground) $3,500,000 (air)
Santa Clara Pueblo	87 Acres	127,064
Private	1 Acres	30,266
TOTAL COST	3,104 Acres	$ 3,026,600 (ground) $3,590,000 (air)

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Los Alamos Reservoir	JURISDICTIONS:	LA Co., USFS
PART E: LINE ITEM:	#24 W-4e Drain, dredge, and evaluate the safety of Los Alamos Reservoir	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Drain and dredge Los Alamos Reservoir to increase storage capacity and evaluate the safety of the dam for passing expected peak flows from Los Alamos Canyon.

B. **Location (Suitable) Sites:** Los Alamos Reservoir. T19N R6E Section 18 NWNW

C. **Design/Construction Specifications:** To be designed by Engineer.

D. **Purpose of Treatment Specifications:** Los Alamos Reservoir lies near the lower end of the burned area in Los Alamos Canyon and is a key element in reducing the effects of flood waters, sediment, and debris expected from the upper watershed on downstream areas in the city of Los Alamos and on Los Alamos National Laboratory (LANL) lands. The reservoir has a reported design storage capacity of 30 acre-feet that has reportedly been reduced to less than 10 acre-feet due to sediment deposition. The structure appears to be an earthen dam with a concrete spillway that may not be adequate to convey post fire peak, particularly with the amount of debris anticipated with these flows. The intent of this treatment is to increase the storage capacity of the reservoir and ensure that it will safely pass the anticipated post fire peak flows. To accomplish this project the elements listed below should be completed.

1. The reservoir will be drained. (Recommended: A 3-6 cfs capacity pump that could be kept on standby)
2. A dam safety inspection will be completed to evaluate safety during expected post fire peak flows. COE to inspect. Final decision to breach or not to breach is Leonard Atencio in conjunction with DOE.

Recommend further that an engineer evaluate the feasibility of increasing the storage capacity of the reservoir by raising the embankment.

Once the risk of flooding has ended (estimated to be in 3-7 years) measures to restore the reservoir to its original storage capacity and to restore its recreational amenities may be necessary. This would require inventory and assessment by the Forest Service, a Landscape Architects, and a Civil Engineer.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
An engineer should evaluate methods for completing the draining, dredging and dam safety modifications. Cost estimates should be developed from these evaluations.	
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM

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

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1					EFR	
FY 2					EFR	
FY 3					EFR	
TOTAL					EFR	

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- CP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
TOTAL COST		

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Assess & protect structures at flood risk	JURISDICTIONS:	LA Co., SCP & SIP
PART E: LINE ITEM:	#25 W-10 Assess & protect structures	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Assess flood stage for multiple flow discharges along canyons that head within the burn area and identify structures at risk to flooding.

B. Location (Suitable) Sites: The five communities of:
Los Alamos (School draw at Yucca Street),
Ponderosa Estates (Rendija Canyon);
White Rock (Pajarito Canyon);
San Ildefonso (Guaje Canyon);
Santa Clara (Santa Clara Canyon); and
State Road 30 channel crossings between Santa Clara and State Road 501

C. Design/Construction Specifications:

1. Develop design hydrograph for 25 yr and 100 yr- 1hr and 6 hour storm events using a 1.9" @ 25 yr-1hr and 2.3" @ 100 yr-1hr events and 2.6" @ 25yr-6hr and 3.2 @ 100 yr-6hr events. Use TR-20, HEC or similar models to route storm flows and steam discharges to identify high water marks

2. Plot high water levels of design storms in the vicinity of structures to identify homes with stormflow flooding potential

3. Map location of structures needing protection including road crossing and drainage structures

4. Identify treatments to protect structures (e.g. sandbags, deflection structures)

5. Construct appropriate emergency protection treatments identified in this assessment.

6. Include additional flows from Oso burn.

D. Purpose of Treatment Specifications:

The sites listed above are located in areas of risk from storm flow flooding associated with the Cerro Grande fire. Many of the structures are homes. This assessment is designed to provide a more definitive delineation of flooding potential in areas where structures are located in the vicinity of potential flood flows.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Hydrologist or Civil Engineer, Survey crew 3 days for storm flow modeling, 5 days for site surveying	$5000
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Vehicle and mileage	$300

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TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
sandbags, deflection structures (purchase, installation, and maintenance)	$494,700
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 2000	Survey	$500,000	1	$500,000	EWP funds	P
TOTAL		$500,000	1	$500,000	EWP funds	P

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Func
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Infrastructure Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
LA Co.	1	$ 166,666
SCP	1	$ 166,666
SIP	1	$ 166,666
TOTAL COST	3	$ 500,000

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F - SPECIFICATIONS

SPECIFICATION TITLE:	Inventory of Existing Trail Conditions and Development of Reconstruction Specifications	JURISDICTIONS:	USFS, SIP & SCP
PART E LINE ITEM:	#26 S-5a Trail Stabilization – Inventory of Existing Trail Con	FISCAL YEAR(S) (list each year):	2000

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

Number and Describe Each Task:

A. General Description: Conduct on-the-ground survey/inventory of post-fire conditions of trails and develop recommendations for rehabilitation work.

B. Location: Trails - Santa Fe National Forest trails within the burned area as shown on the attached trail system map. Rock climbing walls – Along Pajarito Canyon trail # 280, approximately .4 miles from NMSH 501; Los Alamos Canyon along Trail # 294 above Los Alamos Reservoir; and off Mitchell Trail # 69 Trails on Santa Clara & San Ildefonso pueblo lands.

C. Design/Construction Specifications:

1. Conduct on-the-ground survey/inventory of existing conditions to determine impacts of fire and/or fire-suppression related activities and develop Trail Log of reconstruction needs on Forest Service and pueblo trails. Work includes the following:
   - Location (stations) of water bars, drainage dips, or other drainage structures to be replaced
   - Location of additional water bars, check dams, drainage dips, or other drainage structures needed as a result of fire damage
   - Materials to be used for construction of above drainage structures and required length for each
   - Location of trail identification signs, numbers and related trail marking to be replaced
   - Required treadway work to bring trail back to original conditions (width, outsloping, surfacing, etc.)
   - Location of debris (fallen trees, limbs, rocks, etc.) to be removed that is obstructing trail tread or impeding proper drainage of trail
   - Other recommendations as required to bring trail back to pre-fire conditions and to stabilize tread in anticipation of increased sediment run-off resulting from changed watershed and loss of vegetation.
   - Identify photo points for monitoring success of emergency treatment(refer to M-2 Monitoring and Evaluation of Emergency Treatments specification)

2. Write up specifications for required rehabilitation work to return identified trails to agency standards.

D. Purpose of Treatment Specifications: Approximately 80% of the Santa Fe National Forest trails in this area have been impacted to some degree by the fire. Santa Clara and San Ildefonso pueblo trails also impacted. Pedestrians and mountain bikers use the trails in Los Alamos County for exercise, pleasure, and commuting to and from work. These trails must be rehabilitated in order to replace lost/damaged recreation opportunities. On-the-ground inspection is required in order to determine what rehabilitation efforts are required. In addition, the public will get out and create their own trails if these trails are not reconstructed. This would increase erosion potential and possibly undermine erosion control measures that have been put in place. Specifications and estimates for trail rehabilitation work will be developed for supplemental EFR funding. The walls used by rock climbers are in areas of low to moderate burn severity. The integrity of the rock face and anchors must be evaluated prior to public use to ensure health and safety of rock climbers.

II. LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item): Note: Do not include regular hours for contracted personnel (see contracted services below).	COST/ITEM
GS-12 Landscape Architect or District Recreation Staff, 10 days @ $ 265/day	$ 2,650
1 Trail Specialists, GS-9 – 20 days @ $175/day	$ 3,500
3 Trail Specialists, GS-5—15 days each @ $115/day	$ 5,175
GS-9 Land Surveyor/GPS specialist, 5 days @ $175/day	$875
GS-11 Geologist 5 days @ $225/day	$1,125
TOTAL PERSONNEL SERVICE COST	$ 13,325

EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	COST/ITEM
FOR: 2-4x4 pickup trucks @ $300/month/vehicle for trail specialist	$600
Mileage: 1000 miles @ .18/mile for trail specialists	$180
FOR: 1 – 4x4 pickup truck @ $300/month for geologist	$300
Mileage: 200 miles @ .18/mile for geologist	$36
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$ 1,116
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	**COST/ITEM**
Trimble GEO Explorer III, manufactured by Trimble Navigation, includes Pathfinder Office software, V2.51	$ 5,000
TOTAL MATERIALS AND SUPPLY COST	$ 5,000

TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST/ITEM
Travel and per dim for 4 trail specialists: ($136/day x 15 x 3) + ($136 x 20) + $200/person (travel)	$ 9,640
Travel and per iem for geologist: ($136 x 5) +$200	$880
Travel and per \diem for certified rock climber: ($136 x 5) + $200	$880
TOTAL TRAVEL COST	$ 11,400
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	**COST/ITEM**
Certified Technical Rock Climber to inspect rock climbing walls: 5 days @ $ 250/day	$ 1,000
TOTAL CONTRACT COST	$ 1,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNITS COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Miles	$ 283.68	97	$ 27,420	EFR	P
FY 2	Rock climbing wall	$ 4,221.00	1	$ 4,221	EFR	P,C
TOTAL			98	$31,641	EFR	P,C

FUNDING SOURCES:

F = Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:

P = Agency Personnel Services
C = Contract (long-term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

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

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Identify the assessment from which this specification is recommended and reference the necessary maps. For example: See Appendix I, Recreation Assessment. See Appendix III, Trails Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USNF SIP	97 Miles	$27,420
USNF SCP	Rock Walls	$4,421
TOTAL COST	97 Miles	$31,841

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F - SPECIFICATIONS

SPECIFICATION TITLE:	Monitoring of trail conditions and effectiveness of emergency rehabilitation work	JURISDICTIONS:	USFS
PART E LINE ITEM:	#27 M-2 Monitoring and Evaluation of Emergency Treatments—Trail conditions	FISCAL YEAR(S) (list each year):	2000, 2001

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

Number and Describe Each Task:

A. **General Description:** Monitor the condition of the 97 miles of trails within burned area for one year to determine effectiveness of emergency rehabilitation work.

B. **Location:** Santa Fe National Forest trails within the burned area as shown on the attached trail system map

C. **Design/Construction Specifications.**

1. Conduct on-the-ground survey of trail conditions to effectiveness of emergency rehabilitation work. Assessment to include

   - Condition and effectiveness of water bars, drainage dips, or other drainage structures in handling runoff
   - Identification of additional water bars, check dams, drainage dips, or other drainage structures needed as a result of flooding and changed drainage patterns
   - Condition of trail tread (width, cross slope, surfacing, slope stability, debris, etc.)
   - Other recommendations as required to bring trail back to pre-fire conditions

2. Three monitoring trips shall be conducted between Spring/Summer 200 and Spring/Summer 2001- the first immediately after implementation of emergency rehabilitation work, the second after summer 2000 monsoon period, and the third after the Spring 2001 snow melt/winter run off. Photo points referenced in Specification S-5 Trail Stabilization shall be used to compare the condition of trail after each monitoring trip to assess degree of change and success.

3. Specifications shall be developed after monitoring for required additional emergency rehabilitation work to return trails to pre-fire conditions. Necessary work to be covered by supplemental emergency fire rehabilitation funds.

D. **Purpose of Treatment Specifications:** The watersheds around the trails in the burned area have been drastically altered as a result of the Cerro Grande fire. Implementation of rehabilitation work, such as tread work or installation of water bars, drainage dips, or other drainage structures, may be damaged or washed out as a result of floods and melting snow. Trail conditions shall be monitored for a period of one year after implementation of emergency rehabilitation work. The purpose of this monitoring is to determine the effectiveness of the emergency work in handling run off resulting from a changed watershed and loss of vegetation.

II. LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item): Note: Do not include regular hours for contracted personnel (see contracted services below).	**COST/ITEM**
Landscape Architect or District Recreation Staff, GS-12, 5 days @ $265/day	$1,325
1 Trail Specialist, GS-9 – 5 days @ $175/day	$2,625
2 Trail Specialists, GS-5—10 days each @ $115/day	$3,450
TOTAL PERSONNEL SERVICE COST	$7,400
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	**COST/ITEM**
FOR: 2-4x4 pickup trucks @ $300/month/vehicle	$600
Mileage: 2000 miles @ .18/mile	$360
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$600
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	**COST/ITEM**
Provide a detail breakdown of the materials needed to complete the job. Identify a detailed description of the materials (% of seed mix, # of pounds, seeding rate, germination rate, etc.)	

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TOTAL MATERIALS AND SUPPLY COST	N/A

TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	COST/ITEM
Travel and per diem for 3 trail specialists: [$136/day/person (per diem) X 15 days/person] + $200/person (travel)	$6,720
TOTAL TRAVEL COST	$6,720
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	N/A

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNITS COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Miles (2 monitoring trips)	$ 103.64	97	$10,053	EFR	P
FY 2	Miles (1 monitoring trip)	$ 51.82	97	$5,027	EFR	P
TOTAL			97	$15,080	EFR	P

FUNDING SOURCES:

F = Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Func
O = Other
EWP = Emergency Watershed Program

METHODS:

P = Agency Personnel Services
C = Contract (long-term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

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

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:
See Appendix I, Recreation Assessment. See Appendix III, Trails Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
Santa Fe National Forest	97 miles	$15,080
TOTAL COST	97 miles	$15,080

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Parking Area Rehabilitation	JURISDICTIONS:	SCP
PART E: LINE ITEM:	#28 W-1b Surface Stabilization Puye Cliff Dwelling Parking Area Rehabilitation	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Rehabilitation of parking area adjacent to Puye Cliff Dwelling Visitor Center

B. **Location (Suitable) Sites:** Puye Cliff Dwellings on Santa Clara Pueblo. T20N, R7E, Sec. 17, NMPM

C. **Design/Construction Specifications:**

1. Hire contractor to develop plans and specifications for reconstruction of
2. RV/bus parking area, as shown on the attached concept drawing. Original parking area was disturbed by suppression activities for safety zone. Contractor shall submit two proposed site plans from which the final site plan will be developed. Parking area shall accommodate approximately 50 passenger vehicles and 2-4 RV/bus spaces. Design of parking area shall include the following:
   - Adequate maneuvering room and turning radii for the safe ingress and egress of passenger and oversized vehicles
   - Safe circulation routes from pedestrians from parking area to visitor center
   - Adequate drainage schemes and/or structures to minimize erosion
   - Appropriate measures to stabilize cut and fill slopes, if required
3. Contractor shall prepare contract package and cost estimates for construction of parking area.
4. Contractor shall work with a designated representative of the Santa Clara Pueblo during all aspects of planning and design.
5. Santa Clara Pueblo shall have final approval of all plans and specifications for completion of parking areas.

D. **Purpose of Treatment Specifications:** To restore RV/bus parking area to pre-fire conditions. Dozers substantially modified this area during construction of fire safety zone.

II. LABOR, MATERIALS AND OTHER COST:

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

TOTAL MATERIALS AND SUPPLY COST	N/A
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
3 visits to site for Engineer and Landscape Architect – Lump Sum	$500
TOTAL TRAVEL COST	$500
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Design time – Engineer: 15 days @ $250/day = $3750 Landscape Architect: 10 days @ $250/day = $2500 3 person survey crew, 3 days at $100/person/day = $900 Risk, profit, and overhead = 25% of total expenses = $1790	 $3750 $2,500 $900 $1,790
TOTAL CONTRACT COST	$8940

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres	$4720	2	$9,440	F	C
TOTAL			2	$9,440	F	C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

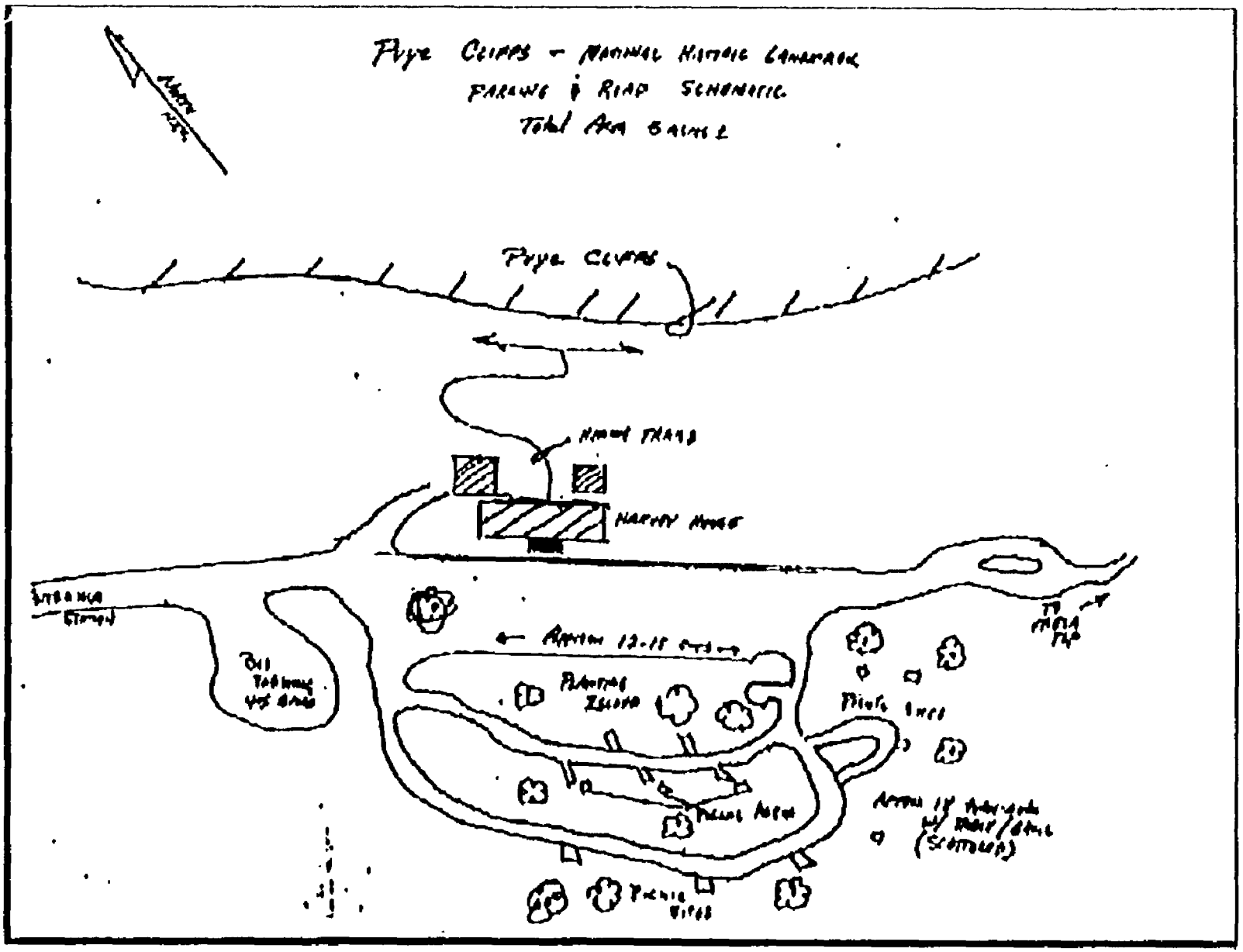
III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:

See attached Concept Drawing submitted by Santa Clara Pueblo

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
Bureau of Indian Affairs, Santa Clara Pueblo	2 acres	$9,440
TOTAL COST	2 acres	$9,440


Pye Cliffs - National Historic Landmark
Parking & Road Schematic
Total Area Basis
Pye Cliffs
Road Trans
Parking Area
Picnic Area
Picnic Tables

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Pipeline Access Road Rehabilitation	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#29 W-9 Protection from localized soil erosion	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Rehabilitation of gas pipeline access road. Pipeline is administered under special use permit to PNM (Public Service Company of New Mexico) by the Santa Fe National Forest

B. **Location (Suitable) Sites:** Los Alamos County, T19N, R6E, Secs. 7-8, NMPM

C. **Design/Construction Specifications:** Section numbers referenced in this specification are indicated on the attached Pipeline Map

1. Install 4 rock check dams as flagged on the ground in Section 1. Install 3 rock check dams as flagged on the ground in Section 2. This includes the following:
   - Pull boulders from berms alongside access road to create check dams. Pack fines firmly behind boulders to aid in sediment trapping and to bed boulders.
   - Dams are to be located on alternate sides of pipeline in herringbone fashion (see Detail A), following alignment of existing fracture zone. Slope dams so that water drains away from access road as shown. Leave 12" clear traveiway between edge of access road and rock check dam so as to permit vehicular access in a zigzag pattern up the road.
   - Height of check dams – 18" – 24"
2. Section 3: Install 7 water bars as flagged on the ground. Construction of water bars to be as directed in Water Bar Specification for Suppression Line Rehabilitation.
3. Road needs no further grading except for installation of water bars.
4. After construction of check dams, hand seed in irregular patterns, as directed by Landscape Architect, along both sides of access road, in fines behind rock check dams, and in other areas in access road where sediment has collected. Seed to be scattered in natural patterns on alternate sides of rehabilitated area, taking advantages of natural dips or depression where water would likely collect. Seeded areas to extend approximately 50' to 100' by 50' to 100', or as designated by Landscape Architect. Since this area will be aerial seeded, the Cerro Grande Aerial Grass Seed Mix is to be hand seeded only within road right-of-way where sediment has been trapped.
5. Forest Service Landscape Architect shall be on site to supervisor construction activities.

D. **Purpose of Treatment Specifications:** To mitigate visual contrast of pipeline as a result of fire and to reduce potential erosion. The pipeline access road is located on slopes of 50-60% in an area of high burn severity where there is close to 100% tree mortality. Construction of this access road has exposed subsurface soils and bedrock; the road now appears as a white stripe or scar on the mountainside. Because of lack of tree cover and blackened soil, the road is highly visible to visitors entering Los Alamos Townsite from Trinity Drive, Central Avenue, and Canyon Road. Without rehabilitation, any rain events will quickly wash remaining fines down slope, exposing more subsurface soils and bedrock.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Forest Service Landscape Architect for operations oversight, GS-9, 8 days @ $220/day	$1,760

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2 GS-3 seasonal employees for hand seeding, 2 days each @ $75/day	$300
TOTAL PERSONNEL SERVICE COST	$2,060
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
FOR: 2-4x4 pickup trucks @ $300/month/vehicle	$ 600
Mileage: 500 miles @ .18/mile	$90
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$ 690
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Seed mix 8 acres total to be seeded Cerro Grande Aerial Grass Seed Mix (in road right-of-way only) 100 lbs. @$1.04/lb Gambel's Oak - ¼ lb. PLS (pure live seed)/acre = 2.0 lb @ $40/lb Winterfat - 1/8 lb. PLS/acre = 1.0 lb @ $40/lb Cliffrose - ½ lb. PLS/acre = 2.0 lb @ $40/lb Serviceberry - ½ lb. PLS/acre = 2.0 lb @ $40/lb	 $104 $ 80 $ 40 $ 80 $ 80
TOTAL MATERIAL AND SUPPLY COST	$384
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	N/A
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Operator and track hoe with 30' reach and ½-1 yard clam shell bucket or bucket with opposable thumb— 6 hours @ $120/hr for Section 1 10 hours @ $120/hr for Section 2 Mobilization and demobilization of track hoe @ $500 each Dozer and operator for construction of 11 water bars in Section 3 – 10 hours @ $95/hour Mobilization and demobilization of track hoe @ $500 each	 $ 720 $1,200 $1,000 $ 950 $1,000
TOTAL CONTRACT COST	$4,870

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acres	$ 1,000.5	8	$ 8,004	OP/O	P, C
TOTAL			8	$ 8,004	OP/O	P, C

FUNDING SOURCES:
F = Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:
See attached Concept Drawing submitted by Santa Clara Pueblo

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
Santa Fe National Forest	8 acres	$ 8,004
TOTAL COST	8 acres	$ 8,004

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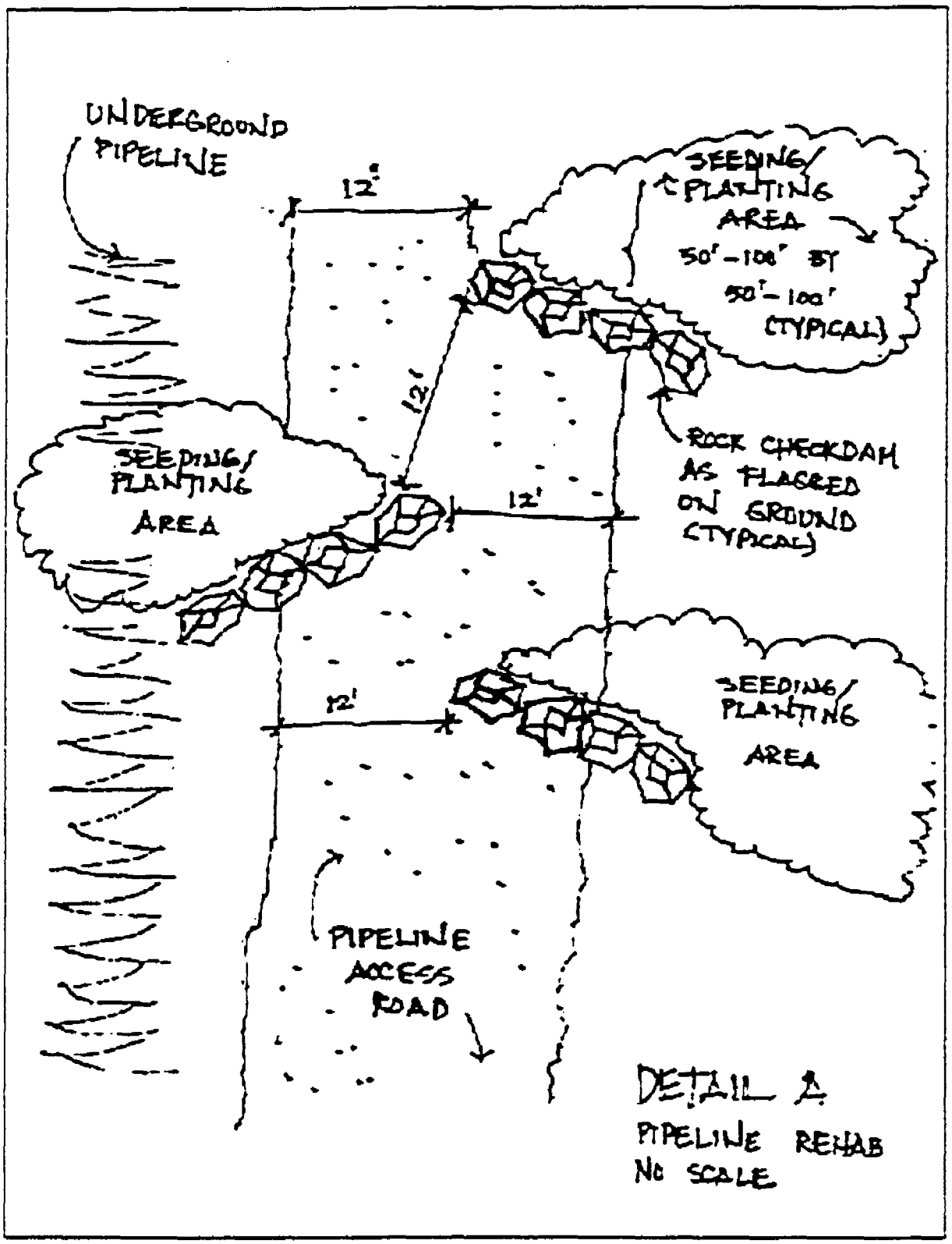
BOUNDARY


UNDERGROUND PIPELINE
12'
12'
12'
12'
SEEDING/ PLANTING AREA
50'-100' BY 50'-100' (TYPICAL)
ROCK CHECKDAM AS FLAGGED ON GROUND (TYPICAL)
SEEDING/ PLANTING AREA
SEEDING/ PLANTING AREA
PIPELINE ACCESS ROAD
DETAIL A
PIPELINE REHAB
NO SCALE

004

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Jemez Mountains Salamander - Monitoring	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#30 N-1c Monitor persistence of Jemez Mountains Salamander populations and their prey base	FISCAL YEAR(S) (list each year):	2000 2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Determine effects of fire and suppression actions to Jemez Mountains Salamander. Monitor Jemez Mountains Salamander locations for persistence and evidence of reproduction within the area burned by the Cerro Grande Fire. Monitor for presence/reestablishment of Jemez Mountains Salamander prey.

B. **Location (Suitable) Sites:** Low, moderate and high intensity burn areas of the fire.

C. **Design/Construction Specifications:**

1. Salamander persistence and population monitoring: Resurvey all known sites of Jemez Mountains Salamander occurrence within the burn area for persistence during each of the three years. Surveys will follow the established protocol (Interagency Agreement and Cooperative Management Plan; USFS, USFWS, NM Dept. Game & Fish; January, 2000). Monitoring will include collection of morphometric data to provide an indication of individual salamander condition, reproduction and recruitment of young into the population (size class structure). USFS, USGS and NM Dept. Game & Fish will coordinate monitoring program and design details, protocol on file with NMDGF.
2. Salamander prey monitoring: Determine if Jemez Mountains Salamander prey is present or becomes reestablished. Jemez Mountains Salamanders feed primarily on ants and other small invertebrates found within rotted logs and within the soil profile. Because of the severe habitat degradation as a result of the Cerro Grande Fire, prey may not be available for Jemez Mountains Salamanders. Thus, the ability to persist at a given area may be compromised. Arthropod pitfall traps will be established and monitored for three years. Traps will be located at four salamander locations (2 rows of 6 traps each, at each location) in each of the burn intensity classifications (low, moderate, high); total 12 locations, 144 traps. Prey study will be completed under contract coordinated by USFS, USGS and NM Dept. Game & Fish.

D. **Purpose of Treatment Specifications:** Loss of habitat from unnatural stand replacing fire is considered the greatest threat to survival of the species (Interagency Agreement and Cooperative Management Plan; USFS, USFWS, NM Dept. Game & Fish; January, 2000)). 8,407 acres of all vegetation types of the total known habitat crucial for the long term maintenance of viable populations of Jemez Mountains Salamander on USFS lands (i.e., 28% of the Essential Zone as defined in the Interagency Management Plan; map attached) are within the fire perimeter of which 4,226 acres are in the High and Moderate burn severity areas (i.e., 14% of the Essential Zone). Due to the severe habitat degradation resulting from the Cerro Grande Fire, Jemez Mountains Salamanders may not survive in these areas. Conservation of the species on USFS lands is necessary to meet requirements of the Cooperative Management Plan. This interagency agreement was in lieu of Federal listing of the species under the Endangered Species Act. Research indicates very little horizontal movement (<10 meters) making the potential for re-colonization from distant areas unlikely for many decades. Therefore, survival of existing populations is imperative. Monitoring within the burn area is critical for assessing the impacts of the Cerro Grande Fire and determining if additional measures or actions are necessary to assure survival of the species.

II. LABOR, MATERIALS AND OTHER COST:

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

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TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Labor @ ($51,225 x 3 FY) + $3,000 Equipment total =	$156,675
TOTAL CONTRACT COST	$156,675

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Monitoring day	$598	88	$52,624	EFR	C
FY 2	Monitoring day	$598	87	$52,026	EFR	C
FY 3	Monitoring day	$598	87	$52,026	EFR	C
TOTAL			262	$156,675	EFR	C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Report for New Mexico Department of Game and Fish on the Jemez Mountains Salamanders and costs reported to do three years of monitoring.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
US Forest Service	262 monitoring days	$156,675
TOTAL COST	262 monitoring days	$156,675

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Peregrine Falcon monitoring	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#31 N-1d Peregrine Falcon monitoring	FISCAL YEAR(S) (list each year):	2001, 2002, 2003

I. WORK TO BE DONE

Number and Describe Each Task:

A General Description: Determine effects of fire, suppression actions and emergency rehab to Peregrine falcon. Determine re-occupancy of a site within the Cerro Grande fire near Los Alamos, New Mexico which experienced low, moderate and high fire intensity, and vegetation mortality of 40%-70% and 70%-100% in the Primary and Secondary Management Zones. Aircraft intrusion over primary zone occurred during the first ten days of the fire, May 5 through May 14, 2000.

B Location (Suitable) Sites: One site location to be made known to qualified personnel.

C. Design/Construction Specifications:

1. Determine site occupancy by single or pair.

2. Determine breeding success of pair.

3. Determine nest success/number of young.

4. Determine fledging success.

5. If successful nesting 1st year no need for 2nd and 3rd year monitoring. If successful 2nd year no need for 3rd year monitoring.

D Purpose of Treatment Specifications: Compliance with de-listing under the Endangered Species Act (ESA) of 1973, as amended. Species will be placed on Region 3 Regional Forester's Sensitive Species list for a minimum of 5 years ((ESA 1973, as amended 1533-Determinations of endangered species and threatened species (c), (2)). During the 5-year monitoring period, the U.S. Fish and Wildlife Service (FWS) is depending on partners such as the Forest Service to develop an effective monitoring program to support the de-listing decision " (Letter to Forest Supervisors from the Regional Forester, September 16, 1999). It is essential to determine if this pair was effected by the fire, suppression action or emergency rehab because the results will considered as part of the information needed to determine if re-listing of this species is necessary.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-11 $20.05/hr X 48 hrs X 3 Years	$2,887
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM

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TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Vehicle rate .20/mi X 50 mi round trip X 4 trips per year X 3 years	$120
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	each	$1,002	1	$1,002	EFR	P
FY2	each	$1,002	1	$1,002	EFR	P
FY3	each	$1,002	1	$1,002	EFR	P
TOTAL			3	$3,006	EFR	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:
Wildlife Assessment Letter to Forest Supervisors dated 9/16/99.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
US Forest Service	One site	$3,006
TOTAL COST	One site	$3,006

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Monitor Threatened Mexican Spotted Owl	JURISDICTIONS:	DOE
PART E: LINE ITEM:	#32 N-1e Monitor Mexican Spotted Owl	FISCAL YEAR(S) (list each year):	2000, 2001, 2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Determine effects of fire, suppression and emergency rehab actions to Mexican spotted owl at 6 sites on DOE lands to determine occupancy and reproductive status. Begin as soon as possible after the Cerro Grande fire and continue for the next 2 growing seasons. Follow standard protocol on file at EHS-20 office of Los Alamos National Laboratory (LANL).

B. **Location (Suitable) Sites:** Suitable habitats within or downstream from fire area on DOE controlled property

C. **Design/Construction Specifications:**

1. Follow LANL Mexican spotted owl monitoring protocol (see attached).
2. Prepare report at conclusion of surveys each year ; share information with FWS as part of Emergency Consultation
3. Map of monitoring sites on file at ESH-20 of LANL

NOTE. Work is done at night. Two people are required for safety and effective data collection in the field. Four visits is the maximum per year, per site

D **Purpose of Treatment Specifications:** To determine fire and suppression impacts on federally listed species.

II. LABOR, MATERIALS AND OTHER COST:

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

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TOTAL TRAVEL COST	N/A
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
1 TSM @ $83./hr X 120 hrs X 3 1 Tech @ $60./hr X 120 hrs X 3	$30,024 $21,600
TOTAL CONTRACT COST	$51,624

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1						
FY2						
FY3						
TOTAL						

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Consultation with US Fish and Wildlife Service

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
TOTAL COST		

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Rehabilitation of roads impacted by suppression activities	JURISDICTIONS:	USFS, SIP & SCP, LA Co.
PART E: LINE ITEM:	#33 S-3a Suppression Road Rehabilitation	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Rehabilitation and stabilization of pre-existing roads is necessary to avoid erosion gullies and ponding on road surfaces due to blockage of road drainage channels by dozer line berms or by road surface degradation caused by intensive use by Suppression forces. The intent is not to improve the road, but to re-establish and strengthen drainage structures capable of resisting functional failure from higher than normal (estimated) burned area sheet and channel erosion flows and to facilitate the hardening of the road surface. Rehabilitation and stabilization is needed to maintain reliable access into the burned area such as existed prior to the wildfire event. Road re-grading on collector roads should be delayed until or near the end of the incident as major traffic has diminished.

B. Location (Suitable) Sites: All roads directly degraded or impacted by "Wildfire Suppression" activities. Listed below are those roads used by suppression forces, see the "Suppression Impacts and Treatments Map" for the location of affected road segments. For a more detailed description of the status of each road segment see the "Suppression Rehabilitation Assessment" report

State Highway(s):	4, 501, 502, and 565.
Forest Service Roads	American Springs, FR57 (Rendija Cy. to Guaje Cy), FR182 (Los Alamos Cy), FR416 (Chupaderos Canyon), FR445 (Garcia and Corral Canyons), FR446, FR446G (Chupaderos Canyon), and Canada Bonito RNA Trail 282 (reopened road).
Los Alamos County:	Camp May Road, and Rendija Canyon. Also assessment of county roads.
Los Alamos Natl. Labs:	Various, Los Alamos Canyon.
Santa Clara Pueblo:	Corral Canyon, Sawyer Canyon, Puye Cliff Dwellings, Garcia Canyon, and Santa Clara Canyon.
San Ildefonso Pueblo:	Mortandad Canyon, and Cedro Canyon.
BACA Land & Cattle Co, Inc.:	Baca contingency road (Pipeline Road to Ritos de los Indios to NF lands north), Valle Grande Road north to Pipeline Road, and Reservoir road (at E. Fk. of Jemez River on east side of Valle Grande.

C. Design/Construction Specifications:

1. Pull berm on outside edge or road including side cast material back onto the grade surface.

2. Clean "drain" ditches to restore rolling grade dip functions.

3. Harden or restore existing drainage surfaces and structures (waterbars, rolling grade dips, and natural drains) with dips or raised berms capable of facilitating existing traffic flows and vehicle types.

4. Construct rolling grade dips or waterbars as necessary to accelerate stabilization of road surfaces from suppression impacts of increased traffic levels.

5. Clean culverts inlets/outlets with backbone and/or hand crews as needed to maintain hydraulic capacity.

6. In extreme dry climates or soil conditions compaction of rolling grade dips may be difficult or impossible without the addition of water. Soil moisture conditions should be conductive toward compaction. Auxiliary equipment such as a water truck (with spray nozzle) may be needed to facilitate re-establishment of road conditions, which were degraded by "Wildfire Suppression" activities.

7. Road surface in Rendija Canyon (FR 57 to Guaje Canyon) will not be restored since this road is in path of potential debris flows, which have the potential to obliterate the road for most of its length. Road surface in Guaje Canyon (FR442) from jct. WithFR416 northwest will not be maintained for the same reason as stated for Rendija Canyon.

8. Road surface stabilization and rehabilitation for Guaje Canyon, Santa Clara Canyon, Baca Pipeline road, and Baca Valle Grande road will not be stabilized with a dozer and motor grader until all suppression activities has ceased and the majority of BAER rehabilitation projects have been completed and sufficient soil moisture is in the ground to make the grader operation effective.

9. A 4 x 4 road runs north from Camp May and Los Alamos Canyon toward the divide of Canada Bonita and Quemazon Canyon. This area is The Canada Bonita Research Natural Area (RNA) which had successfully closed this 4 x 4 trail from ATV and other motorized access. This road was opened up during suppression activities. Per instructions

from Mary Orr (Wildlife Biologist, Espanola Ranger District – Resource Advisor; this trail is to be re-closed. Successful closure of this road will entail use of a "Excavator" (Track hoe) to put the road to bed and blend road to the natural contours. DO NOT USE A DOZER on this segment (see attached map) ! Threatened and Endangered species are also a concern on portions of the road as well as Visual Quality objectives. Please view the attached maps and recreation specs for more detailed information. The essence of the recreation specs states that "Berms" are unacceptable for road closure structures.

D. **Purpose of Treatment Specifications:** This action is consistent with efforts to standard natural resource protection methods that incorporate State and Federal "Best Management Practices (BMP)" which mitigate and reduce watershed and water quality impacts from sources of sediment. This action is also consistent with the "Incident Objectives", specifically item #4 which states "Minimize damage to improvements...and other values (implied to roads) at risk by using approved fire suppression guidelines." Protection of these resources (roads) as used by "Suppression" activities will ensure continued access into the burned area(s) as needed to successfully implement rehabilitation objectives.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Work to be completed by fire crews assigned to fire suppression and fire suppression rehab.	F
TOTAL PERSONNEL SERVICE COST	F
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Work to be completed by equipment assigned to fire suppress and fire suppression rehab.	F
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	F
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Equipment transport to and from desired work locations.	F
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	F

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Miles	450	60	$27,000	F	EFC
TOTAL			60	$27,000	F	EFC

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

EWP = Emergency Watershed Program

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:

Costs and methods derived from George Long, BAER Team, Suppression Rehabilitation Resource Advisor

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
LA co.	10 Miles	$5,000
State Highways 4, 501, 502 and 565	10 Miles	$5,000
USFS Roads	20 Miles	$10,000
Santa Clara Pueblo	10 Miles	$5,000
San Ildefonso Pueblo	5 Miles	$1,000
Private Lands	5 Miles	$1,000
TOTAL COST	60 Miles	$27,000

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Remove floatable debris in stream channels - manual and aerial method	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#34 W-9b Clean stream debris - aerial	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Removal of floatable debris within streams where, if material became entrained, debris jams and plugging of stream crossings may occur. Small debris will be manually removed and placed above flood stage on the first geomorphic terrace. Large debris will be cut into smaller sections and either manually relocated to the terrace or bundled and lifted by helicopter to an area outside the inner gorge to a pre-selected landing site. Lifting capacity of the helicopter will determine size of large debris airlifted. Used where debris is expected to be large. Manual labor will remove smaller debris first along stream reach and then followed by helicopter for larger debris.

B. Location (Suitable) Sites: Along stream reaches upstream of culverts at risk and infrastructure, within Los Alamos and Rendija Canyons, as identified on Watershed Treatments map (see Appendix III)

C. Design/Construction Specifications:

1. Remove only dead, floatable material. Do not cut or remove green, live vegetation.
2. Do not remove very small material, less than 3 inches diameter.
3. Small debris is less than 35 lbs., shorter than 10 feet in length, and capable of being lifted by one average adult.
4. Larger debris (heavier than 35 lbs.) should be lifted by 2 persons or cut into pieces less than 35 pounds or 10 feet in length.
5. First terrace will need to be identified by resource advisors and flagged prior to removal of debris.
6. All debris manually removed will be placed upon the first terrace.
7. All manual removal of debris will take place prior to aerial removal of large debris.
8. Large debris that is not cut into small size category will be airlifted out by helicopter.
9. Helicopter landings and fueling stations will be identified and cleared of trees and brush prior to removal activities.
10. All cultural sites will be protected from landings and fueling stations.

D. Purpose of Treatment Specifications: To remove debris capable of being moved downstream during major runoff events, which may plug culverts, cause debris jams and intensify channel scour, adding to storm flow capacities and flooding effects. To reduce risk of failure to stream crossings and infrastructure.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Helitack Crew, 4 person crew GS-7 @ 12.68 x 4 x 8 x 1	$406
Type II crew, 20 person GS-4 @ 9.15 x 20 x 3 hr. x 1	$549
TOTAL PERSONNEL SERVICE COST	$955
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM

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TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Miscellaneous (chainsaw chain, hand tools, safety equipment) @ $500 x .20 x 1	$100
TOTAL MATERIALS AND SUPPLY COST	$100
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Type II (Mid-size) Helicopter with pilot @ 2,000/hr x 16 x 1	$32,000
Helicopter Availability rate @ $5500/day x 2 days x 1	$11,000
TOTAL CONTRACT COST	$43,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Miles	45,110	10	451,100	EWP	P
TOTAL			10	451,100	EWP	P

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	10	$451,100
TOTAL COST	10	$451,100

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Remove floatable debris in stream channels - manual remove large debris by mulching	JURISDICTIONS:	USFS, SCP, LA Co.
PART E: LINE ITEM:	# 35 W-9c Clean stream debris	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Removal of floatable debris within streams where, if material became entrained, debris jams and plugging of stream crossings may occur. Small debris will be manually removed and placed above flood stage on the first geomorphic terrace. Large debris will be cut into smaller sections and manually relocated to the terrace. Manual labor used where debris and trees are expected to be small.

B. Location (Suitable) Sites: Along stream reaches upstream of culverts at risk and infrastructure, within Los Alamos, Rendija school, Pajarita, Water, Pueblo, Canada del Buey and Garcia Canyons, as identified on Watershed Treatments map (see Appendix III).

C. Design/Construction Specifications:

1. Remove only dead, floatable material. Do not cut or remove green, live vegetation.

2. Do not remove very small material, less than 3 inches diameter.

3. Small debris is less than 35 lbs., shorter than 10 feet in length, and capable of being lifted by one average adult.

4. Larger debris (heavier than 35 lbs.) should be lifted by 2 persons or cut into pieces less than 35 pounds or 10 feet in length.

5. First terrace will need to be identified by resource advisors and flagged prior to removal of debris.

6. All debris manually removed will be placed upon the first terrace.

7. All manual removal of debris will take place prior to aerial removal of large debris.

8. All cultural sites will be protected.

9. Yard large debris.

D. Purpose of Treatment Specifications: To remove debris capable of being moved downstream during major runoff events, which may plug culverts, cause debris jams and intensify channel scour, adding to storm flow capacities and flooding effects. To reduce risk of failure to stream crossings and infrastructure.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Type II crew, 20 person GS-4 @ 9.15 x 20 x 5 hr. x 1	$915
Resource Advisor, GS-9 @ 15.52 x .5 x 1	8
TOTAL PERSONNEL SERVICE COST	$923
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM

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TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Miscellaneous (chainsaw chain, hand tools, safety equipment) @ $500 x .20 x 1	$100
TOTAL MATERIALS AND SUPPLY COST	$100
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Miles	1023	12	$12,276	EFR	P
FY1	Miles	3,200	15	$48,000	EWP	C
FY1	Miles	1,045	16	$16,138	EWP	C
TOTAL			12	$12,276	EFR,EWP	P,C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	12 miles	$12,276
LA Co.	15 miles	$48,000
Santa Clara Pueblo	6 miles	$16,138
TOTAL COST	33 miles	$76,414

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	BAER Road Closure	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#37 S-3b Road Closures	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** FS Road #442 will be closed for public safety protection due to flooding, hazard trees and falling rocks from steep slopes. It will also protect T & E species in the area. Closure will be implemented with a backhoe, partially burying large boulders to block access.

B. **Location (Suitable) Sites:** FS Road #442 will be closed at its junction with FS #416 (T.19 N., R.7 E., SE ¼ Sec. 31and in the vicinity of Guaje Cemetery (T.19 N., R6 E., SE ¼ Sec. 4)

C. **Design/Construction Specifications:**

1. Close road by placing large boulders (3' min. diam) to prevent motor vehicle entry into the area. Boulders should be placed in random pattern, with no more than 2' clear space between boulders. Boulder placement shall block entire drivable area, including flatter terrain on either side of road edge.

2. Boulders shall be buried 1/3 the diameter. Backfill and compact soil around boulders.

3. Closure of the road will be coordinated with the completion of BAER rehabilitation treatments scheduled in the area.

D. **Purpose of Treatment Specifications:** This action is consistent with efforts of standard natural resource protection methods that incorporates State and Federal "Best Management Practices (BMP)" which mitigate and reduce watershed and water quality

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-9/1 COR @175/Day	$175.00
TOTAL PERSONNEL SERVICE COST	$175.00
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Mobilization costs for heavy equipment transport with trailer- $375/delivery and return	$375

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TOTAL TRAVEL COST	$375
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Catepillar 436C Backhoe and operator @ $500/Day X 1 Day Dump Truck, 6 C.Y. 4 X 2 @ $400/Day X 1 Day	$500.00 $400.00
TOTAL CONTRACT COST	$900.00

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Each	$ 1,450	1	$ 1,450	EFR	C
TOTAL			1	$ 1,450	EFR	C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Infrastructure Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1	$1,450.00
TOTAL COST	1	$1,450.00

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Santa Clara Continuous Forest Inventory Plot Reestablishment	JURISDICTIONS:	SCP
PART E: LINE ITEM:	#39 O-5b Research & Continuous Forest Inventory Plots	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Locate and reestablish 43 Continuous Forest Inventory (CFI) plots on the Santa Clara Pueblo Reservation that were damaged by the Cerro Grande Fire.

B. Location (Suitable) Sites: Santa Clara Pueblo

C. Design/Construction Specifications:

1. Locate plots on the ground from existing maps and assess damage to bearing trees and tree tags on each plot.

2. Establish new bearing trees if necessary and remark CFI plot trees with new tags if necessary.

D. Purpose of Treatment Specifications: Reestablish CFI plots on Santa Clara Pueblo Reservation.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
1 GS-9 Forester @ $24.68/hr X 8 hrs/day X 45 days	$8,885
TOTAL PERSONNEL SERVICE COST	$4,435
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Transportation & GPS rental	$3,100
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Paint, tags, flagging, stakes, etc	$1,600
TOTAL MATERIALS AND SUPPLY COST	$1,600
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM

TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Plots	$419.00	43.0	$18,020	EFR	P
TOTAL			43.0	$18,020	EFR	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Forest Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
SCP	43 Plots	$ 18,020
TOTAL COST	43 Plots	$18,020

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Reforestation Survival Survey	JURISDICTIONS:	USFS, SCP & SIP
PART E: LINE ITEM:	#40 O-2 Fire Related Monitoring	FISCAL YEAR(S) (list each year):	2001 2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Monitor reforestation on 990 acres of Pueblo lands and approximately 1,000 acre of USFS lands to assess growth and survival of tree seedlings

B. **Location (Suitable) Sites:** All planted and tree-seeded areas

C. **Design/Construction Specifications:** In accordance with Agency policies and procedures.

D. **Purpose of Treatment Specifications:** In accordance with Agency policies and procedures.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
2 GS-5 technicians X $16.40/hr X 8 hrs X 52 days (Santa Clara & San Ildefonso Pueblos	$ 13,644
TOTAL PERSONNEL SERVICE COST	$ 13,644
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
	$0
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	$0
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	$0
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	$0

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SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1						
FY 2	Acre	$6.63	2,000	$ 13,644	OP/O	P
FY 3	Acre	$6.63	151	$1,001	OP/O	P
TOTAL			2,151	$ 14,645	OP/O	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Refer to the Forest Resources Assessment and Potential Salvage/Reforestation Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1,000 Acres	$ 6,822
Santa Clara Pueblo	1,000 Acres	$ 6,822
San Ildefonso	151 Acres	$1,001
TOTAL COST	2,000 Acres	$ 14,645

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Reforestation-Seed Collection & Nursery Production	JURISDICTIONS:	SCP & SIP, LA Co.
PART E: LINE ITEM:	#41 O-6a Reforestation – Seed Collection, etc.	FISCAL YEAR(S) (list each year):	2000-2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Reforestation by hand planting of Ponderosa Pine and Douglas-fir seedlings on 1927 acres on the Santa Clara Pueblo and 115 acres on the San Ildefonso Pueblo and 375 acres on LA county lands.

B. Location (Suitable) Sites: All suitable sites within the burned area. See Potential Salvage/Reforestation Site Map.

C. Design/Construction Specifications:

1. Mechanically site prep. 62 acres of fire-killed saplings on Borrega Mesa (Santa Clara Pueblo).

2. Hand plant ponderosa pine and Douglas-fir seedlings with auger or hoedad at a rate of 538 trees per acre on Pueblo lands. Not site preparation is needed if this practice is completed within three years following the burn. Local seed must be collected, seedlings grown in a container nursery and hand planting techniques.

3. Tree planting compliance inspections to include: over see proper storage and handling of tree seedlings at planting site installation of random plots for quality checks to insure proper planting techniques.

D. Purpose of Treatment Specifications: To reestablish trees on sites severely damaged by fire.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Year 1 (2000) seed collection (sufficient to plant 1,000 acres) @ $3.12 per acre X 1,000 acres	$3,120
Year 2 (2001) seed collection (sufficient to plant 1,078 acres) @ $3.24 per acre X 1,078 acres	$3,493
Year 2 (2001) planting @ $225.96 per acre X 1151 acres	$260,080
Year 3 (2002) planting @ $236.72 per acre X 927 acres	$219,440
Year 2 & 3 compliance inspection: forestry tech. (GS-7) $13.54/hr X8 hrs/day X 35 days 2 fiscal years	$7,580*
Year 2 & 3 compliance inspection: forestry tech. (GS-5) $10.93/hr X 8 hrs/day X 35 days X 2 fiscal years	$6,120*
*4% inflation rate for year 3 included	
TOTAL PERSONNEL SERVICE COST	$499,835
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

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TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Year 2 (2001) site prepare 175 acres at $250 per acre Year 2 (2001) contract production of tree seedlings @ $0.34 per seedling x 538 seedlings per acre x 1,305 Year 3 (2002) contract production of tree seedlings @ $0.35 per seedling x 538 seedlings per acre x 1,079	$43,745 $238,786 $202,799
TOTAL CONTRACT COST	$485,330

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Acres	$3.12	1,000	$3,120	OP	P
FY2	Acres	$431.33	1151	$496,465	OP	P, C
FY3	Acres	$432.41	927	$400,845	OP	P,C
TOTAL			3,078	$900,430	OP	P, C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Refer to the Forest Resources Assessment and Potential Salvage/Reforestation Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
BIA – Santa Clara Pueblo	1,927 Acres	$ 837,730
BIA – San Ildefonso	151 Acres	$62,700
LA Co.	375 Acres	$84,735
TOTAL COST	3,453 Acres	$ 985,165

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Salvage Sale Layout and Preparation	JURISDICTIONS:	SCP, SIP
PART E: LINE ITEM:	# 42 N-3 Timber Resource Value	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Layout, marking, and cruising of potential salvage units.

B. **Location (Suitable) Sites:** All potential salvage harvest units on the Santa Clara Pueblo and the San Ildefonso Pueblo. See treatment for specific locations.

C. **Design/Construction Specifications:** According to Agency policy and specifications.
1. Coordination of habitat needs for culturally sensitive species (included in costs below)

D. **Purpose of Treatment Specifications:** Salvage sale layout and preparation

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
4 GS-7 employees @ $18.75 per hour x 8 hours per day x 45 days	$27,000
4 GS-9 employees @ $21.38 per hour x 8 hours per day x 45 days	$31,000
TOTAL PERSONNEL SERVICE COST	$58,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
3 4x4 pickup trucks @ ($300 per month x 1.5 months) + $0.18 per mile x 30 mi/day x 45 days	$2,100
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$2,100
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Flagging, marking paint, miscellaneous = $1,000	$1,000
TOTAL MATERIALS AND SUPPLY COST	$1,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
8 employees x 90 days per person x $85 per person per day	$61,200
TOTAL TRAVEL COST	$61,200
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM

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TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acre	109.48	1,117	$122,300	OP/O	P
TOTAL			1,117	$122,300	OP/O	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Refer to Management Discussion in the Recommendations Section of the Forest Resources Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
Santa Clara Pueblo	966	$ 105,767
San Ildefonso Pueblo	151	$ 16,533
TOTAL COST	1,117	$ 122,300

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Sediment Traps in Tributary Drainages	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#45 W-4f Sediment Traps/Check Dam Structures	FISCAL YEAR(S) (list each year):	FY 2000 & FY 2001

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Use dozer to construct small (less than 1 acre in size) sedimentation traps in ephemeral drainages.

B. Location (Suitable) Sites: Sites located in Corral Canyon adjacent to Forest Road 445C, (see attached map)

C. Design/Construction Specifications:

1. Sediment traps are to be constructed down gradient (within 200 ft.) of the crossing of FR445C and designated tributaries of Corral Canyon.

2. Sediment traps will be constructed using native borrow excavated from the stream channel of each tributary which will create a catchment basin for sediments transported within the channel. Excavated material from the channel will be used to create an in channel berm across the channel. Material excavated will be compacted in 6 inch to one foot lifts. The berm will be constructed across channel perpendicular to the prevailing stream gradient and will be constructed to a height of 1 to 3 foot below the top of the undisturbed drainage banks.

D. Purpose of Treatment Specifications: Berms are intended to catch sediment and slow sediment transport down stream preventing accelerated erosion in ephemeral stream channels. These catchments will help to stabilize Forest Road crossings for the long term and serve to help hold sediments in the upper watershed until natural vegetative recovery will help stabilize and slow sediment transports to prebum incident levels.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS 7 Dozer boss @$12.68/hr x 40 hrs for coordination and compliance per 3 traps =	$507
TOTAL PERSONNEL SERVICE COST	$507
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
D5 dozer @$90/hr with operator x 3 hours per sediment trap= $270 x 3 sediment traps per year Transport for D5 dozer @$250/one way trip x 2 trips =	$810 $500
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$1,310
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

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

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	1 sed. trap	$605	3	$1817	EFR	EFC
TOTAL			3	$1817	EFR	EFC

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:

As of 05/31/00 this project has been completed.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	3	$1,817
TOTAL COST	3	$1,817

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Fence Reconstruction	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#49 S-1c Fence Replacement	FISCAL YEAR(S) (list each year):	2000 OR 2001

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Reconstruction of approximately 1.5 miles of boundary fence between U.S. Forest Service and Santa Clara Pueblo, which was damaged during fire suppression activities. The majority of the fence was damaged beyond reasonable repair during dozer line construction.

B. Location (Suitable) Sites: Boundary fence between U.S. Forest Service and Santa Clara Pueblo. T. 20N. R.7E. sec(s). 13 and 14.

C. Design/Construction Specifications:

1. Reconstruction of 1.5 miles of four wire barbed fence.
2. Wire spacing of 40", 28", 22", 15" top to bottom.
3. Fence posts will be spaced 16' apart with no fence stays.
4. Braces will be constructed at a minimum every ½ mile. Additional braces will be identified prior to construction
5. Wood posts will be placed after every third steel post.
6. Additional specifications regarding fence replacement will be provided prior to awarding contract.

D. Purpose of Treatment Specifications: Treatment is intended to ensure burn area is rested from livestock use to allow herbaceous vegetation recovery and ensure long-term livestock management. In addition, boundary fence reconstruction is critical to identify land ownership jurisdiction between U.S. Forest Service and Santa Clara Pueblo

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
N/A	0
TOTAL PERSONNEL SERVICE COST	0
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
N/A	0
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
24 rolls of barbed wire @ $37.00/roll =	$ 888.00
330 T posts @ $2.25/post =	$ 742.25
183 - 6' railroad ties @ 7.19/tie =	$1,315.77
1.50# box of fence staples	$ 28.50
TOTAL MATERIALS AND SUPPLY COST	$2,974.52

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TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
N/A	0
TOTAL TRAVEL COST	0
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Contract cost of $1.00 per linear foot @ 7,920 feet =	$7,920.00
TOTAL CONTRACT COST	$7,920.00

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Mile	$7,263.00	1.5	10,894.52	F	C
TOTAL			1.5	10,894.52	F	C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Func
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report:

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
United States Forest Service – Espanola RD, Santa Fe N.F.	1.5 miles of fence	$10,894.52
TOTAL COST	1.5 miles of fence	$10,894.52

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Reforestation – Planting on Sante Fe National Forest	JURISDICTIONS:	USFS, SCP & SIP
PART E: LINE ITEM:	#50 N-4a Reforestation – Planting, FS	FISCAL YEAR(S) (list each year):	2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Reforest severely burned sites above Los Alamos on non-suitable timber base lands as well as pueblo lands. (Can request supplemental when Departmental manual signed)

B. **Location (Suitable) Sites:** Sites for direct tree planting are identified on a reforestation map in the Appendix III. Include sites less than 40 acres.

C. **Design/Construction Specifications:**

1. Plant ponderosa pine on 500 acres west of Los Alamos on National Forest lands in the spring of fiscal year 2002

2. Planting rates will be approximately 12' X 12' (approx. 300 trees/acre)

3. Consult with Pueblos during NEPA (included in costs below).

D. **Purpose of Treatment Specifications:** The areas proposed for planting lie on steep, semi-primitive roadless areas west of the City of Los Alamos. The area is essentially backdrop for the City. There exist no seed trees in the areas- all tree vegetation has been killed. Trees will not reoccupy many of the sites for 50 years or more without planting. The objective is to shorten the time period for the reestablishment of ponderosa pine trees on the scenic backdrop area. Areas to be planted are Santa Fe National Forest lands above Los Alamos Santa Clara Land and San Ildefonso lands. Hand planting is recommended to optimize tree placement in areas having deeper soils. Machine or auger planting are not feasible due to steep slopes or rocky sites.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-11 Forester to serve as contract COR @ $30/hr X 160hrs= $4,800	$4,800
GS-9 Forester inspector team leader @ $23/hr X 160hrs= $3,680	$3,680
(2) GS-5 Forestry Tech layout and inspectors 2 @ $17/hr X 320hrs) = $5,440	$10,880
G-12 Prom. Manager @ $35/hr X 40hrs= $1,400	$1,400
TOTAL PERSONNEL SERVICE COST	$20,760
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Inspection equipment, layout materials	$250
Ponderosa stock from nursery (USFS-Santa Fe sees) 150,00 trees @ $225/M= $33,750	$33,750
Payment to Lucky Peak Nursery for seed and shipping to contract nursery $2,500	$2,500
TOTAL MATERIALS AND SUPPLY COST	$36,500
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

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For and mileage for COR, inspector, and layout crew = $1,500	$1,500
TOTAL TRAVEL COST	$1,500
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Contract for planting 500 acres @ $160/acre = $80,000	$80,000
TOTAL CONTRACT COST	$80,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acre	$225	375	84,735	OP/P	C
FY 2	Acre	$274	500	$137,260	OP/O	P
FY 3	Acre	$274	2074	$569,854	OP/O	C
TOTAL			2549 acres	$583,050	OP/O,	P,C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Santa Fe National Forest Forestry Assessment. See Appendix III, Reforestation map for the Santa Fe National Forest: 500 acres in Units #17 and #18 on reforestation map

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USDA Forest Service	500 Acres	$137,260
Santa Clara Pueblo	1923 Acres	$527,902
San Ildefonso Pueblo	151 Acres	$41,452
LA Co.	375 Acres	$84,735
TOTAL COST	2,949 Acres	$667,815

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Reforestation - Stocking Surveys on Santa Fe National Forest	JURISDICTIONS:	USFS, SCP & SIP
PART E: LINE ITEM:	#51 N-4b Stocking Surveys	FISCAL YEAR(S) (list each year):	2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Conduct Stocking surveys on 500 acres on year following direct seeding in FY2001 on non-suitable timber base lands

B. Location (Suitable) Sites: Sites for direct seeding are identified on a reforestation map in the Appendix.

C. Design/Construction Specifications:

1. According to Agency direction and policy, surveys for survival need to occur one year following planting. In the case of direct seeding, surveys for stocking will be conducted one year following direct seeding.

D. Purpose of Treatment Specifications: A series of 1/100th acre plots will be established throughout the 500 acres directly seeded and will be read. The purpose is to evaluate the success of the treatment and the need for possible reseeding.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
(4) GS-5 Forestry Techs for stocking surveys 3 @ $17/hr X 40hrs) = $1,360 FY2002 (3)GS-11 Silviculturist @ $30/hr X 46hrs = $240 FY2002	$8,160 $4,140
TOTAL PERSONNEL SERVICE COST	$1,600
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Inspection equipment, layout materials FY2002	$150
TOTAL MATERIALS AND SUPPLY COST	$150
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
For and mileage for COR, inspector, and layout crew = $250 X 2 yrs.	$500
TOTAL TRAVEL COST	$500
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM

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TOTAL CONTRACT COST	$0

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1						
FY 2	Acre	$4	3,200	$6,488	OP/O	P
FY 3	Acre	$4	3,200	$6,488	OP/O	P
TOTAL			3,200	$12,976	OP/O	P

FUNDING SOURCES:
F = Fire Suppression Account
ERR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix III, Reforestation map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USDA Forest Service	1,000 Acres	$4,176
Santa Clara Pueblo	2,000 Acres	$8,000
San Ildefonso	200 Acres	$800
TOTAL COST	3,200 Acres	$12,976

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Reforestation - Direct seeding on Sante Fe National Forest	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#52 N-4c Reforestation - Seeding	FISCAL YEAR(S) (list each year):	2001

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Reforest severely burned sites above Los Alamos on non-suitable timber base lands.

B. **Location (Suitable) Sites:** Sites for direct tree seeding are identified on reforestation map in Appendix III.

C. **Design/Construction Specifications:**

1. Apply approximately 550 lbs. of ponderosa pine seed over 500 acres west of Los Alamos on national forest lands in the fall of calendar year 2000 (FY2001). The areas exist on shallow, rocky soil sites where tree planting will be extremely difficult.

2. Seed to be applied by hand seeders at a rate of 1-1.25 lbs/acre in microsite areas deemed suitable by the Forest Service.

D. **Purpose of Treatment Specifications:** The areas proposed for seeding lie on steep, semi-primitive roadless areas west of the City of Los Alamos. The area is essentially backdrop for the City. Areas targeted for direct seeding are too rocky for conventional tree planting. There exist no seed trees in the areas-all tree vegetation has been killed. Trees will not reoccupy many of these sites for 50 years or more without direct seeding and/or planting. The objective is to shorten the time period for the reestablishment of ponderosa pine trees on this scenic backdrop area. Areas to be seeded are Santa Fe National Forest lands. Hand seeding is recommended to optimize seed placement in areas having deeper soils. Aerial seeding would result in much of the seed falling on rock outcrops or areas of very shallow soils. Direct seeding is generally not approved in Region 3, but the seed being used has been determined to be excess to out needs and the seed's germination potential is beginning to fall below that level acceptable to the Nursery.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-9 Forester to serve as Contract COR @ $26/hr X 80hrs = $2,680 GS-7 Forestry Tech inspector @ $23/hr X 80hrs = $1,840 GS-5 Forestry Tech layout @$17/hr X 160hrs = $2,720	$2,080 $1,840 $2,720
TOTAL PERSONNEL SERVICE COST	$6,640
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
25 hand seeders @ $45/seeder = $1,125 Ponderosa pine seed from Lucky Peak Nursery (USFS- Santa Fe seed) 550 lbs @ $69/lb. = $33,000 Shipping of seed from LPN to the Santa Fe NF	$1,125 $33,000 $1.00
TOTAL MATERIALS AND SUPPLY COST	$35,125
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

For and mileage forCOR, inspector, and layout crew = $750	$750
TOTAL TRAVEL COST	$750
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Contract hand seeding 500 acreas @ $80/acrea = $40,000	$40,000
TOTAL CONTRACT COST	$40,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1						
FY2	Acre	$165	500	$82,000	OP/O	P
TOTAL			500	$82,000	OP/O	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See appendix I, Santa Fe National Forest Forestry Assessment. See Appendix III, Reforestation map for the Santa Fe National Forest: 500 acres in Unit #17 on reforestation map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USDA Forest Service	500 acres	$82,000
TOTAL COST	500 acres	$82,000

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Slash Treatment	JURISDICTIONS:	USFS, LA Co.
PART E: LINE ITEM:	#53 S-7 Slash Mitigation	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Treatment of slash resulting from suppression efforts along the Quemazon Trail by chipping.

B. Location (Suitable) Sites: All fuel break slash as depicted on Treatment Map in Cerro Grande BAER Plan. Buck-slash on LA near Range Road

C. Design/Construction Specifications:

1. All slash resulting from the fuel break along the Quemazon trail shall be chipped on site

2. Chips shall be spread uniformly to promote soil stabilization

D. Purpose of Treatment Specifications: Treat fuel break slash to mitigate visual impacts and fire risk. Chips will act as a mulch to reduce surface erosion

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
1 acre @ 500 per acre	$500

TOTAL CONTRACT COST	$500.00

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Acre	$500	1	$500	F	C
FY 1	Acre	$100	10	$1,000	F	FC
TOTAL			11	$1,500	F	C,FC

FUNDING SOURCES:
F = Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: Chipping areas correspond to tree hazard mitigation areas depicted on Treatment Map in Appendix III.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1	$500
LA Co.	10	$1,000
TOTAL COST	11	$1,500

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	BAER IMPLEMENTATION LEADERS	JURISDICTIONS:	USFS, NPS SCP, SIP,
PART E: LINE ITEM:	#54 O-6b Implementation Leaders	FISCAL YEAR(S) (list each year):	2000 - 2003

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Hire a project implementation leaders for the Santa Fe National Forest, Santa Clara Pueblo, San Ildefonso Pueblo, and Bandelier National Monument to coordinate and oversee the implementation of the Cerro Grande Fire BAER Plan. These will be GS-11 term positions. Positions for the Santa Fe National Forest, Santa Clara Pueblo and San Ildefonso Pueblo will be for 3 years. The position at Bandelier National Monument will be for a three month period.

B. **Location (Suitable) Sites:** Treatment areas are distributed throughout the burned area. Duty stations will be at the local headquarters for each agency.

C. **Design/Construction Specifications:** The Project Implementation Leaders are responsible for the over-site of the BAER Plan implementation for the jurisdiction for which they are hired. The Leaders will coordinate with each other on specific projects that cross jurisdictions to achieve efficient use of funds, personnel, equipment and contracts. The Leaders specification implementation, monitoring, program review, proposed plan revisions, and supplemental funding requests. The Leaders complete annual accomplishment reports and track EFR budgets.

D. **Purpose of Treatment Specifications:** The purpose is to provide quality control over project implementation and to ensure a comprehensive plan implementation

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS-11 @ $39,178 / year X 1 years (San Ildefonso Pueblo)	$39,178
GS-11 @ $39,178 / year X 1 years (Santa Clara Pueblo)	39,178
GS-11 @ $39,178 / year X 1 years (Santa Fe NF)	39,178
GS-11 @ $9,795 / 3 months (Bandelier NM)	$9,795
TOTAL PERSONNEL SERVICE COST	$127,329
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Estimated rental vehicles @ average cost of $300/week X 3 weeks x 4 vehicles	$900
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Administrative materials	$1,500
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM

Gas, etc.	ZS1,500
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY1	Leader	$32,579	4	$ 130,319	EFR	p
TOTAL		$36,240	10	$362,397	EFR	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See also Executive Summary.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1	$ 40,178
Santa Clara Pueblo	1	$ 40,178
San Ildefonso Pueblo	1	$ 40,178
NPS	1	$ 9,795
TOTAL COST	4	$ 130,319

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	BAER Team Expenditures	JURISDICTIONS:	USFS, BLM, DOE, FWS, NPS, BIA
PART E: LINE ITEM:	#55 O-7 Team Expenditures	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Personnel cost summary by agency for completion BAER assessment and plan.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Average BLM personnel costs @ $56,239 / day X 17 days	$72,600
Average DOE personnel costs @ $1,275 / day X 8 days	$10,200
Average FWS personnel costs @ $847 / day X 17 days	$14,400
Average FS personnel costs @ $106,851 / day X 17 days	$1,816,472
Average NPS personnel costs @ $30,749 / day X 17 days	$522,730
Average BIA personnel costs @ $46,432 / day X 17 days	$789,353
Average common costs @ $56,239 / day X 17 days	$956,057
TOTAL PERSONNEL SERVICE COST	$4,219,449
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Estimated Rental Vehicles @ average cost of $300 / week X 3 weeks X 50 vehicles	$45,000
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$45,000
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Paper, supplies, film processing, diskettes, etc.	$5,000
TOTAL MATERIALS AND SUPPLY COST	$5,000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Estimated Lodging / Perdiem Cost @ $85 / day X 21 days X 100 individuals	$178,500
TOTAL TRAVEL COST	$178,500
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM

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BAER Plan Reproduction @ $60 each X 300 plans	$18,000
TOTAL CONTRACT COST	$18,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Agency	$371,195	6	$4,219,449	EFR	P
TOTAL			6	$4,219,449	EFR	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See also Executive Summary. Costs as of 6/6/00.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
U.S. Fish and Wildlife Service	N/A	$14,400
Bureau of Land Management	N/A	$72,600
Forest Service	25,633 Acres	$1,816,472
Bureau of Indian Affairs – Santa Clara Pueblo	6,695 Acres	$757,779
Bureau of Indian Affairs – San Ildefonso	294 Acres	$31,574
Department of Energy	7,439 Acres	$10,200
National Park Service	842 Acres	$522,730
Average common costs @ $46,100 / day X 14 days	N/A	$956,057
Natural Resource Conservation Service	(personnel costs tracked separately by NRCS)	$0
TOTAL COST	34,208	$4,219,449

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	INSTALL ALERT RAWS SYSTEM WITH RAIN GAGES	JURISDICTIONS:	USFS, SCP, NPS
PART E: LINE ITEM:	# 56 S-10 Public Safety - RAWS	FISCAL YEAR(S) (list each year):	2000, 2001, 2002, 2003

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Install Remote Automatic Weather Stations (RAWS) with early warning capability tied to local emergency response dispatch center.

B. **Location (Suitable) Sites:** Install 8 RAWS mid-slope to upper slope area in Three-Mile Mesa, Water Canyon, Pajarito Canyon, Upper Los Alamos Canyon, Pueblo Canyon, Guaje Canyon, Garcia Canyon, and Santa Clara Canyon

C. **Design/Construction Specifications:** RAWS units ordered from NIFC's Remote Weather Monitoring Division at 208-387-5726 (Bob McCormick).

1. Professional technicians from NIFC RAWS program will supply and install RAWS in centralized locations above the 8 major watersheds on the fire.

2. RAWS will be connected to local emergency response dispatch center.

3. RAWS will be set to trigger a Flash Flood Warning of areas at risk when rain gages record sustained rain fall at a rate of one inch per hour.

D. **Purpose of Treatment Specifications:** To provide early warning of potential flood hazard.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
72 hours X $40 = $2880 X 3 technicians = $8640 X 3 years = 25,920	$26,000
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
$15,000 x 8 RAWS = $120,000	$120,000
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
8 RAWS @ $ 600 = $ 4800 x 2 years = $ 9600 (this cost should be covered in years 2 & 3)	$9,600
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
$1500 x 1 round trip x 3 years = 4500	$4,500

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

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	RAWS		9	$ 180,117	EFR	P
FY 2	RAWS			$14,940	EFR	P
FY 3	RAWS			$14,940	EFR	P
TOTAL			9	$ 209,997	EFR	P

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Func
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment. See Appendix III, Watershed Treatment Map.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	3	$ 60,039
NPS	5	$100,065
SCP	1	$20,013
TOTAL COST	9	$ 180,117

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Directional Tree Felling Into Small Channels	JURISDICTIONS:	USFS
PART E: LINE ITEM:	#57 W-4g Channel Tree Felling	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Trees will be felled across and in a slightly upstream direction in first and second order drainages less than 200 acres in size.

B. Location (Suitable) Sites: Treated areas will generally be in first and second order channels with the capacity to move small to medium (6-8" diameter) woody debris during flood flows.

C. Design/Construction Specifications: Protect downstream culverts and other drainage structures from clogging due to woody debris. It is anticipated that these structures will catch floatable debris and sediment.

D. Purpose of Treatment Specifications: This approach will mimic natural channel processes in forested watersheds and should reduce the amount of woody debris migrating downstream. It is anticipated that the treatment will be maintenance free and beneficial effects will last more than 10 years.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
Some structures will require cable ties to nearby trees, all structures will be constructed by a timber feller and should take approximately 1/2 hour to construct. @$20/hr x 8hr/day x 2 employees x 30 days.	$9,600
TOTAL PERSONNEL SERVICE COST	
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Purchase of cable, and cable clamps, cable cutter and wrench $15/structure x 500 structures	$7,500
TOTAL MATERIALS AND SUPPLY COST	$7,500
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Feller and Swamper working on existing crews will construct, no additional travel costs are anticipated.	N/A
TOTAL TRAVEL COST	$0
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
	$60/structure

TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Structures	$ 34	500	$ 17,100	EFR	P
TOTAL			500	$ 17,100	EFR	P

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

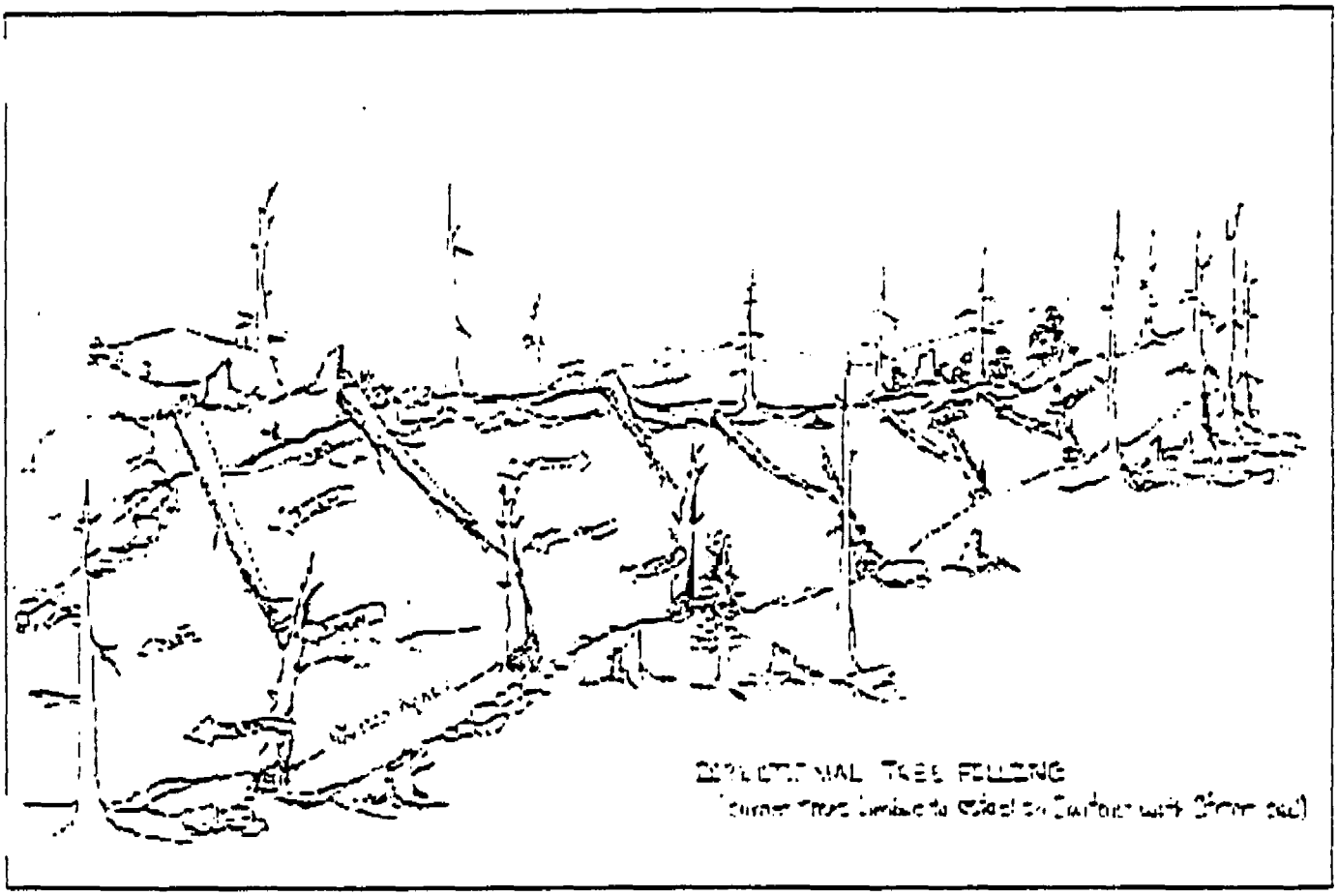
P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USDA Forest Service	500	$ 17,100
TOTAL COST	500	$ 17,100


DIRECTIONAL TREE FELLING

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	GIS BAER Implementation Support	JURISDICTIONS:	USFS, DOE, NPS, BIA
PART E: LINE ITEM:	# 58 U-1 Unique and/or Special Circumstance Treatments	FISCAL YEAR(S) (list each year):	2000 2001

I. WORK TO BE DONE

Number and Describe Each Task:

A. **General Description:** Provide for a GIS configuration to support rehabilitation efforts. The configuration will include the necessary components of a GIS, including hardware, software, data and personnel. This configuration was based on the set-up developed during the BAER planning process. It will serve during the rehabilitation period to provide status maps and data analysis as treatments are deployed and their effects measured. Acquisition of equipment, software and services will follow Federal Acquisition Procedures (FAR) for Information Technology (IT) using Simplified Acquisition Procedures.

B. **Location (Suitable) Sites:** All areas within the Cerro Grande Fire and affected watershed will be the areal extent for this GIS

C. **Design/Construction Specifications:**

1. **GIS Hardware:** Two computers (minimum Pentium III dual-processor 500 MHz, 256 Mb RAM, 5 and 10 Gb hard drives, internal CD-Writer, 250 Mb Zip Drive, 3.5-inch floppy drive, network ready, Internet capable); one plotter (large format, E-size inkjet, minimum 600 dpi, network ready); one laser jet printer (8.5 x 11 inch format, minimum 300 dpi); one network hub or router (minimum 4 ports); one 1250 watt Uninteruptable Power Supply; necessary cables and adapters.
2. **Operating System, GIS, Office Automation Software:** For each computer, Windows NT Version 4, Service Pack 5, Arc/Info for NT Version 8.0x, ArcView for NT/98/95 Version 3.2, Spatial Analyst for ArcView Windows Version 2.0; ArcPress for Windows NT, Office 2000, WordPerfect Version 9, plus the standard utility programs which are loaded with the operating system, including Internet access software, Hyperterminal, text editor, basic image software.
3. **Data:** Data developed from the suppression and BAER planning efforts will be transferred to the implementation team and utilized to fulfill the project.
4. **Personnel:** This specification anticipates the need for two full-time, term employees to manage the GIS support: a comparable GS-344/401/454/460-11 GIS professional manager and a comparable GS-344/401/454/462-7/9 GIS technician. Additional network administrator services will be procured on a contract basis.
5. **Supplies:** Supplies such as plotter paper; printer heads, media disks and other items will be procured on an as-needed basis.

D. **Purpose of Treatment Specifications:** The GIS configuration will support the implementation effort, providing status maps and data analysis as the treatments are completed.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GIS Manager, GS-11 @ 16.57/hr x 1044 =	$20,932
GIS Technician, GS-9 @ 16.57/ hr x 1044 =	$17,299

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TOTAL PERSONNEL SERVICE COST	$38,231
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Computers – Lease 2 per specification 2 x $60/month x 6 months	$720
Plotter – Lease per specification $130/month x 6 months	$780
Hub/Router – Purchase – Item not available for lease	$600
UPS – Purchase – Item not available for lease; will have use beyond rehabilitation projects	$1,100
Laser Jet Printer – Lease per specification	$180
Software – 2 copies for each computer	
ArcInfo Version 8.0x	$6,000
ArcView Version 3.2	$2,000
Spatial Analyst Version 2.0	$4,800
ArcPress for ArcInfo	$1,600
Office 2000 – Included with computer	
WordPerfect Version 9	$1,000
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$18,780
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Plotter paper, plotter pens, laser jet cartridges, media disks	$850
TOTAL MATERIALS AND SUPPLY COST	$850
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
None anticipated if GIS employees are local	$0
TOTAL TRAVEL COST	$0
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Network Administrator, Certified Network Administrator, $100/hour x 20 hours for 1st week x 1 week + Service Contract averaging $100/hour x 2 hour/week x 25 weeks	$7000
TOTAL CONTRACT COST	$7000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Day	$354	153	$54,228	EFR	P, C
FY 2	Day	$354	30	$10,633	EFR	P, C
TOTAL			183	$ 64,861	EFR	P, C

FUNDING SOURCES:
- F= Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, GIS Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	1	$16,215
DOE	1	$16,215
NPS	1	$16,215
BIA	1	$16,215
TOTAL COST	4	$64,361

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Water Quality Monitoring	JURISDICTIONS:	USFS, SCP, SIP
PART E: LINE ITEM:	#59 M-1 Monitoring Water Quality	FISCAL YEAR(S) (list each year):	2000, 2001, 2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Monitor water quality to determine fire, and suppression activities.

B. Location (Suitable) Sites: Sites where flows are expected to contribute sediment volumes to downstream waters including Santa Clara Canyon.

C. Design/Construction Specifications:

D. Purpose of Treatment Specifications: Monitor stream flow quickly for possible violations of the clean water act.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
GS 11-7 Hydrologist/ Soil Scientists @ $200/day X 30 days X 3 years	$18,000
TOTAL PERSONNEL SERVICE COST	$18,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Gov –100 miles/day X 20 days X .33/mile X 3 years	$1,980
TOTAL TRAVEL COST	$1,980
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
TOTAL CONTRACT COST	

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SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Surveys	233	20	$6,660	EFR	P
FY 2	Surveys	233	20	$6,660	EFR	P
FY 3	Surveys	233	20	$6,660	EFR	P
TOTAL			60	$19,980	EFR	P

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
Santa Clara Pueblo	15	$6,495
San Ildefonso	15	$6,495
USFS	30	$6,990
TOTAL COST	60	$19,980

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Volunteer Coordination/Public Affairs	JURISDICTIONS:	USFS, SCP, LA Co.
PART E: LINE ITEM:	#60 O-8 Coordination of volunteer workers	FISCAL YEAR(S) (list each year):	2000, 2001, 2002

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Provide funding for a Volunteer Coordinator/Public Affairs Officer to coordinate and oversee volunteer, public involvement and information exchange for the Cerro Grande Fire rehabilitation program in cooperation with Los Alamos County.

B. Location (Suitable) Sites: Los Alamos, NM, Sante Fe National Forest

C. Design/Construction Specifications:

1. Develop an Information and Education Plan.

D. Purpose of Treatment Specifications: Coordinate long-term volunteer fire-rehabilitation program in cooperation with Los Alamos County.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
1. GS 11 @ $250.00 per day x 2 FY	$65,000
2. GS 9 @ $100.00 per day x .5 FY (1 year half time)	$117,000
TOTAL PERSONNEL SERVICE COST	$182,000
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
Office space, vehicle and cell phone	$20,000
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$20,000
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
Misc. materials and supplies (computer supplies and support, paper, postage)	$3000
TOTAL MATERIALS AND SUPPLY COST	$3000
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
Vehicle mileage	$3000
TOTAL TRAVEL COST	$3000
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A

4

TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1				$208,000	EFR	P,C
FY 1	Plan	2000	1	$2,000	EFR	P,C
TOTAL			1	$210,000	EFR	P,C

FUNDING SOURCES:
F= Fire Suppression Account
EFR = Emergency Fire Rehabilitation
OP = Agency Operating Fund
O = Other
EWP = Emergency Watershed Program

METHODS:
P = Agency Personnel Services
C = Contract (Long-Term)
EFC = Emergency Fire Contract
FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Operations Assessment.

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS		$104,000
LA Co.		$104,00
Santa Clara Pueblo		$2,000
TOTAL COST		$210,000

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION PLAN

PART F – SPECIFICATIONS

SPECIFICATION TITLE:	Fencing around "Alert" Remote Automatic Weather Stations (RAWS)	JURISDICTIONS:	USFS, SCP
PART E: LINE ITEM:	#61 S-11 Fencing around RAWS	FISCAL YEAR(S) (list each year):	2000

I. WORK TO BE DONE

Number and Describe Each Task:

A. General Description: Install fencing around "Alert" Remote Automatic Weather Stations (RAWS). See attached diagrams.

B. Location (Suitable) Sites: See attached site directions.

C. Design/Construction Specifications:

1. Attached are two diagrams for fence installation requirements.

2. Listed below are the type of fences that are recommended:

Station 111 Quezmazon Canyon -	8' chain-linked fence
Station 222 Water Canyon -	4' livestock fence
Station 333 Pajarito Canyon -	8' chain-linked fence
Station 444 Upper Los Alamos Canyon -	8' chain-linked fence
Station 555 Pueblo Canyon -	8' chain-linked fence
Station 666 Guaje Canyon -	4' livestock fence
Station 777 Garcia Canyon -	4' livestock fence
Station 888 Santa Clara Canyon -	4' livestock fence
Station 999 Upper Santa Clara Canyon -	4' livestock fence

3. Mount 1' x 2' sign on south side of fence at a height of 4' above the ground. Sign should be white with black letters.

D. Purpose of Treatment Specifications: Fencing surround the RAWS is a requirement to keep livestock and wildlife from damaging sensors, the antenna, and tower structure. The fence is typically a barbed-wire, four wire fence that is four feet tall. Further a gate is provided to facilitate the raising and lowering of the mast assembly for maintenance purposes. In some cases, an eight foot tall chain link fence is required to reduce the chances of vandalism. Two detailed drawings are provided to identify the placement of the fence surrounding the RAWS. It is important that the placement of the gate for either type of fence is placed north of the RAWS tower.

II. LABOR, MATERIALS AND OTHER COST:

PERSONAL SERVICES (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST/ITEM
	N/A
TOTAL PERSONNEL SERVICE COST	$ 0
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ /cost/Hour X # of Hours X # Fiscal Years = Cost/Item): Note: Purchase requires written justification that demonstrates cost benefits Over leasing or renting.	COST/ITEM
	N/A
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	$ 0
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A

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TOTAL MATERIALS AND SUPPLY COST	$ 0
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X # Fiscal Years = Cost/Item):	COST/ITEM
	N/A
TOTAL TRAVEL COST	$ 0
CONTRACT COST (Labor or Equipment @ Cost/Hour X # Hours X # Fiscal Years = Cost/Item):	COST/ITEM
Station 111 Quezmazon Canyon - 8' chain-linked fence $ 2,000	
Station 222 Water Canyon - 4' livestock fence $ 1,000	
Station 333 Pajarito Canyon - 8' chain-linked fence $ 2,000	
Station 444 Upper Los Alamos Canyon - 8' chain-linked fence $ 2,000	
Station 555 Pueblo Canyon - 8' chain-linked fence $ 2,000	
Station 666 Guaje Canyon - 4' livestock fence $ 1,000	
Station 777 Garcia Canyon - 4' livestock fence $ 1,000	
Station 888 Santa Clara Canyon - 4' livestock fence $ 1,000	
Station 999 Upper Santa Clara Canyon - 4' livestock fence $ 1,000	$ 14,000
TOTAL CONTRACT COST	$ 14,000

SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY 1	Fence	$ 1,555	9	$ 14,000	EFR	C
TOTAL			9	$ 14,000	EFR	C

FUNDING SOURCES:
- F = Fire Suppression Account
- EFR = Emergency Fire Rehabilitation
- OP = Agency Operating Fund
- O = Other
- EWP = Emergency Watershed Program

METHODS:
- P = Agency Personnel Services
- C = Contract (Long-Term)
- EFC = Emergency Fire Contract
- FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATE

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

P = Personnel Services M = Materials/Supplies T = Travel C = Contract F = Suppression

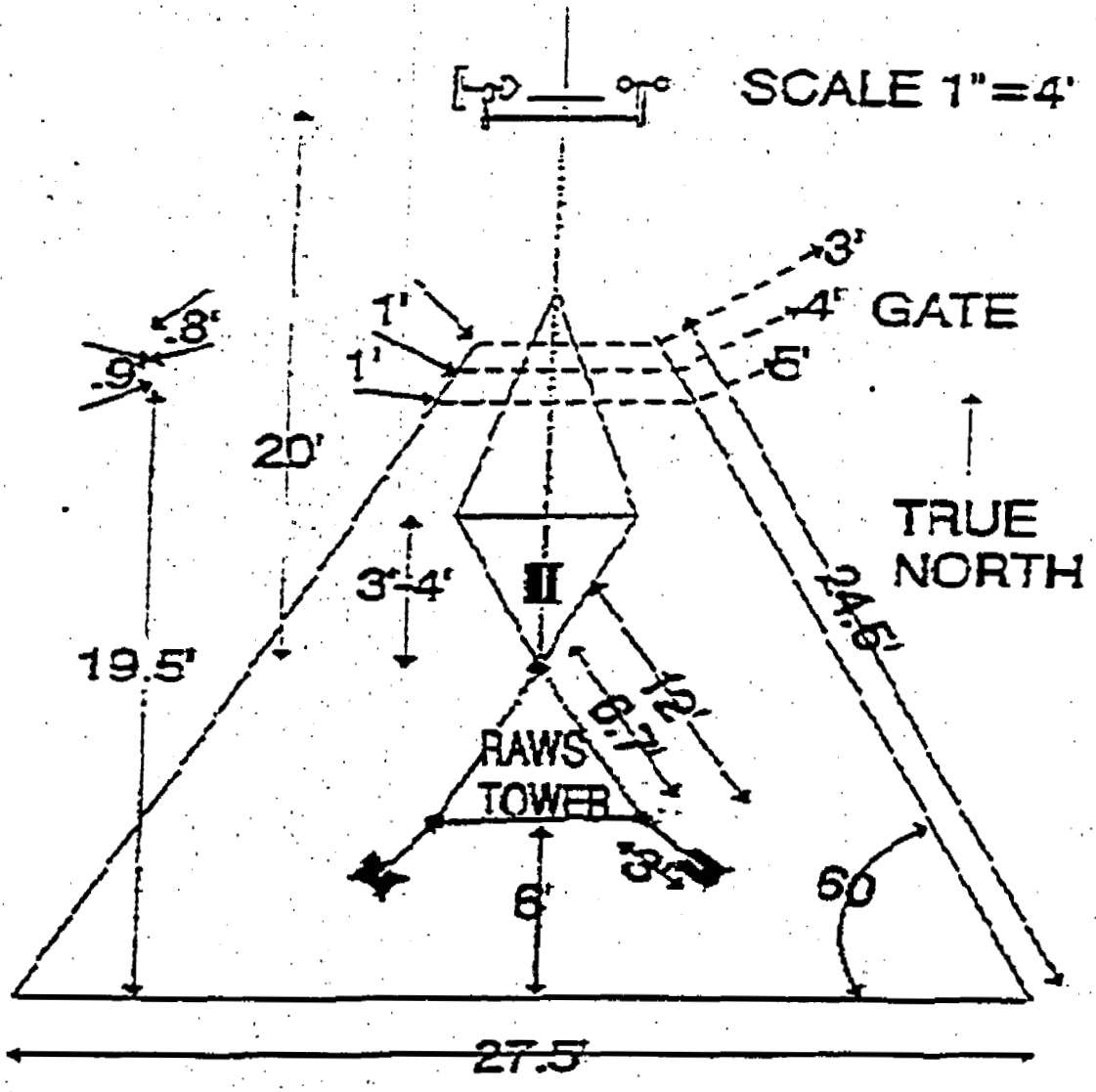
III. RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within BAER Report: See Appendix I, Watershed Assessment

IV. TOTAL COST BY JURISDICTION

JURISDICTION	UNITS TREATED	COST
USFS	7	$ 11,000
SCP	2	$ 3,000
TOTAL COST	9	$ 14,000

FIGURE E



TOP VIEW - MAST LAID HORIZONTAL

FENCED COMPOUND

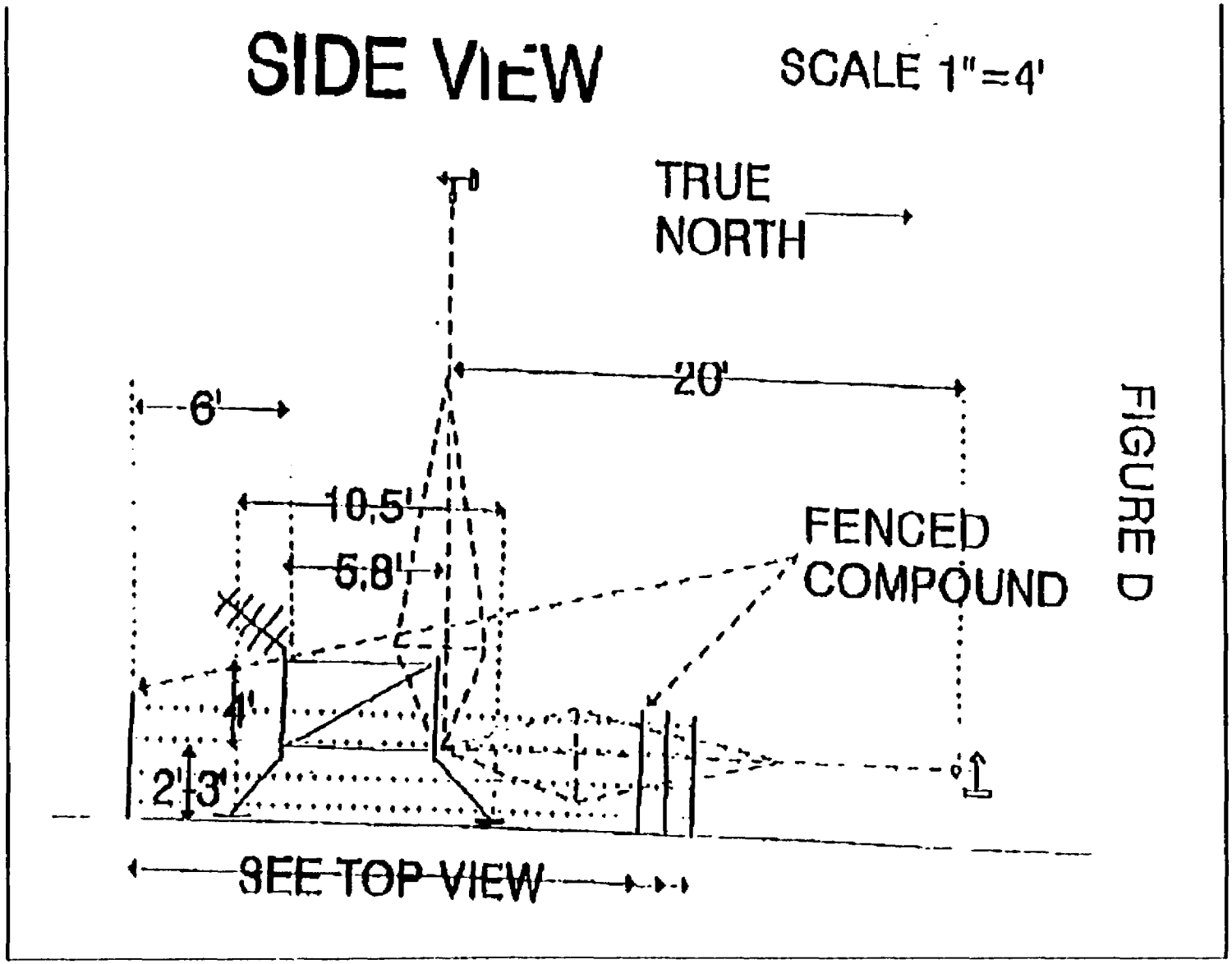
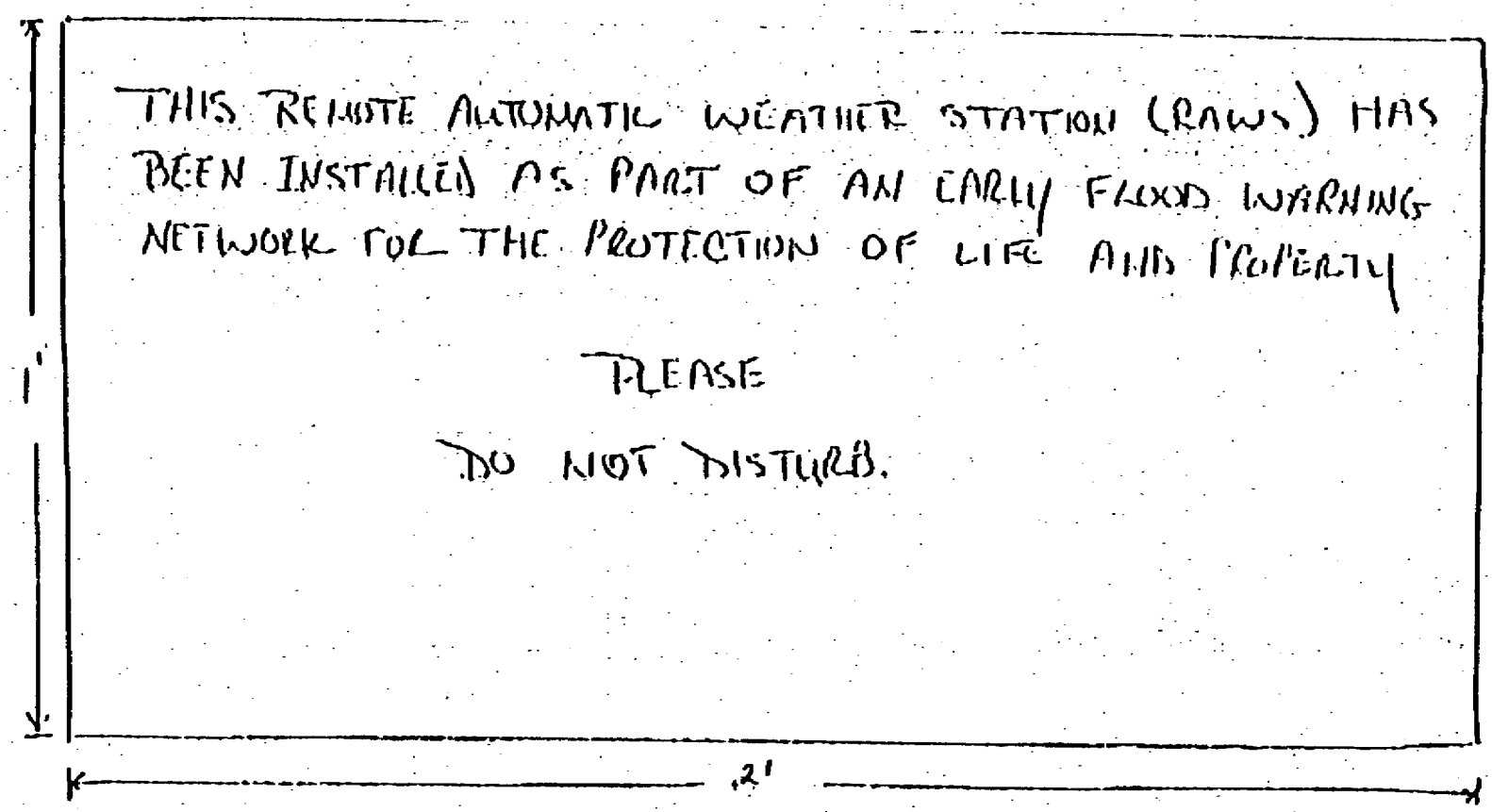

SIDE VIEW
SCALE 1"=4'
TRUE NORTH
20'
6'
10.5'
5.8'
FENCED COMPOUND
4'
2'
3'
SEE TOP VIEW

FIGURE D

TOP


THIS REMOTE AUTOMATIC WEATHER STATION (RAWS) HAS BEEN INSTALLED AS PART OF AN EARLY FLOOD WARNING NETWORK FOR THE PROTECTION OF LIFE AND PROPERTY
PLEASE
DO NOT DISTURB.
1'
2'

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART G POST-REHABILITATION RECOMMENDATIONS

I. Long-Term Monitoring:

- Monitor Aerial Seeding Effectiveness
- Monitor Water Quality
- Monitor Vegetative Recovery
- Monitor Threatened and Endangered Species
- Monitor RAWS Stations
- Monitor Cultural Sites Treatments
- Maintain Installed Treatments

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART H CONSULTATIONS

U.S. Forest Service

Bill Fortini	USFS Cibola National Forest
Carne Leven	USFS Carson National Forest
Kathleen Castro	USFS Stanislaus National Forest
Mike Boynton	USFS Columbia River Gorge NSA
Mike Bremer	USFS Santa Fe National Forest
Mike Elliott	USFS Santa Fe National Forest
David McCray	USFS Santa Fe National Forest
Anne Baldwin	USFS Santa Fe National Forest
Ruth Doyle	USFS Santa Fe National Forest
Bill Armstrong	USFS Santa Fe National Forest
Henry Gallegos	USFS Santa Fe National Forest
Grant Loomis	USFS Tonto National Forest
John Miera	USFS Santa Fe National Forest
Don Serrano	USFS Santa Fe National Forest
Dean Sirucek	USFS Flathead National Forest
Mary Orr	USFS Santa Fe National Forest
Lee Johnson	USFS Santa Fe National Forest
Penny Luehring	USFS Albuquerque
Charles J. Jankiewicz	USFS Sante Fe National Forest
Leonard Atencio	USFS Sante Fe National Forest
John Bruin	USFS Sante Fe National Forest

Bureau of Land Management

Eric Kreush	BLM Nevada
Eric Dillingham	BLM Elko, NV
Chris Arthur	BLM Wyoming

National Park Service

Peter Dudley	NPS Bandelier NP
Suzanne DeCoursey	NPS Bandelier NP
Linn Gassaway	NPS Yosemite NP
Rory Gauthier	NPS Bandelier NP
Trisha Rude	NPS WACC, AZ
Bryan Jacobs	Archaeologist, Bandelier NP
Rory Gauthier	Archaeologist, Bandelier NP

U.S. Fish & Wildlife Service

Joy Nicholopolous	NM Field Office, FWS
Delfinia Jaramillo	NM Field Office, FWS

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Bureau of Indian Affairs

Chuck James	BIA Northwest Region, OR
Rolf Nabahe	BIA Southwest Region, NM
Jerome Jenkins	Forest Manager, Northern Pueblos Agency
Rancy Baker	Northern Pueblos Agency
Dale Swanson	GIS, Northern Pueblos Agency
Hal Luedtke	Forester, BIA SW Region
Chuck Holbert	Forester, BIA SW Region
Bev Schwab	Forester, BIA SW Region
Buff Jepson-Ross	Northern Pueblos Agency
Norman Jojola	Nat. Resource Officer, Northern Pueblo Agency
Cameron Martinez	Northern Pueblos Agency
John Waconda	Forester, BIA SW Region

Santa Clara Pueblo

Gilbert Gutierrez	Lands Inspector
Edward Tafoya	Ranger
Walter Dasheno	Former Governor
J. Michael Chavarria	Environmental
Perry Martinez	Governor
Jose Chavarria	Chief Ranger
Gilbert L. Naranjo	Resource Advisor
Dino Chavarria	Environmental

San Ildefonso Pueblo

Elmer Torres	2nd Lt. Governor
Myron Gonzales	Cultural Resource Technician
Michael Taylor	DECP
Leon Roybal	Natural Resources

New Mexico State Game and Fish

John Klingel	Biologist

New Mexico State Forestry

Kim Kostelnik	Seeding Mgr., N.M. State Forestry
Nancy Noshaskas	N.M. State Forestry

New Mexico Department of Public Safety

Susan Walker	NMDPS

U.S. Geological Survey

Dr. Craig Allen	Ecologist, US Geological Survey
Sue Cannon	Geologist

NRCS

Paul Montoya	Resource Specialist, NRCS
Ken Leiting	NRCS Albuqueque
Levi A. Sandoval	NRCS
Roger Ford	NRCS

FEMA

Mark Price	FEMA

Department of Energy

Elizabeth Withers	TES Species Coord.

Los Alamos National Laboratory

Dr. Samuel Loftin	LANL
Leslie Hansen	LANL
David Keller	LANL
James Biggs	LANL
Kelly Bitner	LANL
Steve Reneau	LANL
Steve Rae	LANL

County / City of Los Alamos

Doug Tucker	Asst. Fire Chief, Los Alamos Co.
Mike Logghe	County Engineer, Los Alamos Co
Dave Riker	Public Works, Los Alamos Co.
Wayne Kohlrust	Public Works, Los Alamos Co.
Bruce Irwin	Public Works, Los Alamos Co.
Jane Volz	Public Works, Los Alamos Co.
Tom Briggs	Utilities, Los Alamos Co.
Robert Gibson	County Council, Los Alamos Co.
Debbie Jo Almager	Recreation, Los Alamos Co.
Lt. Glen W. Mazuravich	Police Department, Los Alamos Co.
Kyle Zimmerman	Public Works, Los Alamos Co.
Robert Repass	EMC, Los Alamos Co.
Tim Glasco	Utilities, Los Alamos Co.

BACA Ranch

Walter Cramer	BACA Ranch
Andy Dunnigan	BACA Ranch

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART I NRCS, NEW MEXICO REVIEW AND APPROVAL

I. EMERGENCY WATERSHED PROTECTION PROGRAM (EWP)

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

State Conservationist, NRCS Date

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART I NATIONAL PARK SERVICE, BANDELIER NATIONAL MONUMENT

I. SUPPRESSION RELATED REHABILITATION APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Superintendent, Bandelier National Monument Date

II. EMERGENCY FIRE REHABILITATION APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Regional Director, Intermountain Region Date

III. EMERGENCY FIRE REHABILITATION APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

BAER Coordinator, Branch of Fire Management, NIFC Date

IV. OPERATIONAL BASE FUNDING APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Superintendent, Bandelier National Monument Date

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART I USDA FOREST SERVICE, SANTA FE NF REVIEW AND APPROVAL

I. SUPPRESSION RELATED REHABILITATION APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Forest Supervisor, Santa Fe National Forest Date

II. EMERGENCY FIRE REHABILITATION APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Regional Forester, Southwestern Region Date

III. EMERGENCY FIRE REHABILITATION APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Director, Watershed and Air Management, Washington DC. Date

IV. OPERATIONAL BASE FUNDING APPROVAL

☐ Approved

☐ Approved with Revision

☐ Disapproved

Explanation for Revision or Disapproval:

Forest Supervisor, Santa Fe National Date

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

PART I. BUREAU OF INDIAN AFFAIRS, N.PUEBLO AGENCY - REVIEW AND APPROVAL

I. SUPPRESSION RELATED REHABILITATION APPROVAL

- ☐ Approved
- ☐ Approved with Revision
- ☐ Disapproved

Explanation for Revision or Disapproval:

Superintendent, Northern Pueblo Agency Date

II. EMERGENCY FIRE REHABILITATION APPROVAL

- ☐ Approved
- ☐ Approved with Revision
- ☐ Disapproved

Explanation for Revision or Disapproval:

Director, Branch of Fire Management, NIFC Date

III. OPERATIONAL BASE FUNDING APPROVAL

- ☐ Approved
- ☐ Approved with Revision
- ☐ Disapproved

Explanation for Revision or Disapproval:

Superintendent, Northern Pueblo Agency Date

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION

MULTI-AGENCY COORDINATING GROUP

THE PARTIES HERETO HAVE REVIEWED AND CONCUR WITH THIS BAER PLAN:

_____
Leonard Atencio, USFS, Santa Fe NF

_____
Alan Cox, NPS, Bandelier NM

_____
Erv Gasser, NPS, BAER Team Leader

_____
Mat Johansen, Dept. of Energy

_____
Gilbert Gutierrez, Santa Clara Pueblo

_____
Hal Luedtke, Bureau of Indian Affairs

_____
Ken Mullen, Los Alamos National Laboratory

_____
Nancy Neskavskas, New Mexico State Forestry

_____
Wayne Patton, USFS, BAER Team Leader

_____
Dave Riker, Los Alamos County

_____
Neil Weber, San Ildefonso Pueblo

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

FOREST RESOURCE ASSESSMENT
SANTA CLARA PUEBLO, SAN ILDEFONSO PUEBLO, COUNTY OF LOS ALAMOS,
BANDELIER NATIONAL MONUMENT

I. OBJECTIVES

- Address needed rehabilitation treatments for forest resource protection for the Cerro Grande Fire. A general assessment is provided for all jurisdictions impacted by the fire. Specific management recommendations for National Forest System lands are included in a companion report addressing Santa Fe National Forest lands. Affected Los Alamos National Laboratory lands will be addressed separately by the Department of Energy.

II. ISSUES

- Tree hazards that may pose a threat to public or worker safety or property.
- Reestablishment of forest cover within forest stands.
- Salvage of fire killed timber.
- Long-term effects on forest health.

III. OBSERVATIONS

A. Background

The Cerro Grande fire began as a prescribed burn on May 4, 2000 to remove brush. The fire escaped and over the course of 15 days, burned lands within Bandelier National Monument, the Santa Fe National Forest, the Department of Energy, the Pueblo of San Ildefonso, the Pueblo of Santa Clara, Los Alamos County, the Baca Ranch, and numerous privately owned parcels. In the community of Los Alamos 260 homes were damaged or destroyed. For much of the time the fire actively burned, it was pushed by high winds, sometimes as great as 50 mph, which made control of the fire extremely difficult.

B. Vegetation

The fire burned in many vegetation types ranging from grasslands in the lower drainages near 6,600 feet in elevation on the San Ildefonso Pueblo Reservation to spruce/fir and aspen stands at 10,000 feet in elevation on Caballo Mountain on the Santa Clara Pueblo Reservation. For the purpose of consistent analysis, plant communities on federal and tribal lands were grouped into seven broad types as defined below. Table 1 indicates the total acreage within the fire perimeter by vegetation class and jurisdiction.

Piñon-Juniper: dominated by a piñon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*) overstory with a grass/herb/shrub understory. Ponderosa pine (*Pinus ponderosa*) is occasional in this type. This community is located at the lowest elevational band within the burn.

Ponderosa Pine: dominated by a ponderosa pine overstory with understones consisting of ponderosa pine or Douglas-fir (*Pseudotsuga menziesii*) with grasses and shrubs including Gambel oak (*Quercus gambelii*) and New Mexican locust (*Robinia neomexicana*)depending on stand density, habitat type, and recent fire history. Early seral stages of this type are dominated by bunch grasses, forbs, ponderosa pine and Douglas-fir on gentle slopes with deeper soils; while the steeper slopes and shallow stony soils are usually dominated in early succession by shrubs intermixed with sparse Ponderosa pine.

Mixed Conifer: dominated by an evergreen, coniferous species overstory including white fir (*Abies concolor*), Douglas-fir, ponderosa pine, southwestern white pine (*Pinus strobiformis*), with intermixed quaking aspen (*Populus tremuloides*). Understories consist primarily of Gambel oak, grasses and forbs depending on specific habitat types. Early seral stages are dominated by bunch grasses, forbs, ponderosa pine, and Douglas-fir on gentle slopes with deeper soils; while the steeper slopes and shallow stony soils are usually dominated in early succession by shrubs intermixed with sparse ponderosa pine and Douglas-fir. If aspen clones are present on the site, aspen stands will usually dominate the site for 80-100 years post disturbance.

Spruce/Fir: stands dominated by Engelmann spruce (*Picea engelmanii*), corkbark fir (*Abies lasiocarpa* var. *arizonica*), white fir and Douglas-fir with intermixed quaking aspen. Early seral stages of this type are usually dominated by bunch grasses, sedges, forbs, aspen, and Douglas-fir.

White Fir: stands dominated by white fir. Other common associates include Douglas-fir, quaking aspen and ponderosa pine.

Aspen: dominated by aspen with an understory of grasses and forbs; considered a fire dependent seral stage which converts to mixed conifer in the absence of fire.

Grassland/Shrub: dominated by native grasses and perennial herbs. Shrubs include currant (*Ribes spp.*) and common juniper (*Juniperus communis*).

Montane Grass: High elevation grasslands occurring as openings within mixed conifer and spruce-fir forests.

Oak: brush fields dominated by Gambel oak.

Non-Stocked/Rock: rock outcrops and other barren areas.

Table 1. Acres of Vegetation Types Within Fire Perimeter by Land Ownership

Veg. Type	Band. Natl. Mon.	Dept. of Energy	Santa Fe National Forest	San Ildefonso Pueblo	Santa Clara Pueblo	Private Lands
Piñon/ Juniper	0	1385	2613	137	335	574
Ponderosa Pine	344	3479	13837	155	3102	877
Mixed Conifer	417	5	6196	0	3030	91
White Fir	0	12	657	0	4	4
Aspen	16	0	1,177	0	28	105
Montane Grass	51	1386	330	0	33	281
Grass Shrub	0	754	57	0	0	115
Oak	0	0	716	0	50	7
Other	0	381	18	0	99	0

C. Management Direction

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Broad management direction is provided for the San Ildefonso Pueblo in the Forest Management Plan for the period of July 1, 1996 to June 30, 2006. Direction pertinent to the Cerro Grande fire is: (1) Seed and reforest fires with indigenous species Bureau of Indian Affairs (BIA) will maintain a listing of recommended species), (2) Areas of trees killed by fire will be harvested for utilization, but 3-5 trees per acre (TPA) greater than 12" Diameter Breast Height DBH to be retained for wildlife, (3) Salvage harvest will be done under emergency authorization to utilize the material before it is beyond use, (4) Treat slash to minimize risk of insect infestation in the Sacred Unit by either removing material greater than 2" in diameter or cutting into lengths of 2' or less to facilitate drying.

Broad management direction for the Santa Clara Pueblo is provided in the Forest Management Plan for the period 1989 to 1999. Direction pertinent to the Cerro Grande fire is: (1) Manage the timber resource in harmony with other natural resources and environmental values, (2) Minimize logging disturbance and designate areas for reseeding or replanting to prevent erosion, (3) Improve the health, vigor, and genetic condition of the forest given Agency and Tribal policy and economic constraints, (4) Maintain all southwestern white pine and perpetuate the seed source.

Management of the forest on Bandelier National Monument is generally by prescribed burn only, though some hand and mechanical treatments are being introduced into woodlands in the monument.

At the time of the fire, the county of Los Alamos did not have a plan to manage their forest lands. Development of a plan is currently under way.

D. Tree Damage and Mortality

Numerous factors influence post-fire tree mortality, including: season the damage occurred, pre-fire tree vigor/site quality, extent of crown damage, extent of cambium damage, post-fire stand density/competition, post-fire climatic conditions, and insect/disease damage. The following guidelines were derived largely from research by Wagener (1961) and other sources as noted:

Season: Conifers are most susceptible to fire damage early in the growing season because retention of sufficient green foliage is necessary to carry the tree through the remainder of the growing season and provide some food reserves for the following year. Because the fire occurred just as buds were beginning to elongate, even moderate levels of crown scorch can be expected to have serious effects on tree vigor and mortality levels. Fires that occur after bud set have much less impact on tree survival.

Tree Vigor/Site Quality: Younger, more vigorous trees on good sites have a better chance of survival than over mature trees on poor sites.

Crown Damage: The amount of live crown remaining, as distinguished from green foliage, is the most important single factor in survival of fire-scorched ponderosa pine. Green needle bases indicate that the surrounding parts of the crown are still alive; conversely, darkened needles and needles "frozen" in position in the direction of fire-run are unmistakable indicators the surrounding crown is dead. The minimum green foliage requirement for vigorous ponderosa pine survival of an early season (before July 1) burn is estimated to be 35 percent of the pre-fire crown. In species with slender twigs and small terminal buds, as in Douglas fir, foliage kill and bud and twig kill are approximately the same as that which will be present in succeeding years. The minimum post-fire survival criteria for moderately vigorous trees, those growing on a poor site, or following a mid season (July) fire, is 40-45 percent of the pre-fire crown.

Cambium Damage: Based on preliminary results, Ryan (1990) has reported that, in the absence of significant crown injury, most trees survive up to 25 percent basal girdling, whereas few survive more than 75 percent.

Post-Fire Stand Density and Competing Plants: Potter and Foxx (1979) reported decreased recovery as stand density increased above 130 trees per acre. Another contributing factor cited for poor

recovery was competition from seeded grass.

IV. RECONNAISSANCE METHODOLOGY & RESULTS

A. Tree Hazards

Areas to be surveyed for tree hazards were identified by officials from the Santa Fe National Forest, the town of Los Alamos and the Northern Pueblos Agency of the BIA. These agencies identified areas along Highway 4, Routes 501 and 502 within the perimeter of the fire and along trails within the burned area where potential tree hazards posed the greatest threat to the public or tribal members. Areas within the burned neighborhoods of Los Alamos were also identified for hazard tree marking. Over 100 miles of trails were identified for reconnaissance and marking. The Santa Fe N.F. Landscape Architect specified the priority of the marking of tree hazards on trails on Santa Fe N.F. lands. Those trails closest to the community of Los Alamos had the highest priority.

Short-term (imminent) tree hazards were identified using the National Park Service Tree Hazard rating system. These are trees that pose an immediate threat to fire suppression and rehabilitation crews and the public. The rating system identifies hazard based primarily on lean, root or bole damage, and stem decay. Those trees with a rating of 4 or greater will be designated with orange "killer tree" ribbon. Imminent tree hazards were either mapped by hand, or Global Positioning System for a map being developed to aid fallers in locating the numerous trees on seven roads and 19 trails identified. A much larger number of fire-killed trees situated along roads and trails will begin to pose a long-term threat to the public, restoration crews and administrative personnel after several years as decay weakens roots, branches, and stems. Over thirty miles of trail have been identified for long-term tree hazard identification and marking. Identification and marking of long-term tree hazards is expected to be completed in mid-June by two BAER foresters.

B. Forest Mortality

The degree of fire-related mortality was determined by utilizing color infrared digital imagery, helicopter and on-the-ground reconnaissance, and by analysis of Continuous Forest Inventory (CFI) data and by using existing and developed GIS databases. The reconnaissance for Pueblo lands was conducted by BAER foresters. USFS foresters reconned Santa Fe National Forest lands and have written their results in the Santa Fe Forest Resources Assessment.

Using the color infrared photograph, all forested areas within the burn were classified into three categories; understory burn (UB), mosaic burn (MB) or stand replacement burn (SR). Understory burn consists of areas that experienced less than 25% loss of standing cubic volume. Mosaic burn is where between 25% and 80% of the standing volume of timber was killed and stand replacement burn is where greater than 80% of the standing volume was killed or is expected to die within three years.

The burned areas within the bounds of the Santa Clara Pueblo and San Ildefonso Pueblo were reconned on-the-ground by the two BAER foresters. Reconnaissance of the Santa Clara Pueblo also included a flight of the burned area to preliminarily map mortality. Accessible areas on both Pueblos were then reconned by walking or driving through affected stands. Informal plots were periodically taken to get a feel for the volume in each stand, but they were not used to determine potential salvage volume.

GIS databases for the Santa Fe National Forest and both Pueblos were queried for vegetation types. Data gathered in the field was digitized and included with the queried data.

The final timber mortality map was completed by mapping three categories of mortality on the color infrared photo of the fire. These polygons were then digitized into a GIS cover called timber mortality. To this cover were unioned the vegetation type cover and ownership covers. Acreages of mortality by vegetation type by ownership was queried.

C. Potential Salvage and Reforestation

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Potential salvage and reforestation areas on Pueblo lands were determined by BAER foresters through a combination of field visits, aerial reconnaissance, and GIS soils, vegetation, stand mortality and slope data. Excessively steep (greater than 40 percent) and inaccessible areas were not considered practical for salvage. Santa Clara Pueblo has expressed that all areas of stand replacement be recommended for reforestation. Methods used for identification of salvage and reforestation areas on National Forest lands are detailed in the Santa Fe National Forest Forest Resource Assessment. Potential salvage and reforestation was not assessed for County, DOE or private lands.

To determine the volume per acre for the Santa Clara Pueblo, the CFI cover, which shows the location of each plot, was unioned with the vegetation type cover that had been previously developed. The specific plots by vegetation type were then queried. The CFI data for 1995 was then grouped by vegetation type and then local volume tables were used to calculate the standing volume. Standard errors were also calculated and were high due to the small number of plots in the sample. For the Ponderosa Pine type, volume per acre calculated at 868 board feet per acre plus or minus 97 board feet per acre. The mixed conifer type calculated at 1964 board feet per acre plus or minus 64 board feet per acre. Calculated volumes per acres were close to the volume per acre harvested from the OSO fire two years ago which is located just to the north of the Cerro Grande fire. Data from an uneven-aged growth study plot which showed that over 4,000 board feet per acre was harvested on one 4.5 acre plot. This was twice as high as volumes calculated from the CFI data. The 55 20th acre CFI plots better represent the landscape than one 4.5 acre plot, so the CFI data was used to determine potential salvage volumes. Actual volumes may be different than the calculated estimates and should be determined by cruising at the time of the sale layout.

Two potential harvest units totaling approximately 151 acres were identified on the San Ildefonso Pueblo lands. Since this was a small amount, the mortality was cruised by a BAER forester and volumes were calculated from that data.

D. Findings

Tree Hazards

Approximately 650 short-term (imminent) tree hazards were identified and flagged within identified public use areas, roads and trails. Estimates of the number of long-term tree hazards to be mitigated were derived by applying an estimate of the number of trees per acre to the forested stand replacement acreage within striking distance (an average of 70 feet) of selected roads and trails occurring outside of potential salvage areas. Areas designated for salvage harvesting were excluded since tree hazards in these areas will be mitigated in conjunction with the harvest operation. The safest and most efficient method of mitigating long-term tree hazards is to fall, in one operation, all fire-killed trees that will potentially impact roads and trails. The Tree Hazard Map indicates areas with long-term tree hazards and summarizes the number of tree hazards on each trail or road. As of the writing of this document, all trails and roads had been surveyed by BAER foresters for imminent tree hazards, maps have been made and given to operations so crews can be dispatched to begin felling tree hazards. Tree hazards have been felled on highways 4, 501 and 502, on the town property west of 48th street and in designated areas on Ski Hill road. Suppression crews will continue to work until all tree hazards have been mitigated.

Table 2. indicates total acreage of mortality classes by jurisdiction. Table 3. indicates acreage by mortality class by vegetation class by jurisdiction.

On San Ildefonso lands, the fire burned approximately 293 acres of which about two thirds was stand replacement. The fire burned the hottest in the valley bottom through the open ponderosa pine type with a significant amount of mahogany and Gambel oak in the understory. In those areas where the stocking of ponderosa pine was lower and the mahogany was thickest, the fire burned the hottest

causing 70% to 90% of the ponderosa pine to be killed by scorch or damaged beyond which the trees are likely to survive. Where the stocking of ponderosa pine was heavier and the mahogany thinner, the fire burned at a lower intensity. In these stands, approximately 25% to 70% of the ponderosa pine was killed or damaged. There is a pocket of pole sized ponderosa pine on the tabletop in the far western corner of the reservation where scorch killed or damaged 70% to 90% of the trees. On steep slopes to the south and on the mesa, in the piñon/juniper woodland type, the fire burned lightly or not at all.

Table 2. Stand Mortality Class Acreage by Jurisdiction.

	Understory Burn	Mosaic Burn	Stand Replacement	Total
Bandelier N.M.	0	761	67	828
Dept. of Energy	169	6476	757	7402
Santa Fe Natl. For	2067	10461	13073	25601
San Ildefonso Pueblo	51	49	192	292
Santa Clara Pueblo	119	4635	1927	6681
Private	206	1719	129	2054
Total	2612	24101	16145	42858

Some high intensity burn areas, and most areas in the mosaic burn contain some overstory ponderosa pine expected to survive and provide a seed source. Gambel oak is expected to resprout and mahogany is expected to germinate from the buried seed source.

Almost 7,000 acres burned on the Santa Clara Pueblo reservation, of which, a little over 6,100 acres is ponderosa pine or mixed conifer. About two thirds (1,946 acres) of the ponderosa pine type burned in a mosaic pattern and one third (1,098 acres) was a stand replacement fire. In the mixed conifer type approximately three fourths (2,305 acres) burned in a mosaic pattern and one fourth (725 acres) was stand replacement.

Table 3. Acres of Vegetation Type by Mortality by Ownership (Other than Santa Fe National Forest Lands)

A1

Bandelier N.M.	Underburn	Mosaic Burn	Stand Replacement
Ponderosa Pine	0	300	39
Mixed Conifer	0	393	24
White Fir	0	0	0
Spruce/Fir	0	0	0
Aspen	0	0	0
Piñon Juniper	0	0	0
Grass/Meadow/Shrub	0	12	13
Oak	0	0	0
Other/Nonforested	0	16	2
TOTALS	0	721	78

Santa Clara Pueblo	Underburn	Mosaic Burn	Stand Replacement
Ponderosa Pine	91	1946	1098
Mixed Conifer	0	2305	725

San Ildefonso Pueblo	Underburn	Mosaic Burn	Stand Replacement
Ponderosa Pine	19	228	185
Grass/Meadow/Shrub	37	35	46
Grass/Meadow/Shrub	249	48	37
Other/Nonforested	9	98	19
Other/Nonforested	119	4648	1924

Private Lands	Underburn	Mosaic Burn	Stand Replacement
Ponderosa Pine	0	672	3
Mixed Conifer	0	87	4
Spruce/Fir	0	0	0
Aspen	0	87	18
Piñon/Juniper	21	539	21
Grass/Meadow/Shrub	4	307	70
Oak	0	7	0
Other/Nonforested	0	26	10
TOTALS	25	1725	126

The fire burned through the Santa Clara uneven-aged growth study plot located at T20N, R6E, Section 11. An informal walk-through exam shows that the fire was mostly an underburn, with a few individual trees torching.

The Northern Pueblos Agency estimates that 43 CFI plots were damaged by the fire.

Potential Salvage and Reforestation

Approximately 897 acres have been identified as potentially available for salvage harvesting on Pueblo lands, with 746 acres on the Santa Clara Pueblo and 151 acres on the San Ildefonso Pueblo. Areas of limited accessibility or slopes greater than 40% requiring advanced logging systems and therefore limited by economic constraints were not analyzed.

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Potential salvage and reforestation on National Forest System lands is discussed in the Santa Fe N. F. Forest Resources Assessment

Santa Clara Pueblo	Potential Tractor Acres	Board feet/Ac (Gross 9"+DBH)	Total board feet (Gross 9"+DBH)
PP Type	672 Ac	868 Bf/Ac	583,296 BF
MC Type	74	1964	145,336 BF
TOTAL			728,632 BF

Total volume for the San Ildefonso Pueblo was calculated from a cruise conducted by a BAER forester. The total volume for the 151 acres is approximately 511,000 board feet.

San Ildefonso Pueblo			
PP Type	151 Ac		511,000 BF

The Northern Pueblos Agency recommends all areas of stand replacement burn be reforested. On the Santa Clara Pueblo reservation, this is approximately 1923 acres of which 1,179 acres is inaccessible by vehicle. The 151 acres of the San Ildefonso Pueblo reservation will need to be planted or mahogany and other shrubs will capture the site.

No treatments are expected on Bandelier National Monument lands other than felling of tree hazards (if any are identified).

Forest Health

In those areas of stand replacement fire, the trees are obviously dead, so health is not an issue.

In those areas of mosaic burn or underburn, there is the potential of an increase in the population of bark beetles and other insects, especially if the drought continues. Trees that were already weakened by the drought were further weakened by scorching of the needles and partial girdling. Weakened trees are less likely to survive an insect attack and would become a breeding ground for pine beetles. The large areas of stand replacement burn would however act as buffers keeping increased populations somewhat isolated.

In areas of underburn and mosaic burn, the fire may have improved forest health by killing low hanging brooms of mistletoe.

V. RECOMMENDATIONS

A. Specification Related Treatments

Research and Continuous Forest Inventory - conduct a formal exam on the Santa Clara uneven-aged growth study plots. (BAER Spec #43, 0-5b, Santa Clara Stocking Plot Damage Assessment).

OTHER - reforestation (including site preparation)- reforest approximately 1923 acres on the Santa Clara Pueblo reservation and 151 acres on the San Ildefonso Pueblo reservation. (BAER Spec #41 0-6, Reforestation - Hand Planting).

Slash Mitigation – chip slash resulting from felling tree hazards on Guaje Canyon trail. (BAER Spec #53, S-7, Slash Treatment).
Fence Reconstruction – repair and reconstruct fence to protect tree seedlings (BAER #15, S-1a, Protect Revegetation Efforts).

B. Specification Related Monitoring

Fire Related Monitoring - Monitor survival and growth of the seedlings planted on 1923 acres of Santa Clara Pueblo lands and 151 acres on the San Ildefonso Pueblo reservation and 1000 acres on the Santa Fe National Forest. (BAER Spec #40 0-2, Reforestation Survival Survey).

Short-term Tree Hazard Mitigation – Identify, mark and fell imminent tree hazards. (BAER Spec #44 S-8, Short Term Tree Hazard Mitigation).

S-2 Long-term Tree Hazard Mitigation – Identify, mark and fell long-term tree hazards.

Salvage Sale Preparation – Layout and cruise potential salvage units on the Santa Clara Pueblo Reservation. (BAER Spec #42 N-3, Salvage Sale Layout and Preparation).

Reestablish continuous forest inventory plots and the uneven-aged growth study plots on the Santa Clara Pueblo. (BAER Spec #39, 0-5a, Research and Continuous Forest Inventory Plots).

C. Non-Specification Related Management

Potential salvage approximately 728,632 board feet of timber on 966 acres on the Santa Clara Pueblo Reservation.

Potential salvage approximately 511,000 board feet of timber on 151 acres on the San Ildefonso Pueblo Reservation.

Santa Clara is currently working under an extension of their management plan. They have CFI data from 1995, which has not been analyzed. It is recommended the Northern Pueblos Agency receive funding to begin analysis and development of a new management plan.

The County of Los Alamos should consider a salvage sale to remove any merchantable timber from Town lands within the burn.

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

INFRASTRUCTURE ASSESSMENT

I. OBJECTIVES

Inventory and prescribe mitigation measures to structural improvements affected by the fire, fire suppression activities, or threatened by the effects of the fire.

II. ISSUES

Direct and indirect fire damage, including suppression effects to structural improvements on Santa Fe National Forest (SFNF), City/County of Los Alamos, private homeowners, Department of Energy (DOE), Los Alamos National Laboratories (LANL), New Mexico State Highway Department (NMSHTD), San Ildefonso Pueblo and Santa Clara Pueblo structures and facilities.

Potential flood and debris flow damage and impacts to structures and facilities within the affected fire area, namely drainage structures, roads and homes within and downstream of the impacted watersheds.

Rehabilitation and restoration of road systems adversely impacted by the fire suppression effort and potentially impacted by the after effects of the fire event.

Impacts to fences, corrals and other range land improvements in the area.

Impacts to utility poles and lines serving the area.

III. OBSERVATIONS

This assessment addresses and identifies the resultant and potential impacts of the fire to the structural integrity of the existing structural improvements in the burned area of the Cerro Grande Fire and on affected areas of the fire including access points not burned and areas downstream of the impacted watersheds on lands under the jurisdiction of SFNF, City/County of Los Alamos, DOE, LANL, tribal lands of Santa Clara Pueblo and San Ildefonso Pueblo, Baca Ranch and on NMSHTD highways. The burned area consists of federal lands under the jurisdiction of the USDA Forest Service SFNF, USDI Park Service Bandelier National Park, DOE, and LANL; municipal lands of the City/County of Los Alamos; and tribal lands of San Ildefonso Pueblo and Santa Clara Pueblo. These structural improvements include roads, drainage structures, dwellings, industrial laboratory facilities, fences and utility lines.

The Cerro Grande fire destroyed 236 structures. 232 were private residences in the City of Los Alamos, and 4 were buildings on LANL lands. Most of the fire damage resulted in total loss of the structures and destruction of vehicles parked at these residences. Additionally, some old, abandoned homesteads in the fire area were destroyed or damaged as a result of the fire.

Roads were heavily impacted by heavy traffic during the fire suppression effort and during the rehabilitation effort. The drainage structures associated with these roads will also be impacted due to the after effects of the fire, which may include increased water flow, mudflows and debris flow.

There are approximately 200 miles of road associated with the burned area, ranging from paved highways and urban subdivision roads to unimproved dirt logging roads. Suppression activities impacted approximately 125 miles of this road system. There are approximately 195 drainage structures associated with these roads which are under threat of impact from the after effects of the fire.

There is approximately 3.5 miles of fencing in the burned area. 1.5 miles of boundary fence were destroyed or damaged by suppression activities and 2.0 miles of range fence were destroyed or damaged by fire sufficiently to require replacement in kind.

The findings and recommendations contained herein are based on information obtained through reconnaissance of the impacted area, literature research and personal interviews with staff from the City/County of Los Alamos, LANL, DOE, Natural Resource Conservation Service (NRCS), NMSHTD, Bureau of Reclamation (BOR) and Bureau of Indian Affairs (BIA).

A. Background

The Cerro Grande fire perimeter burned approximately 42,878 acres. Roads in the affected area were used for transportation of personnel and materiel in approximately 2 weeks of fire suppression efforts. Roads were also used as fuel breaks and were widened with dozers during back burning efforts in an attempt to contain the fire. Dozers were also used to construct safety zones around structures in the Los Alamos area and the Puye Cliffs Visitor Center.

The road system could be negatively impacted due to the potential for increased sedimentation from road surfaces made unstable through heavy traffic use in the fire rehabilitation efforts, potential timber salvage, and threats to life and property during high flow events from sedimentation and debris flow from the burned area

Many utility poles were damaged or destroyed during the fire and have been replaced.

B. Reconnaissance Methodology and Results

Impacted area reconnaissance was conducted utilizing standard ground survey methods and inventories sites were recorded utilizing Global Positioning Systems (GPS). Field inventories on roads were conducted by Henry Gallegos and George Long, BAER Team members. Field inventories on drainage structures on roads were conducted by Frank Casaus and Mark McKinley of NRCS and Henry Gallegos of the BAER Team, with GPS assistance from Melissa Chavez, Sheldon Fernando, Dottie Miller and Bobby Beckwith of the BAER Team. Noah Kenitobe and Naomi Archuleta of San Ildefonso Pueblo recorded locations for trail warning sign placement. Additional site investigations are being conducted by Jose Silva of NMSTHD on their rights of way and by Rodney Whittler, Tony Wahl and Blair Gnemann on the Los Alamos Reservoir Dam and Diamond Drive road fill.

1. Road Grading

Approximately 125 miles of road were used for fire suppression activities. Local Forest Service Roads (FS #144, FS # 445, FS #446 and FS # 446G) were adversely impacted by fire suppression traffic under extremely dry soil conditions, causing the road surfaces to degrade. Roads were watered, graded and rolling grade dips were reconstructed under road suppression rehabilitation according to the specifications contained herein. All work will be completed prior to completion of incident activities.

Post fire suppression road rehabilitation will be conducted during and after completion of the other rehabilitation efforts, as roads will be heavily impacted during these efforts. This will consist of road grading and watering and construction of rolling grade dips and leadout ditches to control water runoff on roads not having culverts for drainage control. 45 miles of road will be rehabilitated accordingly.

Field reconnaissance and further rehabilitation will need to be conducted on some Forest Service roads and on roads in the tribal lands of San Ildefonso and Santa Clara Pueblos to determine road grading needs.

2. Road Dust Abatement

Approximately 30 miles of local Forest Service roads (FS #144, FS #416, FS # 445, FS #446 and FS # 446G) that were heavily impacted by fire suppression traffic were treated with water for dust abatement. All work will be completed prior to completion of incident activities.

3. Drainage Structures

Field inventories revealed a total of 212 drainage structures in the area affected by the fire. These sites occur on high speed highways, municipal streets and low volume/low speed roads. These structures consist of corrugated metal pipes (CMP), Concrete Box Culverts (CBC), concrete low water crossings (LWC) and bridges, the vast majority of which are CMPs.

12 sites were determined to be critical structures, based on the high potential for loss of these structures and the portion of road they are located on, due to an increased runoff and flow of water through them and the potential for mudflow and debris blocking the inlets. These CMPs are decidedly undersized for the projected increased flows.

It has been determined that there is a potential for either blockage or failure of these culverts and that there is an imminent threat to human life and property should they fail. Values at risk include life and property, water quality degradation from the associated erosion if failure should occur and a loss of site productivity.

Culverts throughout the area were determined to be in need of maintenance, namely cleaning of the outlets and inlets and cleaning of the inlet and outlet channels where appropriate. A substantial number of the inventoried culverts will need to be upsized to accommodate the increased projected runoff. This is in addition to the 12 critical structures. Addition of appurtenances to the existing culverts in place include, but are not limited to debris racks, drop culvert inlets (or enlarged inlets on native soil), culvert standpipes, and hazard markers. Additional reconnaissance and design work needs to be completed to determine additional appropriate mitigation measures.

NMSHTD is conducting independent site assessments on NM State Highways 4, 502 and 30. DOE is conducting independent site assessments on NM State Highway 502 and interior roads. LANL is assessing their interior road system also. The City/County of Los Alamos is conducting independent assessments in conjunction with US Army Corps of Engineers (USACE), BOR and NRCS.

Additional field reconnaissance and design will be conducted on Forest Service road drainages to determine the need to upsize and add appurtenances to the culverts.

4. Road Signs

Due to the urban interface in the affected fire area and the imminent risk to life and property, hazard warning signs will be installed on roads and trails throughout the area to warn vehicular and pedestrian traffic of potentially hazardous situations due to flash flooding, rolling rocks, snags and stump holes. See Appendix III, Watershed Treatments Map overview.

Approximately 100 road hazard warning signs will be installed on high, medium and low speed highways under the jurisdiction of NMSHTD and Santa Clara Reservation and on residential streets in Los Alamos and White Rock, as well as on low volume/low speed local roads on national forest lands and Santa Clara Reservation.

Approximately 100 trail signs will be installed on trails within the city of Los Alamos and in the vicinity of the city of White Rock. They will also be installed on Santa Fe National Forest lands and San Ildefonso Pueblo lands, as well as on Santa Clara Pueblo lands.

Object markers will be replaced or installed as needed on culverts that have been identified in the culvert inventory reconnaissance.

5. Buildings

The Los Alamos County Skating Rink is in imminent danger of flooding as it is located on the floodplain of Los Alamos Canyon and increased runoff and debris as a result of the fire effects could cause the culverts at the entrance off of West Road to overrun the stream channel. Concrete "Jersey Barriers" are proposed as a sheet flow diversion.

The decommissioned Omega 2 Reactor, downstream of the Los Alamos Reservoir in the Los Alamos Canyon drainage floodplain, is also in danger of flooding and debris flow impacts should a large surge event occur, as it has drainage structures in its immediate proximity. DOE is assessing mitigation measures.

6. Road Closures

7.9 miles of FS Road #442 will be decommissioned to prevent vehicular access for the purpose of protection of public safety and T & E species. Other road closures or decommissioning of roads is being considered for protection of cultural sites and/or wildlife, namely portions of FS Road #416 and spur roads off of FS Roads # 445 and 446.

7. Dam

The 25 acre-feet Los Alamos Reservoir Dam has been drained and all debris will be removed from the reservoir spillway, including stoplogs and stanchions, blocks and wire rope, pipe wall support, all other debris and potential snags, the bridge deck and bridge railing. The outlet drainage should also be cleaned of debris to facilitate flow. This structure is critical due to its location upstream of the Los Alamos County Skating Rink and the decommissioned Omega 2 reactor.

8. Fence

There is approximately 3.5 miles of fencing in the burned area. 1.5 miles of boundary fence were destroyed or damaged by suppression activities and 2.0 miles of range fence were destroyed or damaged by fire sufficiently to require replacement in kind.

IV. RECOMMENDATIONS

1. Management (specification related)

- Install road hazard signs (BAER Spec #38, S-4, Resource Protection and Public Safety).
- Repair or replace boundary and range fence (BAER Spec #16, S-1b, Repair Permanent Range and Boundary Fence and #49, S-1, Fence Replacement).

Based on field reconnaissance and input from various entities, it is recommended that routine road maintenance such as grading, cleaning of leadout ditches and road watering where needed be conducted while BAER activities are ongoing and that roads be rehabilitated post fire suppression through construction of rolling grade dips, installation of standpipes, installation of debris racks, hardening of headwalls through the use of armoring with riprap and geotextiles, adding concrete drop inlets, and upsizing of culverts to accommodate increased runoff. In addition, sediment catchment basins should be installed in locations that will protect road fills from washing out. (BAER Spec #36, S-3, Rehabilitation and Stabilization of Pre-existing Roads).

Any specification for recommendations below are covered in other assessments.

A very critical drainage structure site is located at the junction of Pueblo Canyon drainage and Diamond Drive. A very large road fill with an 18 inch CMP with standpipe will need to be upsized and debris screened to accommodate extremely large anticipated runoff and debris flow and prevent potential breeching of the fill. Previous high precipitation has revealed the inadequacy of this CMP to handle preburn flows. An engineering study has been conducted to investigate options. This drainage crossing is vital to the community, as approximately 60% of the city population would be cut off from the rest of the city should the earthen fill fail, with the only exit being on an improved gravel and dirt road. These special circumstances will require specialized horizontal boring by the USACE through the fill to install a 6 foot diameter pipe to replace the 18 inch CMP.

Another critical road drainage crossing is located at the junction of Pajarito Canyon and NM State Highway 4 in White Rock. This crossing consists of a single 36 inch CMP with concrete headwalls on the inlets and outlets. This CMP is also greatly undersized for the projected runoff and debris flows that are anticipated in this drainage and is considered critical in that it could threaten homes in the floodplain and the highway itself should the fill fail.

Other critical culverts at great risk of overflowing and/or washing out are outlined in the attached table. All are recommended for upsizing and hardening of the inlet headwalls. Additional reconnaissance and design work needs to be conducted to mitigate the needs to these culverts and other infrastructure in the affected burn area.

Road closures and/or decommissioning of roads need to be implemented for public, T & E species and cultural resource protection. The closures of portions or FS Road # 416 and decommissioning of spur roads off FS Roads # 445 and 446 are recommended.

V. CONSULTATIONS

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Zimmerman, Kyle	County Engineer, Los Alamos County	505/662-8145

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Cerro Grand Fire

Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
1	3970125 056 378140 503	NM501_15	Water Canyon - After Canon de Valle heading North	None	24"	70'	CMP	Fair	0%	Clean	Con I/W
2	3970261.481 378219 343	no pic	Water Canyon - After Canon de Valle heading North	Inlet	36"	80'	CMP	Poor	0%	Clean	Flared inlet rusted. Flared outlet ok
3	3970376 587 378315 070	NM501_17	Water Canyon - After Canon de Valle heading North	Inlet	24"	70'	CMP	Fair		Clean & remove brush	Flared inlet w/ 3" sediment. Cannot see outlet due to cut brush
4	3970465 624 378578 542	NM501_18	Water Canyon - After Canon de Valle heading North	Inlet	24"	75'	CMP	Fair	0%	None	Con I/W
5	3970480 661 378702 728	NM501_19	Water Canyon - After Canon de Valle heading North	Inlet	24"	60'	CMP	Fair		Clean	Flared inlet w/ 3" sediment. Cannot see outlet due to 24" sediment
6	3970550 272 378887 636	NM501_20	Water Canyon - After Canon de Valle heading North	None	24"	110'	CMP	Fair		Clean. Inlet has debris & 6" sed	Flared I/O
7	3970723 762 379705 429	NM501_21 NM501_21B	Water Canyon - After Canon de Valle heading North	Inlet	18"	est 55'	CMP	Unk	100%	Clean and maybe repair	Con I/W 18" of sed @ Flared outlet
8	3970646 317 379250 590	NM501_22	Water Canyon - After Canon de Valle heading North	Inlet	24"	65'	CMP	Fair			Flared I/O
9	3970675 011 379409 837	NM501_23	Water Canyon - After Canon de Valle heading North	None	24"	110'	CMP	Poor		Clean, replace flared inlet	Flar I/I rusted, needs replaced. Cattails @I/O 12" sed
10	3970707 208 379621 595	NM501_24	Nm 501 Pajarito Canyon 9" Parshell flume & solar recorder ~ 200 US of Rd	Outlet	42"	150'	Twin CMP	Fair	0%	Clean outlets	Flared I/O on both
11	3970723 232 379732 504	NM501_25	Nm 501 Pajarito Canyon 9" Parshell flume & solar recorder ~ 200 US of Rd	outlet	12"	unk	CMP dropdown pipe	Fair	0%	Clean outlets	Drop Down for each side of #24
12	3970720 428 379707.782	NM501_26	NM 501 North of Pajarito Canyon drainage	None	24"	100'	CMP	Fair	50%		Flared I/O - Inlet has debris & 12" sediment

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Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
13	3970756 673 379931 766	NM501_27	Same	None	48"	130'	CMP	Fair		Clean	Flared I/O - OA 12" red - 12" CMP
14	3970125 056 378140 503 nm501_14-37	NM501_28	NM 501 South fork of 2 Mile Canyon	Inlet	48"	100'	CMP	Fair		Clean	Flared I/O - Inlet w/ 24 of sediment
15	3971167.334 3796556 785	NM501_29	Same	Outlet	30"	55'	CMP	Fair	10%	Clean	Flared I/O - Inlet w/ 12 sediment
16	3970261 481 378219 343	NM501_30	CMP under NM501 and old highway	I/O	48"	380'	CMP	Fair		clean	Flared I/O, inlet needs sediment & debris removal
17	3970376 587 378315 070	NM501_31	NM 501 Headwaters of 2 Mile Canyon	None	18"	Unk	CMP	Unk			Appears to drain small area next (south) of NM 501 - outlet unknown
18	3970465 624 378578 542	NM501_32	NM 501 Headwaters of 2 Mile Canyon	None	36"	160'	CMP	Fair		Clean and place trash rack	Flared I/O, Con HW, Flared inlet floor rusted, rebar trash rack laying off to side
19	3970480 861 378702 728	NM501_33 NM501_33B	NM 501 Headwaters of 2 Mile Canyon	Outlet	24"	60'	CMP	Unk	100%	Clean	Con HW - Inlet has 24 of sediment, Flared Outlet 18" of sediment
20	3970550 272 378887 636	NM501_34	NM 501 Headwaters of 2 Mile Canyon	Guardrail on South side	24"	70'	CMP	Fair		Clean	Con HW, need sediment removal above inlet, 12" sediment at Flared outlet
21	3970640 841 379115 259	NM501_35	NM 501 Headwaters of 2 Mile Canyon	Inlet	24"	70'	CMP	Fair			Con HW on inlet with rebar trash rack, Flared outlet
22	3970646 317 379250 590	NM501_36	NM 501 Headwaters of 2 Mile Canyon	Inlet	36"	130'	CMP	Fair		—	Flared I/O, inlet with rebar trash rack
23	3970756 673 379931 766	NM501_37	Last culvert before Los Alamos near West Road	Inlet	24"	80'	CMP	Fair			Con HW on inlet New spiral ext ~ 10' long @ outlet
38	3971243 049 379719 302	LA-1 jpg	Los Alamos Canyon		18'	41'	Other	Good	0%	Clean	Low H2o X-ing
39	3971416 798 378552 557	LA_2 jpg	Los Alamos Canyon		24"	40'	CMP	Fair	5%	Repair	Hole in Center
40	3971349.190 378653 130	LA-_3 jpg	Los Alamos Canyon		18"	30'	CMP	Good	0%		Brush

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Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
41	3971234 956 378990 518	A_4 jpg	Los Alamos Canyon		18"	30'	CMP	Good	0%		None
42	3971139 364 379407 006	A_5 jpg	Los Alamos Canyon		18"	30'	CMP	Good	0%		None
43	3971307 029 379907 624	A_6 jpg A_6a jpg	Los Alamos Canyon		48"	48'	Concrete	Fair	35%	Clean	Rock Mason HW inlet
44	3971299 429 380323 978	A_7 jpg A_7a jpg	Los Alamos Canyon		42"	51"x40'	CMP	Fair	0%		3'x 12' Gabion add 4 type 2 OM
45	3971267 000 380403 024	A_8 jpg	Los Alamos Canyon		53"x42"	40	CMP	Fair	0%		None
46	3791219 771 381301 367	A_9 jpg	Los Alamos Canyon		24"	40'	CMP	Fair	75%	Clean	45° Elbow Inlet
47	39711687 950 381582 642	A_10 jpg A_10a jpg	Los Alamos Canyon		9'x3'	40'	CBC	Good	0%		Wingwall Gabions inlet 10'x3' and 12'x3'
48	3970997 326 381990 722	A_11 jpg A_11a jpg	Los Alamos Canyon		9'x3'	40'	CBC	Good	10%	Clean	Wingwall Gabions I/O
49	3966235 765 375417 421 2419a	AmSpr_1	American Spring		24"	50'	CMP	Fair	75%	Clean	CLEAN OUTLET
50	3966336 464 375385 247	AmSpr_2	American Spring		24"	30'	CMP	Fair	0%		1' SOIL COVER
51	3966493 615 375282 139	AmSpr_3	American Spring		24"	30'	CMP	Fair	0%	Clean	CLEAN OUTLET
52	3966676 538 375229 804	AmSpr_4	American Spring		24"	30'	CMP	Fair	0%	Clean	CLEAN OUTLET
53	3966783 841 375182 899	AmSpr_5	American Spring		24"	34'	CMP	Fair	0%		DENT - TOP OF O/L
54	3966930 979 375094 493	AmSpr_6	American Spring		24"	30'	CMP	Fair	0%		NONE
55	3967163 133 375149 868	AmSpr_7	American Spring		24"	28'	CMP	Fair	10%	Clean	CLEAN OUTLET, HSIDE I/L
56	3967281 073 375090 719	AmSpr_8	American Spring		24"	26'	CMP	Fair	10%	Clean	CLEAN OUTLET, HSIDE I/L
57	3967319 050 374938 834	AmSpr_9	American Spring		24"	26'	CMP	Fair	0%		HSIDE INLET
58	3967345 581 374818 715	AmSpr_10	American Spring		24"	40'	CMP	Fair	0%		MINOR DET ON I/L
59	3967390 971 374792 844	AmSpr_11	American Spring		36"	70'	CMP	Fair	15%	Clean	CLEAN O/L, HEAD OF H20 CNYN
60	3967411 032 374890 990	AmSpr_12	American Spring		24"	37'	CMP	Fair	0%		HSIDE INLET

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Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
61	3967422 310 374927 075	AmSpr_13	American Spring		24"	40'	CMP	Fair	10%	Clean	COVERED O/L H/SIDE I/L
62	3967831 363 375129 304	AmSpr_14	American Spring		24"	26'	CMP	Fair	0%		H/SIDE I/L
63	3967690 512 375221 917	AmSpr_15	American Spring		24"	31'	CMP	Fair	0%		DENT ON O/L H/SIDE I/L
64	3967952 899 375605 315	AmSpr_16	American Spring		24"	30'	CMP	Fair	0%		H/SIDE I/L
65	3972534 100 379940 301	Pueblo_1	Pueblo Canyon		60	86'	CMP	Good	0%	Clean	Flared O/L, Lg rock riprap on both
65	3972534 100 379940 301	Pueblo_1	Pueblo Canyon		60	86'	CMP	Good	0%	Clean	Flared O/L, Lg rock riprap on both
66	3972482 203 380435 940	Pueblo_2	Pueblo Canyon		36"	160'	Concrete	Good	0%	Clean	Down strm channel presently being cleared
66	3972482 203 380435 940	Pueblo_2	Pueblo Canyon		36"	160'	Concrete	Good	0%	Clean	Down strm channel presently being cleared
67	3972346 944 380685 074	Pueblo_3	Pueblo Canyon		48"	204'	Concrete	Fair	3%	Clean	134' Con elbows & K ties to 70' of 48" CMP Blkd
67	3972346 944 380685 074	Pueblo_3	Pueblo Canyon		48"	204'	Concrete	Fair	3%	Clean	134' Con elbows & K ties to 70' of 48" CMP Blkd
68	3972453 445 380917 556	Pueblo_4	Pueblo Canyon @ Diamond Drive		18"	?	CMP	Good	0%		18" slotted riser,
68	3972453 445 380917.556	Pueblo_4	Pueblo Canyon @ Diamond Drive		18"	?	CMP	Good	0%		18" slotted riser,
69	3970498 287 378516 718 2500a	SkiRun_1	Ski Run Rd - Pajarito		48"	56'	CMP	Good	10%	Clean	Flared I/O, O/L + H/SIDE
70	3970680 320 378636 526	SkiRun_2	Ski Run Rd - Pajarito		19"	40'	CMP	Fair	10%	Clean	H/SIDE R/OFF CLN O/L
71	3970706 403 378667.320	SkiRun_3	Ski Run Rd - Pajarito		24"	57'	CMP	Fair	0%	Clean	7' CMP ATCH TO 50' RCP
72	3970733 118 378712 079 5215a	SkiRun_4	Ski Run Rd - Pajarito		18"	42'	Concrete	Fair	0%	Clean	H/SIDE R/OFF ROCK I/W
73	3970889 328 378677.309	SkiRun_5	Ski Run Rd - Pajarito		36"	62'	CMP	Fair	0%		H/SIDE R/OFF
74	3971075 842 378756 499	SkiRun_6	Ski Run Rd - Pajarito		12"	60'	CMP	Poor	30%	Replace	RUSTED - DENTED I/L

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Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
75	3971370 454 377811 997	SkiRun_5	Ski Run Rd - Pajarito near access road		18"	24'	CMP	Fair	65%	Clean	DAMAGED I/L
76	3971391 019 377654 450	SkiRun_6	Ski Run Rd - Pajarito		18"	24'	CMP	Fair	0%		ACCESS RD CULVERT
77	3971213 685 377520 530	SkiRun_7 SkiRun_7a	Ski Run Rd - Pajarito		18"	30'	CMP	Poor	50%	Replace	DAMAGED I/O, INSIDE
78	3971129 537 377428 456	SkiRun_8	Ski Run Rd - Pajarito		12"	32'	CMP	Fair	0%		H/SIDE RD/SIDE R/OFF
79	3971038 348 377297 942	SkiRun_9 SkiRun_9a	Ski Run Rd - Pajarito		18"	45'	CMP	Fair	0%		RD/SIDE R/OFF
80	3971062 688 377192 053	SkiRun_10	Ski Run Rd - Pajarito		18"	62'	CMP	Good	0%		BEND INSIDE PIPE, RD/SIDE R/O ROCK HW
81	3971295 160 377094 245	SkiRun_11	Ski Run Rd - Pajarito		18"	41'	CMP	Fair	0%		RD/S R/OFF - MINOR DENT I/L
82	3971560 013 376934 400	SkiRun_12	Ski Run Rd - Pajarito		18"	24'	CMP	Fair	90%	Clean	I/L BLKD, RD/SIDE R/OFF
83	3971597.142 376883 682	SkiRun_13	Ski Run Rd - Pajarito		18"	23'	CMP	Fair	85%	Clean	DENT I/O, RD/SIDE ACS RD CLVT
84	3971755 468 376634 458	SkiRun_14 SkiRun_14a	Ski Run Rd - Pajarito		18"	45'	CMP	Poor	0%	Replace	DENTED I/L, H/SIDE R/O RUST I/S PIPE
85	3971899 446 376601 363	SkiRun_15	Ski Run Rd - Pajarito		18"	36'	CMP	Fair	0%		H/W I/L, H/SIDE R/O
86	3972075 116 376624 803	SkiRun_16	Ski Run Rd - Pajarito	REPL	12"	44'	CMP	Fair	0%		H/S RD/S R/O ROCK HW
87	3972169 405 376538 449	SkiRun_17	Ski Run Rd - Pajarito	REPL	18"	38'	CMP	Fair	0%		CON H/W, RD/S R/O
88	3972426 364 376296 753	SkiRun_18	Ski Run Rd - Pajarito	REPL	18"	38'	CMP	Fair	45%		ROCK H/W RD/S R/O I/L DENTED
89	3972389 840 375878 003	SkiRun_19	Ski Run Rd - Pajarito	REPL	24"	54'	CMP	Fair	0%		S/M CNYN, RD/SIDE R/O 24"O/L
90	3972549 698 375872 760	SkiRun_20	Ski Run Rd - Pajarito		24"	30'	CMP	Fair	0%		H/SIDE RD/SIDE R/OFF CON H/W
91	3972671 052 375827 257	SkiRun_21	Ski Run Rd - Pajarito		15"	38'	CMP	Fair	30%		CON H/W, RD/S R/O
92	3972670 182 375599 860	SkiRun_22	Ski Run Rd - Pajarito	REPL	24"	36'	CMP	Fair	15%	Clean	DAMAGED I/L ROCK H/W RD/S R/O
93	3972675 896 375426 389	SkiRun_23	Ski Run Rd - Pajarito		18"	42'	CMP	Good	20%	Clean	CON H/W, RD/S R/O
94	3972674 895 375334 813	SkiRun_24	Ski Run Rd - Pajarito	REPL	18"	36'	CMP	Fair	15%	Clean	DAMAGE I/L CON H/W RD/

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Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
95	3972784 218 375060 330	SkiRun_25	Ski Run Rd - Pajarito		24"	36'	CMP	Fair	0%	Clean	DENTED H, H/S R/OFF
96	3972887 883 374724 878	SkiRun_26	Ski Run Rd - Pajarito		18"	160'	CMP	Fair	0%		32" RISER O/L UNK
97	3973221 175 374085 379	SkiRun_27	Ski Run Rd - Pajarito		12"	83'	CMP	Fair	50%	Clean	RD/SIDE CLVT - CON HW
98	3973242 510 374036 153	SkiRun_28	Ski Run Rd - Pajarito	REPL	24"	35'	CMP	Good	65%	Clean	RD/H/SIDE R/OFF
99											
100											
101											
102											
103											
104											
105											
106	3966341 838 377158 144 nm501-1-15	NM501_1 NM501B	Water Canyon - Begin @ NM 4 on NM 501	None	24"	128'	CMP	Poor	100%	Repair, reattach flared inlet, clean	Flared inlet damaged (burned) removed from culvert
107	3966385 251 377173 792	NM501_2	Water Canyon - Begin @ NM 4 on NM 501	None	36"	100'	CMP	Poor	50%	24" sediment needs cleaning @ outlet	Flared inlet Burned - still intact ~15' fill inlet /outlet
108	396662 641 377251 253	NM501_3	Water Canyon - Begin @ NM 4 on NM 501	Inlet	36"	130'	CMP	Fair	0%		Con Headwall, Flared metal outlet
109	3966756 483 377279 335	NM501_4	Water Canyon - Begin @ NM 4 on NM 501	None	36"	110'	CMP	Fair		Minor erosion, need rock riprap	flared inlet burned, flared outlet minor erosion need rock riprap
110	3966901 320 377319 901	NM501_5	Water Canyon - Begin @ NM 4 on NM 501	None	24"	100'	CMP	Fair		Needs riprap	Flared outlet burned erosion below outlet, needs riprap
111	3967082 099 377334 081	NM501_6 no O/L pic	Water Canyon - Begin @ NM 4 on NM 501	Inlet	Unk	est 70'	Unk	Unk	100%	Buried	Concrete Headwalls at I/O
112	3967263 126 377357 578	NM501_7	Water Canyon - Begin @ NM 4 on NM 501	I/O	18"	56'	CMP	Poor		Clean	Formed Reinforced Concrete Headwall I/O, Flared Outlet
113	3967412 921 377415 269	NM501_8	Water Canyon - Begin @ NM 4 on NM 501	I/O	24"	75'	CMP	Fair		Clean	Flared Inlet 6" sediment, Flared outlet 12" sediment
114	3967461.151 377442 404	NM501_9 NM501_9B	Water Canyon - Begin @ NM 4 on NM 501	None	Unk	est 70'	? CMP	Unk	100%	Clean	Concrete Headwalls @ inlet, flared outlet

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Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
115	3967576 143 377496 292	NM501_11	Water Canyon - Begin @ NM 4 on NM 501	None	24"	70'	CMP	Fair	50%	Clean	Flared Inlet 3" sediment, Flared outlet ok ~ minor rust
116	3967779 330 377626 031	NM501_12 NM501_12B	Water Canyon - Begin @ NM 4 on NM 501	None	24"	60'	CMP	Good	100%	Clean	Concrete Headwall @ inlet
117	3967949 931 377754 758	NM501_13	Water Canyon - Begin @ NM 4 on NM 501	Inlet	36"	60'	CMP	Fair	0%		Concrete Headwall @ inlet, flared outlet
118	3968130 561 377793 698	NM501_14	Canon de Valle	Inlet	36"	90'	CMP	Fair	0%		Flared I/O
119											
120											
121											
122											
123	3981146 363 389442 663 2517a	SantaClara_1	Santa Clara Canyon/Sawyer Canyon		48	72	cmp	good		25%	
124	3982627 218 386352 784 2518a	Santaclara_2	Santa Clara Canyon		48	72	CMP	good		10%	
125	62518a	SantaClara_3	Santa Clara Canyon		36	62	cmp	good		0%	
126	3983076 211 386212 499 62519a	SantaClara_4	Santa Clara Canyon		36	66	CMP	good		0%	
127	3983193 192 386184 964 62519b	SantaClara_5	Santa Clara Canyon		30	44	cmp	good		25%	down stream blockage
128	3983370 502 386104 079 62519b	SantaClara_6	Santa Clara Canyon		24	40	CMP	good		0%	ends are damaged up stream and down stream
129	3983755 467 385905 997 62519c	SantaClara_7	Santa Clara Canyon		48	78	CMP	good		0%	needs rip rap
130	3984603 231 385520 115 2519e	SantaClara_8	Santa Clara Canyon		36	90	CMP	good		0%	needs rip rap
131	3984835 629 385341 079 62519f	SantaClara_9	Santa Clara Canyon road crossing santa clara creek		60	160	dual cmp	good		0%	
132	3982167 673 386599 657 2520b	SantaClara_10	Santa Clara Canyon		24	55	CMP	good		0%	

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Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
133	3982053 634 386717 846 2520c	SantaClara_11	Santa Clara Canyon		24	62	CMP	good		0%	needs rip rap down stream
134	3982011 906 386789 608 2520d	SantaClara_12	Santa Clara Canyon		36	61	CMP	good		33%	inlet blockage needs rip rap
135	3982011 906 386789 608 2520d	SantaClara_13	Santa Clara Canyon		30	62	CMP	good		30%	blockage down stream
136	3982392 997 386409 958 2617a	SantaClara_14	Santa Clara Canyon		30	49	CMP	good		25%	blockage up stream need rip rap down stream
137	33981760 992 387764 112 2617a	SantaClara_15	Santa Clara Canyon		36	67	CMP	good		15%	blockage up stream need rip rap down stream
138	3981719 004 387853 203 2617a	SantaClara_16	Santa Clara Canyon		24	58	CMP	good		0%	4' vehicle drop down stream, needs rip rap
139	3981620 652 387986 484 2617a	SantaClara_17	Santa Clara Canyon		30	51	CMP	good		0%	4' rock and morter headwall
140	3981206 672 388585 176 2617a	SantaClara_18	Santa Clara Canyon		30	50	CMP	good		30%	blockage down stream
142	3979229 005 385609 765 2716a	FS446-1	Forest Road 446		24	48	CMP	good		20%	object markers down
143	3979375 663 385677.944	FF446-2	Forest Road 446		24	28	CMP	good		50%	needs object marker
144	3979602 656 385710 128	FS446-2	Forest Road 446		48	60	CMP	good		15%	blockage down stream, need object marker
145	No Position 52719a	FF446-3	Forest Road 446		24	40	CMP	good		30%	need object marker
146	3979261 555 385521 506	FS446-3	Forest Road 446		30	55	CMP	good		0%	need object marker
147	3979350 347 385527.078	FF446-4	Forest Road 446		24	48	CMP	good		0%	no object markers
148	3979396 802 385457.119	FS446 4	Forest Road 446		24	28	CMP	good		25%	
149	3979390.424 385332 859	FF446-5	Forest Road 446		24	28	CMP	good		0%	

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Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
150	3979356 295 385167 696	FS446 5	Forest Road 446		24	38	CMP	good		0%	
151	No Position 52719a	FF446 6	Forest Road 446		24	32	CMP	good		0%	
152	3979290 582 384966 207	FS446 6	Forest Road 446		24	43	CMP	good		0%	
153	3979254 204 384834 178	FF446 7	Forest Road 446		24	32	CMP	good		70%	
154	3979137 573 384782 097	FS446 7	Forest Road 446		24	27	CMP	good		50%	need one object marker
155	3979097 533 384759 306	FF446 8	Forest Road 446		24	33	CMP	good		50%	
156	3979049 330 384715 439	FS446 8	Forest Road 446		24	30	CMP	good		0%	
157	3979027 860 384676 919	FF446 9	Forest Road 446		24	34	CMP	good		0%	needs one object marker
158											
159											
160											
161	3975345 627 388679 680 52722a	Guaje-1	Guaje Canyon	Road 416	25	50	concrete	good		0	low water crossing with wire bound rip rap
162	3974847.725 389268 360	Guaje-2	Guaje Canyon	Road 416	12	50	concrete	good		0	2' verticle drop down slope
163	3969982 822 3915015 168 1914 090 2723a	Pueblo NM502	Pueblo Canyon @ NM 502	yes	(2) 10' (ft)	240'	CMP	Good	0%	None	3'x1" CMP 2 11 slope Con I MV
163	3963687 980 388706 740 52800a	Portillo-1	Portillo Canyon	Hwy 4	32	32X4	Concrete box	good	South port 100% blocked	100	Both input and outlet have 10' apron
164	3969753 471 390214 266 1941 492	LA_Cnyn Hwy4	Los Alamos Canyon @ Hwy 4	yes	(2) 10'	200'	CMP	Good	0%	Clean	Rem brush upstream 12" sed in both culverts
164	3964583 106 389600 420 52800b	Pajarito-1	Pajarito Canyon		36	50	CMP	good	weeds inlet and outlet	0	up stream and down stream cone slope.
165	3966972 497 390618 288 1964 889	Mort_Cnyn Hwy4	Mortendad Canyon @ Hwy - 4	yes	(3) 6' x 6'	60'	Concrete	Fair	33%	Clean	2' clearance to sed

Cerro Grand .

Culvert Table

Rpt #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
165	3964667.921 389609.168	Pajarito 2	Pajarito Canyon		30	20	Dual CMP	good	channel restricted, up stream 18X5, down stream 12X'	50	Concrete head wall up stream and down stream
171	3968440.709 389685.527 1971.742 2816a	Buey1	Sandia Canyon @ Hwy 4	yes	(2) 6' x 6'	50'	Concrete	Poor	0%	Repair	Con spalling @ I.L & rebar showing
172	3965245.473 390583.699 1953.681	Buey2	Buey Canyon @ Hwy 4 in White Rock	yes	(2) 8' x 7	110'	Concrete	Fair	50%	Clean & remove D/S debris of soil & debris	Homeless home & debris blocking culvert
173	3965193.976 390876.782 1941.710	Buey3	Buey Canyon @ Bonnie View X-ing White Rock	yes	(2) 6'x2'	55'	Concrete box	Fair	33%	Clean	Can't see floor 4' clearance to sediment
174	3965182.904 390993.111 1940.373m	Buey4	Buey Canyon @ Park Lane X-ing White Rock	yes	(2) 6' x 3'	55'	Concrete Box	Fair	20%	Clean	DS Channel cap reduced by soil & veg
175	3965172.026 391054.030 1931.482m	Buey5	Buey Canyon @ Apt (no street name) White Rock		(2) 7'	90'	CMP	Good	0%	Remove vegetation D/S	New Condition, Riprap D/S
176	3965155.413 391171.611 1931.433m	Buey6	Buey Canyon @ Rover St X-ing White Rock		(2) 7'	110'	CMP	Good		Clean	1" Sed on floor
177	3965094.794 391874.614 1919.426m	Buey7	Buey Canyon @ Lejano St Ped X-ing White Rock		(3) 13' x 7'		Arch Stlcor base	Fair		Clean	Con I/W O/L
179	3965082.064 392300.952 1917.250	Buey8	Buey Canyon @ Meadow Rd X-ing White Rock		(2) 13' x 8'		Arch Stlcor base	Good	0%	Clean	4' I/W over I/L
180	3964177.395 390584.689 1953.643	pajarito9	Pajarito Canyon @ Sherwood Rd Xing White Rock		7'	125'	CMP	Good	20%	Clean Riprap in culvert	Broke concrete riprap in I/L 2:1 I/L Slope
181	3963306.782 387268.321 1971.194	water_10	Water Canyon @ Hwy 4		15'	180'	CMP	Good	0%	Clean	Tree growing @ I/L needs to be removed
182	3961164.682 385934.502 1923.426	ancho_11a ancho_11b	Ancho Canyon @ Hwy 4		8'x8'	160'	Concrete box	Good	0%		1' sed @ O/L

Cerro Grand

Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
R1	3974422 966 382420 457 7619a	Rendja_1	Rendja Canyon		18	40	CMP	good		100%	blockage up stream
R10	3974462 957 386922 989	Rendja_10	Rendja Canyon		20	100	concrete	good		0%	low water crossing to north
R11	3974499 767 387176 546	Rendja_11	Rendja Canyon		20	105	concrete	good		0%	low water crossing to south
R12	3974574 856 387897.127	Rendja_12	Rendja Canyon		20	60	concrete	good		0%	low water crossing to north
R13	3974600 514 388546 571	Rendja_13	Rendja Canyon		20	80	concrete	good		0%	low water crossing to south
R14	3974578 218 388793 968	Rendja_14	Rendja Canyon		20	45	concrete	good		0%	low water crossing to north
R15	3974640 455 389009 455	Rendja_15	Rendja Canyon		20	110	concrete	good		0%	low water crossing to south
R16	3974629 419 389117 945	Rendja_16	Rendja Canyon		15	17	dirt	good		100%	low water crossing with 15" CMP
R17	3974629 419 389117 945	Rendja_17	Rendja Canyon		18	27	dirt	good		100%	low water crossing with 15" CMP
R2	3974424 966 382630 457	Rendja_2	Rendja Canyon		72	60	CMP	good		0%	Sewer pump station 70' up stream, on South bank
R3	3974172 880 382283 225	Rendja_3	Rendja Canyon	South of Aspen Dr. and Sumac Ln	24	100	CMP	fair	75% blockage down stream	25%	Tributary, 25% blockage up stream
R4	3974575 656 385929 651	Rendja_4	Rendja Canyon		18	40	concrete	good		0%	low water crossing to south
R5	3974573 656 385929 651	Rendja_5	Rendja Canyon		20	50	concrete	good		0%	low water crossing to north
R6	3974448 187 386448 064	Rendja_6	Rendja Canyon		20	63	concrete	good		0%	low water crossing to south
R7	3974553 546 3866002 704	Rendja_7	Rendja Canyon		20	45	concrete	good		0%	low water crossing to the south
R8	3974533 573 386628 577	Rendja_8	Rendja Canyon		20	90	concrete	good		0%	low water crossing to north
R9	3974537 680 386838 050	Rendja_9	Rendja Canyon		20	60	concrete	good		0%	low water crossing to south
S1	No Position	School_1	School Canyon		64	132	oval cmp	good		0	bottom rusted out large rock rigging

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Cerro Grand

Culvert Table

Ref #	UTM	Picture File	General Location	Road Marker	DIA	Length	Type	Cond	Blockage	Action/ Treatment	Notes
S2	3973609 992 380593 817 3120a	School_2	School Canyon	North and Arkansas	20	120	bridge	good		0	Bridge over canyon
S3	3973130 176 380542 614 3119a	School_3	School Canyon	on North d at school	30	42	CMP	good		0	4X4 head wall con ink rock and morter channel
S4	3973128 892 380589 611 3119b	School_4	School Canyon		24	30	CMP	good		75	Concrete head wall up stream and down stream
S5	3973309 387 380771905 3120e	School_5	School Canyon	Near Baptist church on Diamond	30	approx 200	Dual CMP	good		0	
S6	3973457 376 381308 824 3120d	School_6	School Canyon		30	approx 300	CMP	good	has been cleaned	0	18' slotted riser removed
S7	3973644 323 380339 031 3120c	School_7	School Canyon	45th and Arizona	48	62	Dual CMP	fair		0	12X3 5 concrete head walls
S8	3973752 960 380409 423 3120b	School_8	School Canyon	45th and Arkansas	52x80	130	Dual Arch CMP	good		0	14X39 Up stream and down stream
S9	3973495 819 381175 031 3120f	School_9	School Canyon		30	154	CMP	good	flared outlet with wooden head walls	10	5x4 concrete head wall
S10	3973620 921 380561 296 3122a		Walnut Canyon	Walnut canyon at Diamond	30	300	CMP	fair		0	Maze of Drainage pipes
S11	3973651 619 382192 227 3121a		Rendija Canyon tributary	Club Road	52	190	oval cmp	good		0	4' line though pipe, pumping station appros 100' South
S12	3973568 553 382552 337 3121c		Rendija Canyon tributary	Range Road	30	110	CMP	good		0	
S13	3973304 038 382817 694 3121b		Rendija Canyon tributary	Under Diamond Dr	24	250	CMP	good		0	Inlet flared

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

SOIL AND WATERSHED RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess overall watershed changes from the fire, particularly those that pose substantial threats to human life, property, and critical natural and cultural resources. This includes evaluating changes to soil productivity, hydrologic function, and watershed response to precipitation events.
- Identify the most critical soil and watershed areas and issues related to the Cerro Grande Fire based on increased flood potential, loss of soil resources, and the wildland-urban interface, and prescribe treatments to mitigate impacts and risks.
- Develop maps of watershed burn severity, soil loss, and areas to be treated.
- Estimate potential flooding in Los Alamos Canyon, Pueblo Canyon, Pajarito Canyon, and Two-Mile Canyon.
- Assess potential erosion from headwaters and channels in severely burned watersheds.
- Assess fire-related runoff and sedimentation on forest service and tribal lands and interface with NRCS, County, and State Highway and Transportation Department for downstream risks.
- Assess flows released to LANL facilities TA-2, TA-18 and TA-41.
- Assist archaeologists with mitigating surface flow around burned archaeological sites.
- Identify future assessment or analysis needs.

II. ISSUES

- Greatly increased potential for storm flow runoff and flooding, particularly in watersheds with a large percentage of high burn severity.
- Threats to human life and property from floods, dam or embankment breach, and debris flows in burned watersheds (see Watershed Vulnerability Map in appendix).
- Threats to infrastructure and waste/contaminant sites (LANL) in canyons subject to fire-related floods and debris flows.
- Threats to vegetative productivity in moderately to severely burned areas due to loss of ash, soil, and other nutrients.
- Threat of large-scale erosion of headwaters and canyon bottoms in burned watersheds.
- Threats to water quality, specifically from sedimentation and contaminants, in the lower reaches of burned watersheds.

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- Perturbation reaction (geologic correction) resulting in long-term channel adjustment.
- Threat of an ecological type conversion.
- Threats to archeological sites from overland runoff in burned watersheds.
- Treatment limitations for flood protection.

III. OBSERVATIONS

The Wildland-Urban Interface: The geographic location of the Cerro Grande Fire includes the eastern flank of the Jemez Mountains and the western half of the Pajarito Plateau. The townsite of Los Alamos and the Los Alamos National Laboratory (LANL) are situated on the Plateau at the base of the headwater basins draining from the Jemez Mountains. The fire directly affected portions of both.
The proximity of Los Alamos and LANL to these headwater basins defines a wildland-urban interface with greatly increased potential for storm flow and flooding, particularly in watersheds with a large percentage of high burn severity and that will have short reaction time between rainfall and stormflow runoff. More distant communities that may also be affected by post-fire hydrologic events include the nearby community of White Rock, and inhabited portions of the Santa Clara Pueblo and the San Ildefonso Pueblo.

A. Background

Long-term fire history of the Cerro Grande Fire area, and hydrologic/geomorphic implications: Landscape-scale patterns of runoff and erosion are sensitive to changes in vegetation cover, which in turn responds to land use practices such as livestock grazing and fire suppression. Paleoecological research provides long-term evidence that extensive portions of the Cerro Grande Fire area have undergone ecological changes over the past century that substantially increase the risk of markedly accelerated runoff and erosion processes after this fire. This is particularly evident from ponderosa pine dominated forests that burned severely and extensively, in large degree because these forests have changed the most. A local network of dendrochronologically dated fire-scar chronologies documents patterns of frequent and extensive fire in these forests over at least the past 300-500 years (Allen 1989, Touchan et al. 1996, Swetnam and Baisan 1996, Allen et al. 1996, Morino, et al. 1998, Swetnam et al. 1999). The fire scar chronologies indicate that the mean intervals between widespread surface fires averaged 7-15 years in pine-dominated forests for at least the past several centuries; mean fire return intervals of less than 10 years were found in settings as varied as the floodplain of upper Frijoles Canyon to the southerly-aspect slopes of Pajarito Mountain at 9600 feet in elevation. These extensive, low-intensity surface fires maintained open forests with understones dominated by grasses that fueled the frequent fires while maintaining perennial vegetation cover on the burned watersheds. These conditions did not support crown fire behavior in pine forests, although mixed fire regimes of surface fires and patchy crown fires characterized mesic mixed-conifer and spruce-fir forests at higher elevations (Touchan et al. 1996). More generally, abundant charcoal in sediments from nearby Alamo Bog in the central Jemez Mountains indicates essentially continuous fire activity extending back at least 8000 years ago (Brunner-Jass 1999), suggesting that these basic fire regimes have been persistent throughout the Holocene; this view is supported by paleoecological data from elsewhere in the Southwest (Anderson 1989, Weng and Jackson 1999).

However, the fire-scar and Alamo Bog records show that spreading surface fires ceased throughout the Jemez Mountains in the late 1800s due to land use histories of livestock grazing and fire suppression. For example, fire scar chronologies suggest that these

fires ceased after 1875 on the upper slopes of Pajarito Mountain, 1883 in the Pueblo Canyon watershed, and 1892 in upper Quemazon Canyon. Overgrazing by livestock apparently reduced the grassy fuels so that fires no longer could spread widely, markedly enhancing the ability of young trees to become established and grow in the absence of grass competition to tree seedlings (cf. Madany and West 1983) and the thinning effects of fire. As a result there have been extraordinary increases in the density of young trees in these forests that have come at the expense of the formerly herbaceous understories (Covington and Moore 1994, Allen 1998). As tree densities increased from approximately 100 stems/acre to approximately 1000 stems/acre, the ground cover changed from perennial herbaceous plants to thick blankets of needle litter, and laddered woody fuel loads increased markedly. These changes in stand structure provided conditions suitable to support the extensive crown fire behavior of the Cerro Grande Fire.

These recent changes in ponderosa pine vegetation patterns, and the associated severity and extensiveness of current crown fire behavior, are likely unprecedented at millennial time scales and outside the historic range of variability for these ponderosa pine forests (Swetnam et al. 1999). Consequently, it is logical to expect that a variety of hydrological, geomorphic, and ecological patterns and processes may have changed from long-term conditions in concert with these major changes in vegetation and fire disturbance.

One of these changes observed in the headwater basins is the obliteration of first-order, and in some cases second-order, stream channels. Increasingly dense forests on the hillslopes retain sediment and decrease available water for surface runoff. The result is a decrease in channel flushing and gradual filling with sediment. With the loss of forest following the fire, this channel-filling sediment becomes available for erosion. In short, the headwater basins have been on a sediment "binge" for at least 120 years. The stage is now set for a "purge" cycle.

Potentially anomalous hydrologic and geomorphic responses from severely burned ponderosa pine watersheds may include:

- increased flood magnitudes and substantial channel incision of some reaches(cf. Veenhuis 1998);
- extensive sheet and rill erosion;
- possibility of slope failures on some devegetated canyon walls; and
- mobilization of large-diameter rock from hillslopes and channels.

Probable ecological implications include:

- decline in site productivity due to oxidation of soil nutrients during the fire and soil loss following the fire;
- long-term conversion of some forest sites to persistent shrub cover;
- slow recovery of forest cover due to elimination of local seed sources in large severely-burned patches, with increased microclimatic harshness of exposed ground; and
- short and long-term impacts to Jemez Mountains salamander populations

Geology / Physiography: The Cerro Grande Fire occurred in the Sierra de los Valles on the eastern flank of the Jemez Mountains and on the western side of the Pajarito Plateau, within the Jemez volcanic field. Elevations of the burn area range from approximately 6400 feet (1950 m) above mean sea level (amsl) to 10,300 feet (3140 m) amsl. All burned watersheds drain eastward to the Rio Grande upstream of Cochiti Reservoir. The Sierra de los Valles contains the headwaters of most burned watersheds, and is dominated by steep rugged terrain underlain by dacitic rocks of the Miocene-Pliocene Tschicoma Formation. The Pajarito Plateau consists of gently sloping mesas

and steep-sided canyons underlain by the early Pleistocene Bandelier Tuff, which contains both welded tuff that is resistant to erosion and forms cliffs, and non-welded tuff that is easily eroded. Pumice beds of the early Pleistocene Cerro Toledo Rhyolite locally occur between the upper and lower members of the Bandelier Tuff and are also easily eroded. In the northeastern part of the Cerro Grande Fire are exposures of the Pliocene Puye Formation, a thick fanglomerate that includes boulder-rich debris flow deposits, fluvial deposits, and tuffs. Fine-grained sedimentary rocks of the Miocene Santa Fe Group occur in a small part of the burn area along Santa Clara Canyon. Canyon bottoms are underlain by alluvium that ranges in thickness from less than 1 m to greater than 10 m. Pleistocene and Holocene stream terraces occur along some canyons, and colluvial deposits mantle many slopes. Mesa tops are locally overlain by erodible eolian or reworked eolian deposits and by pumice beds. Rock units in the area are shown on the map by Smith, et al. (1970), and Bailey, et al. (1969) and provide brief discussions of these units. Surficial geologic units and soils found in portions of the burn area are discussed by Reneau and McDonald (1996).

Soils: Soils form the basis of the terrestrial ecosystems that are found in the burned area. The soils on the east side of the Jemez are generally deep and coarse textured. Surfaces are typically sandy loam, and the subsoil is influenced by the volcanic tuff parent material. Soil orders are inceptisols and entisols, with alfisols in the higher portion of the watershed. Soil characteristics important to hydrologic assessment include infiltration and percolation. Pre-fire condition generally supported a thick duff layer (hemic, sapric, and fibric) under a nearly complete canopy.

Fires are a natural part of the ecosystems in the burned area and produce impacts to the soil. Soil condition and hydrologic function are important components to healthy ecosystems that can be affected by wildfires. The Cerro Grande Fire is outside the range of natural fire behavior (Touchan & Swetnam 1995, Allen 2000) and has the potential to impact the soil beyond the limits of natural variability, including reduced soil aggregate stability, reduced permeability, increased runoff and erosion, and reduced organic matter/nutrient status.

The dominant soils in the burned area are derived from volcanic parent materials (predominantly welded tuff, dacite, and rhyolite) and are moderately deep to shallow on side slopes and deep on footslopes. They typically have surface textures of fine sandy loam and gravelly fine sandy loam, with surface coarse fragments ranging from 5 to 40 percent gravels, cobbles or stones. Some soils on older surfaces and higher elevation sites have clay loam texture subsoils. The erosion hazard for these soils is high to very high when soil cover is removed.

Complete descriptions of the soils in the burned area are found in the following documents: Terrestrial Ecosystem Survey of the Santa Fe National Forest (USFS 1991), Soil Survey of Santa Fe Area, New Mexico; Santa Fe and Part of Rio Arriba County (NRCS, 1975), Soils of Bandelier National Monument (DOI NPS, 19XX), and Soil Survey of Los Alamos County, New Mexico (Los Alamos Scientific Laboratory, 1978). The fire area includes a series of landforms in the landscape going from lower elevation alluvial stream deposits, to dissected piedmont plains, to moderately sloping foothills, to mid-elevation mountain slopes, and ending in sub-alpine basins and ridges. Table 1 gives a general description of the landscape settings in the fire area.

Table 1: Landscape Characteristics (landforms, vegetation, soils) of the Cerro Grande Fire Area.

Landforms / Vegetation	Representative Soil Sub-groups	Parent Material	Slope Range	% of Area	Natural Erosion Hazard Rating
Valley Bottom, Terraces / Grass/Shrub	Ustifluvents Haplargnds	Alluvium	2-15%	21%	Moderate - High
Dissected Piedmont Plains / Pinyon-Juniper	Haploxerolls Haplustalfs	Colluvium, Alluvium	15-25%	23%	Moderate - High
Foothills / Ponderosa Pine & Pinyon-Juniper	Ustochrepts Ustorthents Haplustalfs	Tuffs, Dacites	20-40%	12%	Low – Moderate
Mountain Slopes / Ponderosa Pine	Ustorthents Haplustalfs Ustochrepts	Tuffs, Dacite, Rhyolites	40-55%	10%	Low - Moderate
Sub-alpine Basins, Mountain Ridges / Mix Conifer & Sub-alpine Meadow	Cryochrepts Dystrochrepts Eutroboralfs Glossoboralfs	Tuffs, Rhyolites, Volcanic Cinder	40-65%+	34%	Low - Moderate

Hydrology / Geomorphology: The 1977 La Mesa Fire, the 1996 Dome Fire, and the 1998 Oso Fire occurred in areas immediately south and north of the Cerro Grande Fire and provide insight into likely hydrologic and geomorphic responses of watersheds to the Cerro Grande Fire. The La Mesa Fire burned over 15,000 acres in the vicinity of Frijoles Canyon; the Dome Fire burned over 16,000 acres in the vicinity of Capulin Canyon; and the Oso Fire burned over 5,300 acres in the vicinity of Santa Clara Canyon. The most pronounced effects after the first two fires were dramatic increases in flood discharge relative to pre-burn conditions, with floods in both watersheds being triggered by intense summer thunderstorms. Maximum post-fire peak discharge was estimated at 3030 cfs in Frijoles Canyon and 3630 cfs in Capulin Canyon, compared with maximum pre-fire peak discharges during short gauged periods of 19 and 25 cfs, respectively (Veenhuis, 1999). The largest floods in Capulin Canyon occurred in the summer immediately following the Dome Fire, but the largest floods in Frijoles Canyon occurred over one year after the La Mesa Fire.

The floods in Capulin Canyon after the Dome Fire caused geomorphic changes along the stream channel. Most areas experienced channel-bed incision and channel widening by bank erosion, excavating large volumes of coarse sediment that was previously stored along the channel. The most pronounced areas of sediment deposition were sand and gravel deposits behind log jams, and some of these deposits created during the first flood were eroded in floods later in the summer. No significant deposits of fine sediment were found in Capulin Canyon after these floods; instead most fine sediment was apparently transported downstream to the Rio Grande.

Field observations indicated extensive rilling on hillslopes burned by the La Mesa Fire (White and Wells, 1984) and the Dome Fire (Reneau and McDonald, 1996; Cannon, 1999), associated with an increase in runoff and sediment yield relative to unburned conditions. Although, there was little evidence for the mobilization of coarse gravelly sediment from hillslopes into the main Capulin Canyon channel after the Dome Fire,

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up to cobble-sized material was mobilized from the hillslopes of a steep tributary to Capulin Canyon.

The potential for sediment deposition in post-fire floods will vary dependent on many factors, including flood discharge, stream gradient, floodplain width, and sediment supply. In a single flood channel incision could occur in relatively steep narrow parts of watersheds, and deposition could occur in gentler, wider reaches downstream. A variety of potential channel changes could therefore occur after the Cerro Grande Fire.

In contrast to the occurrence of incision in Capulin Canyon after the Dome Fire, geomorphic evidence on the Pajarito Plateau indicates that under some conditions large floods can cause extensive aggradation along channels. For example, a bouldery stream deposit dated at ca. 1300-1650 A.D. fills the bottom of Los Alamos Canyon and appears to record a single high-magnitude flood event (Reneau and McDonald, 1996, p. 159). Similar bouldery deposits have been observed in Capulin Canyon and Rendija Canyon. One possible response to the Cerro Grande Fire may therefore be aggradation along stream channels if large volumes of coarse sediment are mobilized in headwater areas.

One common geomorphic response of burned slopes is the generation of debris flows or mudflows which can be much more erosive and destructive than floods. Given the severity of the fire, the availability of unconsolidated materials on hillslopes, and in low order basins and the steep, dissected terrain, it is possible that large debris flows could be produced after the Cerro Grande Fire given an intense rainfall event. Unfortunately, threshold rainfall conditions for such an event are not documented for this setting. Field observations suggest that under unburned conditions debris flow is not a significant process over most of the burn area. In the southern part of the burn area, no clear debris flow deposits have been observed in fans or along channels. However, following the Dome Fire, an extensive investigation found debris flows were produced from a steep, partially rock-mantled tributary to Capulin Canyon. The topographic configuration and materials of this basin are similar to those burned by the Cerro Grande Fire. (Cannon, 1999). However, observations after the La Mesa Fire indicated some minor debris flows from north-facing slopes of Frijoles Canyon, but these did not propagate downstream (C. Allen, per. comm.). The largest potential for debris flows after the Cerro Grande Fire may be in the northern and northeastern parts of the burn where sedimentary rocks of the Puye Formation and the Santa Fe Group are exposed. Debris flows were reported in these rock units after the 1998 Oso Fire (D. Dethier, pers. Comm.).

Climate: Climatological data have been collected in Los Alamos since 1911. Bowen (1990) described the climate as a semiarid, temperate mountain climate. Annual precipitation is 18 in. Precipitation normally occurs as about 50% thundershowers in the summer and fall and 50% snow during the winter and early spring months. There are 58 thunderstorm days in an average year. Snowstorms with accumulations exceeding 4 inches are common and the average annual snowfall is about 51 inches total.

Summers are generally sunny, with moderate, warm days and cool nights. Maximum daily temperatures are usually below 90°F. High altitude light winds, clear skies, and the dry atmosphere allow night temperatures to drop to the 50s (°F). Winter temperatures typically range from about 15°F to 25°F during the night and from 30°F to 50°F during the day. Occasionally, temperatures drop to 0°F or below.

LANL has conducted a routine meteorological monitoring program since 1979. The program consists of four components: measurements, data management, analysis, and plume modeling. Currently, the monitoring network consists of five meteorological towers, an acoustic wind profiler, and three supplementary precipitation stations including one in the Los Alamos townsite.

Meteorological towers are located on mesa tops except for one in Los Alamos Canyon. Towers are placed near specific areas where wind monitoring is desired. The mean spacing of towers on the plateau is approximately 4 miles. Years of data show that, plateau-wide, surface winds often vary greatly with time of day and location but are generally southerly to northwesterly over western Los Alamos County and southwesterly and northwesterly toward the Rio Grande valley. Wind speeds are strongest from March through June and weakest in December and January. Wind gusts usually occur mid-afternoon and are more intense on the mesas than in the canyons.

In early 2000 the U.S. experienced the warmest winter on record in the middle of a long-term drought. Following the floods of 1998 global climate shifted from an El Nino to a La Nina pattern, in which the jet stream is pushed north, bringing moisture to the Pacific Northwest and hot, dry conditions in the desert southwest. According to the Palmer Drought Index, much of the southwest is presently enduring a severe drought. The deficit of normal winter rain was exacerbated by strong, drying winds, and by late April wildfire potential was extreme (NOAA Drought Information Center).

B. Reconnaissance Methodology

The purpose of the burned area assessment is to determine the emergency watershed conditions created by the fire. If there is an emergency, (i.e., the potential for flooding and debris flows), the assessment and subsequent flow and sediment transport analyses identify the location and relative magnitude of the possible watershed damages, as well as values at risk and resources to be protected. Table 2 describes terms used throughout this watershed assessment. Other commonly used terms are given in the Glossary of Watershed Terminology at the end of this document.

Table 2. Definitions of terms commonly used in soil and watershed assessments.

Term	Definition
Fire Intensity	Based on temperature, flame length, heat of combustion and total amount and size of fuel consumed. Accounts for convective heat rising into the atmosphere and fire effects on the overstory.
Fire Severity	Based on temperature, moisture content of duff and fuels lying on the ground, heat of combustion and total amount of duff and ground vegetation consumed. Accounts for the amount of conductive and radiant heat that goes down into the soil, affecting soil characteristics.
Burn Severity	A relative measure of the degree of change in a watershed that relates to the severity of the effects of the fire on watershed conditions. Burn severity is delineated on topographic maps as polygons labeled high, moderate, and low.
Watershed Response	A qualitative degree and/or modeled measure of how a watershed will respond to precipitation. Parameters include pre-existing soil moisture; amount and duration of rainfall; lag time between initiation of storm and peak flow runoff; and peak flow discharge (maximum cfs generated by a storm) and sediment yield. Changes in the characteristics of a watershed brought about by a fire increase the efficiency with which a watershed yields runoff. Burned watersheds shed more water faster.

Aerial reconnaissance, extensive field evaluation and digital color infrared photography were used to identify the spatial distribution and extent of burn intensity and resulting burn severity and soil conditions. Field evaluations included, but were not limited to:

- Edaphic fire effects;
- Areal extent and strength of hydrophobic soil conditions;
- Accumulated material(s) within ordinary high water;
- Current channel and culvert capacities;
- Mapping burn severity;
- Evaluations(s) of mass movement potential;
- Channel stability or lack thereof;
- Flow routing related to protecting cultural sites;
- Threats to infrastructure from flow and debris;
- Extent/location of floatable large woody debris;
- Threats to structures and facilities from flow and debris.

Burn Severity: The watershed team used site indicators to evaluate burn severity. The mapping criteria include soil hydrophobicity (water repellency), ash depth and color (fire severity), size of residual fuels (fire intensity), soil texture and structure, and post-fire effective ground cover. These criteria indicate fire residence time, depth of litter layer consumed, radiant heat throughout the litter layer and ease of detachability of the surface soil. Using these indicators, the team field surveyed and mapped the burned area into three relative burn severity categories. These include High, Moderate, and Low/Unburned.

For BAER purposes, burn severity describes the effects of the fire on the soil hydrologic function (amount of surface litter, erodibility, infiltration rate, runoff response) and productivity. Generally there is a close correlation between these soil properties and the amount of heat experienced by the soil as well as the residence time of the heat in contact with the soil. The burn severity map then becomes a basis to predict the hydrologic response of soil to the fire, and the rate of natural re-vegetation of the site following the fire.

To aid in mapping burn severity, digital color infrared imagery was used in identifying and delineating the various burn severity classes. This imagery was acquired on May 20-21, 2000 by a specially commissioned flight at approximately 12,000 feet altitude, with a digital image resolution of 3 meters. The composite mosaic of individual images were geo-referenced by a contractor and then delivered to the BAER team via ftp on the evening of May 22. With color infrared imagery, spectral reflectance is related to the amount of moisture in the reflecting surface and therefore provides a valuable indicator of stressed or dead vegetation as compared to unburned areas of live vegetation. In general, the brighter the red band reflectance of the imagery, the greater the amount of live vegetation present. The areas of high, moderate, and low/unburned severity classes were delineated using a process of heads-up (on-screen) digitizing. The color tone on the imagery can be affected by shadows, vegetation type, soil type, and other factors unrelated to burn severity. For this reason, studies of automated image classification techniques have not demonstrated successful automated image classification procedures for this application (Parsons and Hardwick, 2000). Using the imagery for a visual guide to mapping burn severity polygons is valuable, but it is dependent upon the team's ground observations for verifying classification of polygons. It is important to note that burned area map units are no less than 40 acres in size and may include areas of other burn severity, but which are too small to segregate. Small areas of different burn severity can therefore be present in each polygon.

Loss of Soil Resources: To assess some of the potential effects of the wildfire on the soil resource, a soil survey GIS data layer was developed. This map was a composite of the Terrestrial Ecosystem Survey of the Santa Fe National Forest, Soil Survey of Santa Fe Area-New Mexico, Soil Survey of Los Alamos National Laboratory Lands, Soil Survey of Rio Arriba Area-New Mexico, and Soil Survey of the Bandelier National Monument.

The Revised Universal Soil Loss Equation (USLE) is the standard method used to determine potential soil movement from a site under various natural and/or disturbed conditions. The Terrestrial Ecosystem Survey (TES) of the Santa Fe National Forest has USLE erosion rates calculated for natural conditions, current conditions, and potential erosion following complete removal of the vegetation and the litter from a site. The soil map units for the other soil surveys within the burn area were correlated to the Santa Fe National Forest map units. This allowed for use of locally developed USLE estimated soil erosion rates (for various soil conditions), to be linked to all the soil map units in the burn area.

Before development of the post-fire potential soil erosion estimates from the fire area, the watershed scientists conducted extensive field investigations of the response of the soils to the wildfire. Three soil scientists, two geologists, and three hydrologists were assigned to the fire. These scientists examined both burned and unburned sites to determine the effect of the fire on soil characteristics. The unburned areas examined displayed some slight to moderate water repellency; this is not unusual for surface soils that are high in organic matter and are very dry. Waxy organic compounds from the duff, especially when dry, often affect surface tension. These can cause light scattered water repellency if the surface duff is removed. Heat from an intense wildfire can volatize these compounds and drive the gases into the mineral soil. Upon cooling, they re-condense and coat soil particles, increasing water repellency.

After the field examination of the burn severity and soil response, and based upon past soil erosion events following wildfire in similar soils, the soil scientists adjusted the USLE erosion rates from the Santa Fe National Forest (TES) in the following manner:

- For soils mapped as low/unburned, the USLE soil erosion rates for *current* conditions were multiplied by a fire correction factor of 1.1.
- For soils with moderate burn severity, the USLE soil erosion rate for *potential erosion* was multiplied by a fire correction factor of 0.75.
- For soils on northerly and southerly aspects with high burn severity and vegetation/aspect sites that did not exhibit hydrophobic soil conditions, the USLE *potential* erosion rate was used
- For soils that exhibited significant water repellency, the USLE *potential* erosion rate was multiplied by a fire correction factor per the following table:

Table 3. Erosion rate modification of Sante Fe National Forest TES map units for hydrophobic soils

Vegetation Type	Micro-climate Vegetation Modifier	USLE Potential Soil Erosion Rate Multiplier
Mixed Conifer Forest	Moist Shrub Understory	1.8
Mixed Conifer Forest	Grass-Shrub Understory	1.3
Mixed Conifer Forest	Grass Understory	1.1
Ponderosa Pine Forest	Shrub Understory	2.5
Ponderosa Pine Forest	Grass Understory	1.8
Ponderosa Pine/Pinyon/Juniper	—	1.2

Refer to the Appendix for a complete list of each soil map unit in the fire area and the general characteristics, soil erosion ratings, and hydrologic soil groups.

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The watershed team used the burn severity data and other watershed observations including slope, existing and potential ground cover density (e.g. unburned vegetation, down logs, rock fragments) and sediment available for transport both on the hillsides and in the channels to assess watershed response. All of the above criteria are used to identify areas of excessive watershed response that can lead to emergency watershed conditions and threats to life and other resources.

Watershed Response and Flood Potential: The watershed team used the burn severity data, and other watershed observations including slope, existing and potential ground cover density (e.g. unburned vegetation, down logs, rock fragments) and sediment available for transport both on the hillsides and in the channels to assess watershed response. All of the above criteria are used to identify areas of excessive watershed response that can lead to emergency watershed conditions (i.e., potential flooding and debris flows) and threats to life and other resources.

In order to assess flood potential from storm flow events, 25 year-1hour and 100 year-1 hour events were selected as design storms. A 2 year-1 hour event was selected to demonstrate if dramatic changes would be realized. During late June to early September, large scale southerly and southeasterly winds brings moist air into New Mexico from the Gulf of Mexico and Pacific Ocean. The combination of moisture and ample convective energy encourages the formation of afternoon and evening thunderstorms, especially over the Jemez Mountains (Bower, 1992) where the Cerro Grande fire occurred. The Precipitation Frequency Atlas of the Western United States – New Mexico (NOAA, 1973) for the crest of the Jemez Mountains indicates the following precipitation intensity for 1-hour storms:

2 year-1hour	1.1 inches of rain
25 year-1hour	1.9 inches of rain
100 year-1hour	2.3 inches or rain

These precipitation intensities are similar to design storms for Los Alamos documented in Bower (1990) and McLin (1992), who report a Los Alamos precipitation intensity of 2 year-1hour of 1.03 inch, 25 year-1hour of 1.86 inch, and 50year-1hour of 2.06 inches.

Distribution of the 1-hour storm were approximated using the NOAA (1973) distribution:

Time (minutes)	% Hour	% Rainfall
5	8.83	29
10	16.67	45
15	25	57
30	50	79
60	100	100

In order to estimate storm flow runoff the unit hydrograph (runoff curve number method) was used to develop stream hydrographs. The runoff methodology is described in detail in the SCS (1973) Engineering Field Manual for Conservation Practices in New Mexico, and Jencsok (1969) for Arizona. The runoff curve number method is widely used in the Southwestern US for watersheds less than 10 square miles to estimate peak rates of discharge and associated runoff volumes for a range of rainfall amounts, soil types, land use, cover condition, and average watershed type. McLin (1992) provides a description of curve number (CN) function and variation for the watersheds draining through the LANL. The unit hydrograph method is very useful to estimate storm flow for areas that have undergone cover condition change such as forest fires or land clearing. For the Cerro Grande fire, a PC version of the unit hydrograph procedure (developed by Pete

Hawkins of Utah State University and the University of Arizona, and Richard Moore, BLM) was used, which greatly accelerated our ability to generate hydrographs.

Runoff curve numbers for modeled watersheds were derived from a combination of CN diagrams for Ponderosa Pine in Jencsok (1969) and SCS (1973). McLin's CN's for LANL watersheds were used where available since his CN's are very consistent with the CN diagrams and allow a more direct comparison of a unit hydrograph modeled with HEC-1 simulations of LANL watersheds peak flow events (McLin, 1992).

Input data for the SCS unit hydrograph analysis was done by a combination of GIS generated burn severity acres by watershed. GIS generated watershed acreage, and planimetered watershed lengths for several areas before the GIS data was available. For LANL watersheds stream lengths and areas from McLin (1992) were used which have a very consistent comparability with GIS generated data.

The selection of watersheds to model during the BAER process was based on areas in need of protection identified by the Multi-Area Coordination group (consisting of decision makers from each jurisdiction affected by the fire) with several watersheds added by LANL and Los Alamos County personnel. See the appendix for a map of Watersheds.

C. Findings

Soil Resources and Burn Severity: Table 4 displays a summary of burn severity acres and percentages by category that was determined for the Cerro Grande Fire area. Two maps in the appendix, Burn Severity and a combined map of Watersheds and Burn Severity, show the distribution of burn severity classes throughout the burned area. Table 5 shows burn severity results for each subwatershed in the burned area.

Table 4: Summary of burn severity acres and percentages found on the Cerro Grande Fire.

Burn Severity	Acres	Percent
High	14,5[illegible]1	34
Moderate	3,323	8
Low/Unburned	25,035	58
Total	42,869	100

Table 5. Burn Severity per Subwatershed, Cerro Grande Fire.

			Watershed			Burn Severity in Watershed					
Watershed Name	BAER Label	LANL Label	Total Area (Acres)	Burned Area Acres	Burned Area %	High Acres	High %	Moderate Acres	Moderate %	Low Acres	Low %
Santa Clara Canyon	SC1	n/a	15,025	1539	10	372	2	102	1	1065	7
Santa Clara Tributaries	SC2	n/a	2,502	2323	93	983	39	603	24	737	29
	SC3	n/a	770	716	93	115	15	353	46	248	32
	SC4	n/a	922	846	92	158	17	119	13	569	62
	SC5	n/a	421	178	42	88	21	86	20	4	1
	SC6	n/a	911	295	32	63	7	66	7	166	18
	SC7	n/a	10,009	190	2	94	1	53	1	43	0
Subtotal			15,535	4548	29	1501	10	1280	8	1767	11
Garcia Canyon	GAR1	GAR1	4,216	3771	89	1111	26	0	0	2660	63
	GAR2		4,813	0	0	0	0	0	0	0	0
Subtotal			9,029	3771	42	1111	12	0	0	2660	30
Chupaderos Canyon	C1	C1	11,600	2051	18	1100	9	1	0	950	8
Guaje Canyon	G1	G1	7,277	5375	74	1349	19	112	2	3914	54
	G2	G2	2,045	1201	59	665	32	90	4	446	22
	G4	G4	1,393	0	0	0	0	0	0	0	0
	G5	G5	929	0	0	0	0	0	0	0	0
Subtotal			11,644	6576	56	2014	17	202	2	5310	46
Rendija Canyon (trib to Guaje)	REN1	REND	3,150	3095	98	2595	82	329	10	171	5
	REN2		2,981	1659	56	552	19	27	1	1080	36
Subtotal			6,131	4,754	78	3147	51	356	6	1251	20
Barrancas Canyon (trib to Guaje)	BAR1	BAR1	1,173	0	0	0	0	0	0	0	0
	BAR2	BAR2	210	0	0	0	0	0	0	0	0
	BAR3	BAR3	1,648	0	0	0	0	0	0	0	0
	BAR4	BAR4	144	0	0	0	0	0	0	0	0
Subtotal			3,175	0	0	0	0	0	0	0	0
Bayo Canyon (trib to Los Alamos)	BAY1	BAY1	1,001	0	0	0	0	0	0	0	0
	BAY2	BAY2	712	0	0	0	0	0	0	0	0
	BAY3	BAY3	777	0	0	0	0	0	0	0	0
Subtotal			2,490	0	0	0	0	0	0	0	0
Pueblo Canyon (trib to Los Alamos)	PUE1	PUE1	1,450	1426	98	1144	79	138	10	144	10
	PUE2	PUE2	2,948	227	8	63	2	58	2	106	4
	PUE3	PUE3	989	0	0	0	0	0	0	0	0
Subtotal			5,387	1653	31	1207	22	196	4	250	5
Los Alamos Canyon	LA1	LA1	4,069	2572	63	1115	27	102	2	1355	33
	LA2	LA2	498	358	72	267	54	0	0	91	18
	LA3	LA3	2,102	0	0	0	0	0	0	0	0
	LA4	LA4	1,267	0	0	0	0	0	0	0	0
	LA5	LA5	419	0	0	0	0	0	0	0	0
	LA6	LA6	481	0	0	0	0	0	0	0	0
Subtotal			8,834	2930	33	1382	16	102	1	1355	15
Sandia Canyon	SAN1	SAN1	1,687	384	23	0	0	0	0	384	23
	SAN2	BAS2	567	0	0	0	0	0	0	0	0
	SAN3	BAS3	890	0	0	0	0	0	0	0	0

Watershed Name	BAER Label	LANL Label	Watershed Total Area (Acres)	Watershed Burned Area Acres	Watershed Burned Area %	Burn Severity in Watershed High Acres	High %	Moderate Acres	Moderate %	Low Acres	Low %
	SAN4	BAS4	445	0	0	0	0	0	0	0	0
Subtotal			3,589	384	11	0	0	0	0	384	11
Mortandad Canyon	MOR1	MOR1	359	264	74	0	0	94	26	170	47
	MOR2	MOR2	527	527	100	0	0	0	0	527	100
	MOR3	MOR3	235	184	78	0	0	81	35	103	44
	MOR4	MOR4	1,000	436	44	0	0	74	7	362	36
	MOR5	MOR5	571	0	0	0	0	0	0	0	0
	MOR6	MOR6	1,080	0	0	0	0	0	0	0	0
Subtotal			3,772	1,411	37	0	0	249	7	1162	30
Canada del Buey	CAN1	CAN1	1,314	414	32	0	0	77	6	337	26
	CAN2	CAN2	1,543	0	0	0	0	0	0	0	0
Subtotal			2,857	414	14	0	0	77	3	337	11
Pajarito Canyon	PAJ1	BAS1	1,275	1182	93	731	57	24	2	427	33
	PAJ2	BAS2	1,615	1335	83	275	17	34	2	1022	63
	PAJ3	2-MI	2,036	1647	81	311	15	110	5	1226	60
	PAJ4	BAS4	414	346	84	0	0	0	0	346	84
	PAJ5	0-MI	1,074	729	68	0	0	0	0	729	68
	PAJ6	BAS6	690	0	0	0	0	0	0	0	0
	PAJ7	BAS7	1,407	0	0	0	0	0	0	0	0
Subtotal			8,511	5,239	62	1321	16	168	2	3741	43
Water Canyon	WAT1	BASW1	2,462	2418	98	1046	43	70	3	1302	53
	WAT2	BASW2	1,653	1490	90	0	0	366	22	1124	68
	WAT4	BASW3	872	74	8	0	0	0	0	74	8
	WAT5	BASW4	1,213	0	0	0	0	0	0	0	0
	WAT7	BASW5	202	0	0	0	0	0	0	0	0
(Canon de Valle)	VAL1	BASV1	1,502	1047	70	247	16	48	3	752	50
	VAL2	BASV2	524	293	56	0	0	21	4	272	52
	VAL3	BASV3	738	706	96	0	0	18	2	688	93
(Fence Canyon)	FEN1	BASF1	630	0	0	0	0	0	0	0	0
(Potrillo Canyon)	POT1	BASP1	1,722	236	14	0	0	0	0	236	14
	POT3	BASP3	620	0	0	0	0	0	0	0	0
Subtotal			12,138	6,264	52	1293	11	523	4	4448	37
Ancho Canyon	ANC1	BAS1	1,434	0	0	0	0	0	0	0	0
	ANC3	BAS4	666	0	0	0	0	0	0	0	0
	ANC5	BAS5	132	0	0	0	0	0	0	0	0
(Frijoles Mesa Canyon)	FM1	BAS2	1,552	104	7	0	0	0	0	104	7
(unknown canyon)	UNK1	BAS3	707	0	0	0	0	0	0	0	0
Subtotal			4,491	104	2	0	0	0	0	104	2
Frijoles Canyon	FRJ1	n/a	3,263	915	28	13	0	44	1	858	26
	FRJ2	n/a	3,223	82	3	0	0	25	1	57	2
	FRJ3	n/a	5,310	231	4	52	1	1	0	178	3
Subtotal			11,796	1,228	10	65	1	70	1	1093	9
TOTAL						14,511	11	25,035	18	3323	2

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The surface soil properties have been changed on the sites with high burn severity. In many of these sites the surface soil structure has been broken down, and at the same time a hydrophobic layer was established during the fire. The surface soil aggregate stability has been significantly reduced. Many of the soils once had moderate to fine granular soil peds in the surface layer. Now the surface soil has very few intact soil peds, the soil surface is essentially structureless (single grain). The lack of surface soil structure and lack of organic litter or duff allows for rain-impact erosion at the soil-air interface, reduced infiltration, and increase erosion and runoff.

Field observations showed the post-fire hydrophobic conditions were significantly greater than any other observed characteristic, especially in high burn severity areas. Also, there is a consistent relationship between fire-caused soil hydrophobicity and the type of pre-fire vegetation and aspect of the site. In general the relationships were as follows:

- Soils that occurred under ponderosa pine forest on northerly aspects that had high burn severity were hydrophobic on 75 to 90%+ of those sites.
- The southerly aspect ponderosa pine sites that had high burn severity were hydrophobic on 25 to 30 percent of those sites.
- The mixed conifer forest on northerly aspects that had high burn severity were hydrophobic on 25 to 35 percent of those sites.
- The mixed conifer forest on southerly aspects that had high burn severity were hydrophobic on 5 to 15 percent of those sites.
- The ponderosa pine/pinyon-juniper forest sites that had high burn severity were hydrophobic on 5 to 15 percent of those sites.
- Hydrophobicity on predominantly pinyon pine sites at lower elevations was localized under canopy positions.

In addition, under similar vegetation and fire conditions coarser grained soils allow for better development of hydrophobic horizons than finer-grained soils. Soils on headwater slopes derived from volcanic dacite tend to be coarser grained than soils derived from volcanic tuff and eolian deposits on the mesa tops. Hydrophobicity on the higher slopes was approximately ¾ inch below the surface and is approximately ¼ to ½ inch thick. Soils on mesa tops, even in high burn severity areas, showed weak hydrophobicity. Hydrophobicity here occurs on the mineral soil surface and is approximately 1/8 inch thick. Unburned small roots are prevalent immediately below the soil surface, and sprouting plants have started to emerge within two weeks of the fire. The very fine soil texture in these areas limited the development of soil hydrophobicity, even under extreme fire conditions, and the mineral composition provided a degree of insulation that protected shallow fine roots and embedded seeds. The fire also tended to sweep across the mesas and there may have been less of a heat pulse into the soil here than in the headwater basins where the fire resided longer. See the map showing Areas of Water Repellant Soils in the map appendix.

In some cases the effect of reduced surface infiltration, because of the surface soil structure breakdown, is multiplied many times due to the water repellant characteristics of the hydrophobic layer. These combined effects will cause the runoff following a rain event to increase significantly; increasing the overland flow available to initiate soil erosion, either as sheet or rill erosion. The potential for erosion is highest on the steeper fine soil slopes that burned with a high severity, and have hydrophobic soil conditions. Table 6 and 7 compare the USLE estimated erosion for pre-fire and post-fire conditions. Two maps in the map appendix show areas of predicted pre-fire and post-fire soil loss.

Areas that have moderate burn severity also have potential for additional soil erosion above the pre-burn soil erosion rate. Mid-elevation pine sites on moderately steep slopes with fine soil surface layers are the most sensitive moderate severity burn sites to increased soil erosion.

Further, the heat of the wildfire has affected the nutrient status of some of the soils. The soils that experienced high burn severity are generally the most affected. There is a combination of processes that have and/or will affect the soil nutrient status in a positive or negative way. First, during the actual wildfire, the fire volatilizes portions of the organic matter in the surface soil. Significant portions of several soil nutrients (e.g. nitrogen, sulfate) are located in the surface organic matter content of the soil and were lost during combustion. Second, the potential surface soil erosion previously mentioned will also have a negative impact on the nutrient status of the soil, by the physical removal of topsoil, which holds the majority of all soil nutrients. At the same time, there are several nutrients (e.g. potassium, ammonium), which are readily released from the ash following a fire. However, these readily available plant nutrients are also susceptible to loss by rapid leaching. Consequences of major nutrient loss will be reduced plant growth on the sites for many years.

Also noted by the soil scientists, geologists, and hydrologists during their field reviews were a common characteristic of upper stream basins. The axes of many of these basins do not have defined stream channels with beds and banks, but instead have deposits of fine sediments that have been deposited over the last several hundred or thousand years, through mechanisms such as surface soil erosion from upland and side slopes. The volume of sediments in many of the larger draws is very significant. The deposit width can range from 10-20 feet, and the estimated depth can range from 2 to greater than 5 feet. These stored sediments can range from 1/8 to 1 mile in length. A key characteristic of these deposits is that there are very few natural grade control structures (e.g. large woody debris, rock steps, etc.) present along the length of these deposits. Also, in many cases there were few or no downed logs or other natural materials present that could become grade control structures following an initial erosion event. This situation, in concert with the additional post-fire runoff, yields a very high potential for severe downcutting and widening of these channel bottoms. This type of erosion would yield significant amounts of suspended sediments to downstream locations and increase an already hazardous potential flood situation.

To assess the cumulative effects of the various upland rehabilitation treatments (e.g. contour felling, grass seeding etc.) on soil erosion, the potential reduction in soil erosion over post-fire untreated condition was modeled. Based upon the subject knowledge and practical experience of the watershed specialists, a percentage reduction in the post-burn soil erosion rate due to treatments was estimated. Table 6 reports the soil loss reduction factors for high and moderate burn severity areas developed by the team for the first and second post-burn years. Assumptions include:

- Favorable weather for successful seed germination;
- Proper installation of treatments; and
- Treatment implementation prior to a damaging storm.

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Table 6. Soil loss reduction factors for the first two years after the fire for treatment areas in high and moderate burn severity areas.

Treatment	Upland Erosion % Reduction Year 1	Upland Erosion % Reduction Year 2	Stream Channel Erosion % Reduction Year 1	Stream Channel Erosion % Reduction Year 2
Grass Seeding	10	40	0	20
Contour Raking	30	30	5	5
Straw Mulch	15	5	5	5
Log Erosion Barriers	10	10	10	10
Contour Tree Felling	5	10	5	5
Low Density Straw Wattles	15	15	5	5
High Density Straw Wattles	15	15	5	5
Hydro-mulch	15	5	5	5
Channel Grade Control Structures	0	0	5	20

Note that when several treatments are done on one site the effect is not additive. For the modeling effort the following general rule was applied, the most effective treatment was given the full percentage reduction, and all other treatments were given 50% of their full percentage reduction.

We compared the post-fire potential hillslope and channel erosion without any treatments, to the post-fire potential erosion with treatments, subtracting out natural background erosion. Table 7 displays estimated reduction in soil erosion that we expect due to treatment.

Table 7. Estimated percent reduction in soil movement due to treatment for first and second years following treatments.

	% Reduced Erosion Year 1 of Treatments	% Reduced Erosion Year 2 of Treatments
Reduction of Post-fire Hillslope Erosion from Grass Seeding and Upland Treatments	8.8%	22.9%

Watershed Response, Values at Risk, and Resources to be Protected: The primary watershed responses of the Cerro Grande Fire are expected to include: (1) an initial flush of ash; (2) gully and rill erosion in the drainages and on the steep slopes within the burned area; and (3) debris and sediment transport and scouring in the canyons with deposition along downstream reaches of the canyons. Peak flows from the burned area are expected to increase by up to two orders of magnitude for the same storm pre- and post-fire.

Table 8 of modeled storm flow by watershed includes the key watershed variables (geometry, CN's, burn severity area) and peak flows and runoff volumes (acre-feet) for the 2 year-1 hour, 25 year-1 hour and 100 year-1hour design storms. For BAER comparisons the 25 year-1 hour event was modeled for unburned conditions. Modeling was done using antecedent 2 (ANC2 or average) soil moisture, except for an ANC 3 modeling to evaluate wetter conditions. The CN's for predominantly ponderosa pine

burned areas were assumed to be 65 for low burn severity, 85 for moderate burn severity, and 90 for high burn severity. Some of the low elevation watersheds have pre-fire CN's greater than 65, in which case the low burn severity was elevated by 1 to 3 CN units.

The results indicate a strong correlation between projected stormflows and of medium and high burn severity. Watersheds that pose the greatest discharge increase include Pueblo Canyon, Rendija Canyon, Two-Mile Canyon at NM 501, and South Fork Pajarito at NM 501. Modeled peak discharge (Q) frequently decreases at accounting points lower in watershed due to gradient reduction and increased channel length downstream from high burn severity areas. Santa Clara Canyon is projected to increase from a CN of 54 to a CN of 55 which only results in a minor projected peak flow increase since a small part of the watershed burned. USGS gaging data for the Santa Clara Creek near Espanola shows storm flow response annual peaks ranging from 12 to 970 cfs and typically in the 100 to 400 cfs range in the July to September period. The potential stormflow response for Santa Clara Creek will be well within the pre-fire variation and is not expected to significantly change the watershed stormflow response. A variable which the unit hydrograph method does not account for which would contribute to flow moderation is increased floodplain infiltration of stormflow.

BAER treatment potential peak flow reduction were modeled for Pueblo Canyon, Los Alamos Canyon, Rendija Canyon, and School Canyon assuming 20% of the watershed could be treated by a combination of raking, log erosion barriers, and mulch which the model predicts would decrease peak flows by 15-34 %. The BAER seeding was assumed to not have CN reduction since re-vegetation would not likely be robust until additional soil moisture is available from July and August storms.

Storm flows are expected to decrease over a 3 to 5 year period as watershed re-vegetation occurs.

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Table 8: Cerro Grande Design Storm Flow Results

5/28/00

Watershed Name	WS #	Cumulative Area (mi2)	High Elev. (ft)	Low Elev (ft)	Stream Length (ft)	Land Slope %	CN Unburned	CN Burned	Unburned CN=54 (mi2)	Low Burn Severity CN=65 (mi2)	Mod Burn Severity CN=85 (mi2)	Hi Burn Severity CN=00 (mi2)	Peak Runoff Time (hrs)	Time Runoff (hrs)
Pueblo @ Diamond St	PUE1	2.26	9140	6900	15900	14.1	52	90	0	0.04	0.03	2.18	1.1	2.7
Pueblo @ City Line	>PUE2	6.87	9140	6500	39900	6.6	62	72	4.24	0.17	0.11	2.46	4.6	10.9
Pueblo @ L A Canyon	>PUE3	8.42	9140	6300	53900	5.3	64	78	5.76	0.17	0.11	2.46	4.7	11.6
Los Alamos Canyon @ Reservoir	LA1	6.33	9700	7400	21000	9.7	52	69	1.63	2.88	0.01	1.82	2.85	6
Los Alamos Canyon @ Omega Bridge	>LA2	7.07	9700	7100	31000	10.6	53	69	1.74	3.02	0.04	2.27	3.2	7.7
Los Alamos Confluence @ Pueblo Creek	>LA3	10.33	9700	6300	66000	6.2	54	67	5.05	3.02	0.04	2.27	3.6	8.3
Pajarito @ HWY 501	PAJ1	2.31	10440	7730	17250	15.7	52	78	0	1.01	0.03	1.22	1.8	3.6
Pajarito @ Two Mile	>PAJ2	7.84	10440	6940	35500	9.9	57	73	0	5.22	0.42	2.17	3.4	8.1
2 Mile Canyon @ Pajarito	PAJ3	3.18	9800	6940	28250	10.1	61		0.44	2.08	0.18	0.48	3.1	7.4
Pajarito @ TA 18	>PAJ4	10.21	10440	6730	45500	8	60	71	0.25	7.38	0.42	2.17	4.9	11.2
3 Mile Canyon @ TA 18	>PAJ5	1.67	7360	6730	19950	3.1	61	65	0.14	1.53	0	0	4.7	10.8
Pajarito @ White Rock/HWY 4	>PAJ6	11.36	10440	6500	61500	6.4	62	70	1.34	7.39	0.42	2.17	6	15
Pajarito @ Rio Grande River	>PAJ7	13.6	10440	5460	77000	6.5	64	69	3.62	7.39	0.42	2.17	6.8	17
Water Canyon @ HWY 501	WAT1	4.07	9920	7520	18500	13.3	54	75	0.26	1.99	0.19	1.63	2	4.3
Water Canyon @ Canon de Valle	WAT2	6.7	9920	6810	35750	8.7	57	73	0.38	3.91	0.78	1.63	3.6	8.2
Rendija @ Cemetery	REN1	5.25	9800	7110	22000	16.2	52	69	0	0.09	0.53	4.63	1.4	3.1
Rendija @ Guaje	REN2	9.4	9800	6230	48400	5.6	58	79	1.69	1.27	0.59	5.85	4.7	10.8
Canon de Valle @ HWY 501	VAL1	2.33	10440	7680	22500	12.3	53	70	0.12	1.69	0.1	0.42	2.6	5.9
Canon de Valle @ Water Canyon	VAL3	4.31	10440	6810	42500	8.5	57	68	0.12	3.69	0.18	0.42	4.8	11
Guaje @ Reservoir	G1	4.85	10450	8020	14500	17.4	54	73	1.43	1.07	1.28	1.07	2.2	4.7
Guaje @ Rendija	G2	14.55	10450	6215	54500	7.1	58	71	0.62	3.35	7.74	2.84	5	13.4
Garcia @ Edge of Fire	GAR2	7.09	9400	6680	40000	6.8	54	70	0.77	4.53	0	1.77	4.8	11
Santa Clara @ BIA Road #602	SC1	28.8	10920	6950	63000	6.3	54	55	25.95	2.1	0.35	0.4	8.9	21.4
Sawyer @ Puye Cliff Campground	SC2	4.03	9500	6850	16000	16.5	58	67	1.18	2.1	0.35	0.4	2.3	4.4
Siouyacongae Stock Pond #2	SC3	1.2	8800	7090	12800	13.3	58	79	0.12	0.23	0.66	0.19	1.5	3.2
Siouyacongae Stock Pond #1	SC4	1.32	8500	6970	12000	12.7	58	74	0	0.77	0.22	0.33	1.7	3.4
Siouyacongae @ Santa Clara	SC6	4.02	8500	6570	25600	7.5	58	72	1.1	1.31	0.99	0.62	3.1	7.4
Mortandad @ Sediment Trap	MOR2	1.35	7400	6900	11950	4.2	66	68	0.14	1.08	0.157	0	6	2.8
Mortandad @ HWY 4	>MOR4	4.2	7400	6380	37750	2.7	70	71	6.64	2.03	0.41	0	6.2	15.4
Sandia @ HWY 4	SAN1	2.63	7460	6550	36750	2.5	68	68	1.62	1.01	0	0	16.7	6.7
Portillo @ HWY 4	POT1	2.69	7300	6440	28500	3.0	70	69	2.07	0.62	0	0	5.5	12.6
School Canyon @ Yucca St		0.08	7820	7460	3300	10.9	55	90				0.08	0.6	1.6
Pajarito and 3 Mile @ TA 18													4	
Canada del Buey @ HWY 4	CAN1	2.05	7200	6400	29500	2.7	69	71	1.21	0.63	0.21		5.9	13.4
Rendija and Guaje @ Confluence													5	
2 Mile Canyon @ HY 501		0.78	9800	6920	11500	25	54	88	0	0.32	0	0.46	0.9	2.1
SF Pajarito @ HY 501		0.45	9440	7800	9000	18	54	87	0	0.05	0	0.4	0.9	2.1
Apache Mesa		0.38	8870	7530	10604	12.4	54		0.07	0.22	0.01	0.08	ND	ND

Table 8: Cerro Grande Design Storm Flow Results (Continued) 5/28/00

Watershed Name	25 yr 1 hr Unburned Peak Q (cfs)	2 yr 1 hr (1.1") Peak Q (cfs)	2 yr 1 hr Tot runoff (ac ft)	25 yr 1 hr (1.9") Peak Q (cfs)	25 yr 1 hr Tot runoff (ac ft)	100 yr 1 hr (2.3") Peak Q (cfs)	100 yr 1 hr Tot runoff (ac ft)	25 yr 1 hr CN95/ANC3 Peak Q (cfs)*	100 yr 1 hr CN95/ANC3 Peak Q (cfs)*	CN Treatment 1 20% Raking LEB, mulch	Treatment 25 yr 1 hr Peak Q cfs (cfs)	Treatment 25 yr 1 hr Total Runoff (ac ft)
Pueblo @ Diamond St	9	494	46	1278	122	1711	163	1661	2122	8	983	100
Pueblo @ City Line	49	27	10	247	96	419	281	321	520			
Pueblo @ L A Canyon	69	93	11	457	204	701	312	594	867			
Los Alamos Canyon @ Reservoir	24	14	3	281	61	515	111	365	633	6	238	53
Los Alamos Canyon @ Ortega Bridge	4	18	5	287	76	509	130	373	631			
Los Alamos Confluence @ Pueblo Creek	17	3	2	286	81	549	150	372	677			
Pajarito @ HWY 501	1	100	14	460	50	683	8	598	847			
Pajarito @ Two Mile	14	49	13	410	115	682	193	533	846			
2 Mile Canyon @ Pajarito	31	7	2	129	32	224	58	163	278			
Pajarito @ TA 18	39	29	10	297	123	523	215	386	647			
3 Mile Canyon @ TA 18	0	0	0	23	9	43	19	30	61			
Pajarito @ White Rock/ HWY 4	64	19	8	228	129	409	223	296	501			
Pajarito @ Rio Grande River	97	12	7	223	137	401	243	290	497			
Water Canyon @ HWY 501	4	81	11	509	74	807	118	659	1001			
Water Canyon @ Canon de Valle	27	39	11	327	99	543	169	429	673			
Rendija @ Cemetery	1	894	97	2398	269	3237	359	3117	4014	85	1740	210
Rendija @ Guaje	4	163	63	686	283	1027	365	892	1273			
Canon de Valle @ HWY 501	4	8	15	129	29	220	41	153	273			
Canon de Valle @ Water Canyon	10	3	1	91	37	171	70	118	212			
Guaje @ Reservoir	7	50	7	437	69	731	119	568	906			
Guaje@ Rendija	30	28	15	372	179	649	311	484	805			
Garcia @ Edge of Fire	3	13	5	188	77	337	139	243	418			
Santa Clara @ BIA Road #602	6	0	0	21	18	107	8	27	133			
Sawyer @ Puye Cliff Campground	33	5	1	217	31	409	61	282	507			
Siouyacongae Stock Pond #2	11	64	7	279	30	420	40	363	521			
Siouyacongae Stock Pond #1	12	29	3	193	22	312	37	251	387			
Siouyacongae @ Santa Clara	4	20	5	204	53	348	91	265	432			
Mortandad @ Sediment Trap	41	2	1	56	12	109	2	73	129			
Mortandad @ HWY 4	171	14	8	187	100	328	188	243	407			
Sandia @ HWY 4	37	15	1	30	24	72	4	51	89			
Portillo @ HWY 4	64	4	2	69	30	117	5	85	149			
School Canyon @ Yucca St	0.5	28	2	74	4	101	6	96	129	8	49	3
Pajarito and 3 Mile @ TA 18				320		571		410	708			
Canada del Buey @ HWY 4	40	4	2	51	29	90	4	69	112			
Rendija and Guaje @ Confluence				981	462	1718	676	1275	2130			
2 Mile Canyon @ HY 501	2	170	13	486	37	667	50	632	827			
SF Pajarito@ HY 501	1	91	7	269	20	370	28	348	459			
Apache Mesa	0.6	1.41	0.16	39	4	50	7	35	63			

ANC 3 (antecedent moisture level 3) for 25yr-1hr event elevated by 30% and 100yr-1hr event by 21% based on hydrographs of several watersheds by raising high burn severity CN to 95

Flows were generated to major road crossings on NM 4, NM 30, and NM 501 because of concerns about flooding near inhabited areas along these highways. These results were provided to the State Highway and Transportation Department for evaluation of existing crossings and determining potential for flood impacts and preventative measures to take in advance of a flood. These modeled flow results do not consider a breach of the Los Alamos dam or the Diamond Street fill in Pueblo Canyon.

Stormflow was calculated for all affected watersheds to the perimeter of the Cerro Grande Fire. Since the runoff curve method used earlier is not effective for watersheds greater than 10 square miles, the SCS Chapter 2 model, a modified version of TR 20, was used. Weighted curve numbers were applied to the model, based on acres of burn severity. Results from five highway stream crossings are presented in Table 9.

Pajarito Canyon was modeled to its crossing at Highway 4. Flows based on cumulative area for Pajarito Canyon were then extrapolated for determining other canyons' flows at highway crossings. As cumulative area increased downstream, flows dissipated respectively.

The exception was Santa Clara Canyon, a 45 square mile watershed that is too large for the Chapter 2 model. The NRCS Albuquerque Office therefore used TR 20 to generate flow for design storms of 25 year 24 hour and 100 year 24 hour events. Results are shown in Tables 9 and 10.

Table 9. Flows at State Highways NM 4 and NM 30

Watershed	Cumulative Area (Sq. Mi.)	Pre-burn 25 year 1 hour Peak Q (cfs)	25 year 1 hour 1.9" Peak Q (cfs)	100 year 1 hour 2.3" Peak Q (cfs)
Water Canyon @ NM 4	10		225	385
Pajarito @ NM 4	11.36	97	228	404
Los Alamos @ NM 4	10.4		286	546
Guaje @ NM 30	16.9		387	708
Garcia @NM 30	26.4		101	181
			25 year 24 hour 2.0" Peak Q (cfs)	100 year 24 hour 2.3" Peak Q (cfs)
Santa Clara @ NM 30	45		1720	3300

Table 10. Flows at State Highway NM 501

Watershed	Cumulative Area (Sq. Mi.)	Pre-burn 25 yr. 1 hr. Peak Q cfs	25 Yr. 1 hr. 1.9" Peak Q cfs	100 Yr. 1 hr. 2.3" Peak Q cfs
Water Canyon	4.07	4	504	807
Canon de Valle	2.33	4	125	220
Pajarito	2.31	1	460	683

During the afternoon of June 2, 2000, ½ -inch of rain fell during about a two-hour period in the area of the burn. Based on the amount of rainfall and duration two members of the watershed group went to Rendija Canyon just below Guaje Pines Cemetery at about the expected arrival time of the peak flow. We found that the modeled flow for this size event yielded expected results.

Three hydraulic engineers from the U. S. Bureau of Reclamation conducted breach analyses of Los Alamos Reservoir, the Diamond Avenue fill-bridge, and road and highway embankments in Pajarito and Two-Mile Canyons. These analyses discuss several scenarios of flood runoff for different failure conditions. See "Breach Analysis of Los Alamos Reservoir," "Breach Analysis of Diamond Avenue Fill Bridge," "Analysis of Dam Break Floods in Pajarito Canyon," and "Analysis of Breach of Fill Bridge on Diamond Avenue across Pueblo Canyon - Summary, " (Wahl, Greimann, and Wittler, this document).

Certain values within watersheds have been placed at risk to potential increases in flooding and sedimentation due to changes in watershed hydrologic efficiency resulting from the fire. Table 11, *Summary of Watershed Risk Analysis*, contains a list of relative risk ratings, values at risk, risk factors or threats, comments, and recommended treatments for each watershed. The analysis is an evaluation of each watershed as a whole. See the map on Watershed Treatments in the map appendix.

Because of the almost complete removal of vegetation, high burn severity, and steep slopes in the headwaters of the burned area, high watershed response is anticipated in the following watersheds: Rendija, Pueblo, Los Alamos, Pajarito, and Water. Moderate watershed response is anticipated in five other watersheds: Santa Clara, Garcia, Chupaderos, Guaje, and Canon de Valle.

Sediment Generation along Channels: Potential channel erosion and scour was estimated using anecdotal information from adjacent fires and best professional judgement(s) of a subset of the watershed group. Only approximate estimates of potential channel erosion and scour are possible at this time and we intend only to indicate the general magnitude of possible effects. Cubic yards per linear foot of scour of channel are expected to vary with burn severity and landscape position, as well as with the duration, intensity, and frequency of precipitation events.

Channel Processes: We evaluated the potential for using the Modified Regime Approach from SCS Technical Release 25 to determine the amount of sediment eroded by channel incision and channel widening for the 25 year, one hour storm, for sand bed moving through cohesive banks. We concluded that this approach was not appropriate due to the assumption of an unlimited potential for both horizontal and vertical incision. Field observations indicate that the upper reaches of most of the burned basins are bedrock controlled, and the Modified Regime approach calculated channel widths up to 88 feet were necessary to convey storm discharges.

Due to the lack of an established approach for estimating the amount of sediment eroded along channels, we made a first approximation based on field observations of the response of the Capulin Canyon channel following the Dome Fire of 1996. Following the June 26, 1996 flood, the channel of Capulin Canyon commonly showed incision up to 10 feet wide and 3 feet deep. Assuming that the original channel was 3 feet wide and 1 foot deep provides net erosion by channel incision and channel widening of 27 cubic feet or 1 cubic yard per foot of channel length. This is equal to a sediment yield of approximately 26,000 cubic yards for this 5-mile long reach of Capulin Canyon. This is several times higher to an order of magnitude higher than estimates of sediment delivery from hillslopes, discussed below, indicating that sediment yield from burned watersheds may be dominated by material eroded along channels.

Hillslope Processes: The effect of hillslope treatments on channel sediment contribution can be evaluated by determining the pre- and post treatment sediment delivery rates, and applying the difference between these rates to the estimated channel yields.

The watershed team also evaluated the potential for sediment delivery to the stream channel network. A sediment delivery ratio (10% of estimated USLE) was estimated by using the stiff diagram for relative changes in sediment delivery found in WRENNS (found in EPA Procedural Handbook) (see Table 12). Documentation of the values used and assumptions can be found in Appendix D. It is doubtful that all this material will be retained within the stream network, as a "geologic correction" may occur in the upper watersheds with a high percentage of severe burn, with a flow response two orders of magnitude greater than for the same storm in pre-burn conditions.

Data and observations from wildfires in similar terrains and materials indicate that within the next three years the potential for the generation of debris flows from shallow soil slips on hillslopes, and the reactivation of pre-existing, deep-seated landslides is negligible.

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Table 11. Summary of Watershed Risk Analysis, Cerro Grande Fire, New Mexico, May 2000.

Watershed	Risk Rating	Values at Risk / Resources to be Protected	Risk Factors / Threats	Comments	Recommended Treatments
Frijoles Canyon	Low	Visitor facilities in Bandelier National Monument, camping & hiking	Localized sheet wash and flash runoff in stream channels in the burned area and immediately below.	Burn confined to upper end of drainage south of Cerro Grande and a small tributary drainage along NM 4, affecting small percentage of watershed. Primarily low burn severity in headwaters and high burn severity along NM 4	None
Water Canyon	High	NM 501 and NM 4 culverts	Localized sheet wash and flash runoff in stream channels in the burned area. Flooding in main channel below	All of the high burn intensity is in the upper part of the watershed above NM 501. Projected storm flows are high at the NM 501 crossing. NM 501 culverts undersized, with potential for road to be overtopped and eroded. 15 foot culvert at NM 4 should be adequate if not blocked by logs/debris. Incomplete data on possible contaminants along stream channel, but little contamination expected	Contour felling, low-density straw wattles, raking and mulching, hydromulching near roads, seeding. Culvert inlet protection, monitoring, and maintenance
Canon de Valle	Low to Moderate	NM 501 and Anchor Ranch Road culverts, monitoring wells	Localized sheet wash and flash runoff in stream channels in the burned area. Flooding in main channel below. Contaminant transport	Burn is extensive in upper watershed but relatively small percentage is of high burn severity. Projected storm flow is moderate at the NM 501 culvert. Relatively large inventory of contaminants discharged from a high explosive machining facility and present in canyon bottom sediments. Borrow pit east of NM 501 could be utilized as detention structure	Contour felling, low density straw wattles, raking and mulching, seeding. Culvert inlet protection, monitoring, and maintenance. Modification of borrow pit to enhance storage of water and sediment
Potrillo Canyon	Low	NM 4 culvert	Localized sheet wash and possible increase in runoff in stream channels in the burned area. Possible flooding in main channel below. Contaminant transport	Limited area of low severity burn in headwaters. Projected storm flow increase is low. Contaminants dispersed in canyon bottom from open air testing	None

Watershed	Risk Rating	Values at Risk / Resources to be Protected	Risk Factors / Threats	Comments	Recommended Treatments
Pajarito Canyon, Two mile Canyon, Three mile Canyon	Moderate to High	TA-18 structures, NM 501, NM 4, Anchor Ranch Road, Pajarito Road, and Sherwood Drive culverts, utilities, water supply well, White Rock homes	Localized sheet wash and flash runoff in stream channels in the burned area Flooding in main channel below. Contaminant transport	Upper end of watershed has a lot of high burn severity. Local areas of high burn severity on LANL land in Two mile and Pajarito drainages Extensive low burn severity in Three mile Canyon basin. Projected storm flows in main stem Pajarito, South Fork of Pajarito, and Two-mile Canyon are high at the NM 501 culverts NM 501 culverts undersized, with very high potential for road to be overtopped at Two mile Canyon and South Fork Pajarito Canyon where little floodwater storage capacity exists west of road. Main stem Pajarito Canyon has larger storage capacity west of road, but has potential for overtopping and erosion of road fill At three drainages have additional culverts at Anchor Ranch Road a short distance to the east Structures at TA-18 located in floodplain Culvert at TA-18 has security grate on downstream side, with high potential for blocking culvert Pajarito Road has two channel crossings with culverts Homes present close to channel near NM 4 crossing Sherwood Drive crossing in White Rock. Borrow pits with wetlands present along Pajarito Road between TA-18 and White Rock and provide potential for flood attenuation. Incomplete data on possible contaminants along stream channel	Contour felling, low density straw wattles, raking and mulching, stream grade control, debris removal, hydromulching along roads, stream debris removal, seeding, road drainage, reinforcement of TA-18 Culvert inlet protection, monitoring, and maintenance Enhance capacity of borrow pits along Pajarito Road to attenuate floodwaters Potential transbasin diversions Trash racks above critical infrastructure TA-18, and State Roads 501 and 4 Monitoring of high flows at TA-18, and State Roads 501 and 4 Contingency plan for equipment capable of removing debris during high flows at stream crossings at TA-18, and State Roads 501 and 4
Canada del Buey	Low	NM 4 culvert, White Rock homes	Localized sheet wash and flash runoff Contaminant transport	Burn is extensive but predominantly low or moderate burn severity. Projected stormflow increase is low. Homes present close to channel downstream of NM 4 crossing Incomplete data on possible contaminants along stream channel, but little contamination expected	Seeding Monitor flows above White Rock. Contingency plan for equipment capable of removing debris during high flow at stream crossing

Watershed	Risk Rating	Values at Risk / Resources to be Protected	Risk Factors / Threats	Comments	Recommended Treatments
Mortandad Canyon	Low	LANL sediment traps, San Ildefonso Pueblo sacred area, monitoring wells, utilites, NM 4 culvert	Localized sheet wash and flash runoff Contaminant transport	Burn is extensive but predominantly low burn severity. Projected storm flow increase is low. Relatively large inventory of contaminants discharged from radioactive liquid waste treatment plant and present in canyon bottom sediments	Seeding Flow montoring Channel debris removal above traps Consider enlarging traps Armor and upgrade trap spillways
Sandia Canyon	Low	East Jemez Road, utilites, NM 4 culvert	Localized sheet wash and flash runoff Contaminant transport	Burn is extensive but predominantly low burn severity. Projected storm flow increase is very low. Incomplete data on possible contaminants along stream channel, but little contamination expected.	Seeding Receive transbasin diversion from Los Alamos Canyon
Los Alamos Canyon	High	Los Alamos Reservoir, Omega West reactor at TA-2, TA 41 structures, several main utility corridors, water supply well, monitoring wells, NM 4 culvert, ice rink, NM 502 road crossing at confluence with Pueblo Canyon, Totavi, San Ildefonso Pueblo houses	Localized sheet wash and flash runoff in stream channels in the burned area Flooding in main channel below Contaminant transport	Headwaters in Quemazon Canyon have considerable high severity burn. Several critical facilities and utility corridors are located in canyon bottom. Relatively large inventory of contaminants discharged from radioactive liquid waste treatment plant and present in canyon bottom sediments. Several houses located near channel on San Ildefonso Pueblo land	Contour felling, log erosion barriers, high density straw wattles, raking and mulching hydromulching roads and hillslopes, stream grade control, debris removal, seeding, LANL reinforcement of TA 41, reinforcement of utility corridors, protect (armor, brace, bury) cross-canyon pipelines Los Alamos Reservoir drainage, dredging, dam stabilization, possible increase in storage Culvert inlet protection, monitoring and maintenance Road fill protection Clean reservoir between major contributing events Possible transbasin diversion Early warning system for TA-18 Equipment staged at upstream box culvert inlet to TA 41 to remove large floatable debris during high flow Protect or remove process lines in culverts

Watershed	Risk Rating	Values at Risk / Resources to be Protected	Risk Factors / Threats	Comments	Recommended Treatments
Pueblo Canyon	High	Diamond Drive crossing, sewage treatment pipeline system, Los Alamos residential areas, San Ildefonso Pueblo houses	Localized sheet wash and flash runoff in stream channels in the burned area Flooding in main channel below Sewage contamination Contaminant transport	Pueblo Canyon is virtually 100% high burn severity. The Diamond Drive crossing and nearby North Road crossings provide the only paved access to the north half of Los Alamos, and dirt roads to the north are at high risk from flash flooding. The Los Alamos sewage treatment system is located at the lower end of Pueblo Canyon with a main sewer line down the canyon and several incoming feeder lines down the canyon sidewalls. The sewer system is at risk from flooding. Residences in North Community of Los Alamos occur at base of slopes and near School Canyon below high severity burn areas. Pueblo Canyon drains into Los Alamos Canyon upstream of residences on San Ildefonso Pueblo. Relatively large inventory of contaminants discharged from radioactive liquid waste treatment plant and present in canyon bottom sediments	Contour felling, log erosion barriers, high density straw wattles, raking and mulching, hydromulching roads, stream grade control, debris removal, seeding. Culvert inlet protection, monitoring, and maintenance Armor up gradient and down gradient road fill Early warning system Equipment staged to remove large woody debris (LWD) Remove LWD from main channel above State Road 501. Protect downstream infrastructure
Rendija Canyon	High	Roads in Ponderosa Estates subdivision, pump station and utility lines for water supply system	Localized sheet wash and flash runoff in stream channels in the burned area Flooding in main channel below	Rendija Canyon has a very high amount of high burn severity and poses considerable risk of flash flooding. Access to residences in northern part of Ponderosa Estates at risk from flooding. Pump station in lower canyon located at outside of meander bend and at risk from undercutting. Utility lines in canyon bottom at risk	Contour felling, low-density straw wattles, hydromulching along roads, stream grade control, debris removal, pump station and power pole protection, seeding. Culvert inlet protection, monitoring, and maintenance
Guaje Canyon	Moderate	Roads, well heads for Los Alamos water system, NM 502 culvert	Localized sheet wash and flash runoff in stream channels in the burned area Flooding in main channel below	Most of Guaje Canyon is low burn severity except for the middle section, which is high. Rendija Canyon is a major tributary that has a high potential for flash flooding. Large borrow pit present in lower canyon above NM 502, which should help attenuate floodwaters and trap sediment	Log erosion barriers, power pole protection, hydromulching roads, stream grade control, seeding Enhancement of capacity of borrow pit to attenuate floodwaters and trap sediments

Watershed	Risk Rating	Values at Risk / Resources to be Protected	Risk Factors / Threats	Comments	Recommended Treatments
Chupaderos Canyon	Moderate	Roads, cultural sites	Localized sheet wash and flash runoff in stream channels in the burned area	Chupaderos Canyon has multiple cultural resource sites in need of protection	Cultural site protection, stream debris removal
Garcia Canyon	Moderate	Roads cultural sites	Localized sheet wash and flash runoff in stream channels in the burned area	USFS road in Garcia Canyon is in a floodplain Several cultural resource sites in need of protection	Close USFS road, contour felling cultural site protection, seeding
Santa Clara Canyon	Moderate	Threat to life at roads & recreational areas, also stock ponds, utility line, transformer site, well, water line, cultural sites, community of Santa Clara (NM 30) sedimentation at inlet to irrigation system	Localized sheet wash and flash runoff in stream channels in the burned area	Although not heavily burned, the Santa Clara Canyon watershed and tributaries (Sawyer and Siouyacongae) have developments in or near channels that have burned headwaters BIA road 602 crosses several of these drainages (Sawyer at Puye Cliffs, the two drainages with stock ponds, and Santa Clara Canyon) Model stormflow in Santa Clara Pueblo at NM 30 to determine burned area contribution to storm runoff and potential flood risk (collaborate with NRCS and State HWY and Transp Dept)	Contour felling low density wattles, debris basins, power pole protection, stream debris removal seeding road drainage, enlarge culverts at stock ponds clean fish ponds, remove floatable debris, transfer station and well protection, rock drainage culverts, remove slash piles from Sawyer Canyon, Sign stream crossings along BIA road 602 and recreational areas in Santa Clara Canyon Close Santa Clara Canyon from midway between fishpond 2 and 3 down entire stream during forecasted rain events
Apache Mesa Draw	Low	Threat to life at Upper Crossing Trail	Localized sheet wash and flash runoff in stream channel within and below burn	Narrow confined channel at stream crossing Vegetation conceals burned watershed above trail	Post flood hazard signs, rock armor downstream side of trail crossing remove floatable debris from channel above trail, flag stream channel, place water bars on old logging road

Table 12. Predicted USLE Soil Loss and Estimated Soil Delivery by Subwatershed. Channel sediment yield under current conditions (post-fire and pre-mitigation) using the following burn severity factors: High (2.0 cubic yards/foot); Moderate (1.0 cubic yards/foot); Low (0.5 cubic yards/foot).

Watershed Name	BAER Label	LANL Label	Predicted Soil Loss (Total Tons)		Estimated Soil Delivery (Total Tons)		
			Pre-Fire	Post-Fire	Pre-Fire <	Post-Fire	Post Treat
Santa Clara Canyon	SC1	n/a	60	750	0.6	75	60
Santa Clara Tributaries	SC2	n/a	163	1060	1.63	106	84.8
	SC3	n/a	159	822	1.59	82.2	65.76
	SC4	n/a	135	496	1.35	49.6	39.68
	SC5	n/a	34	147	0.34	14.7	11.76
	SC6	n/a	62	147	0.62	14.7	11.76
	SC7	n/a	11	59	0.11	5.9	4.72
Subtotal			564	2731	5.64	273.1	218.48
Garcia Canyon	GAR1	GAR1	176	1065	1.76	106.5	85.2
	GAR2		n/a	n/a	n/a	n/a	n/a
Subtotal			176	1065	1.76	106.5	85.2
Chupaderos Canyon	C1	C1	120	416	1.2	41.6	33.28
Guaje Canyon	G1	G1	291	2643	2.91	264.3	211.44
	G2	G2	122	417	1.22	41.7	33.36
	G4	G4	n/a	n/a	n/a	n/a	n/a
	G5	G5	n/a	n/a	n/a	n/a	n/a
Subtotal			413	3060	4.13	306	244.8
Rendija Canyon	REN1	REND	179	2404	1.79	240.4	192.32
(trib to Guaje)	REN2		65	459	0.65	45.9	36.72
Subtotal			244	2863	2.44	286.3	229.04
Barrancas Canyon	BAR1	BAR1	n/a	n/a	n/a	n/a	n/a
(trib to Guaje)	BAR2	BAR2	n/a	n/a	n/a	n/a	n/a
	BAR3	BAR3	n/a	n/a	n/a	n/a	n/a
	BAR4	BAR4	n/a	n/a	n/a	n/a	n/a
Subtotal			n/a	n/a	n/a	n/a	n/a
Bayo Canyon	BAY1	BAY1	n/a	n/a	n/a	n/a	n/a
(trib to Los Alamos)	BAY2	BAY2	n/a	n/a	n/a	n/a	n/a
	BAY3	BAY3	n/a	n/a	n/a	n/a	n/a
Subtotal			n/a	n/a	n/a	n/a	n/a
Pueblo Canyon	PUE1	PUE1	78	903	0.78	90.2	72.16
(trib to Los Alamos)	PUE2	PUE2	30	216	0.3	21.6	17.28
	PUE3	PUE3	n/a	n/a	n/a	n/a	n/a
Subtotal			108	1118	1.08	111.8	89.44
Los Alamos Canyon	LA1	LA1	110	1191	1.1	119.1	95.28
	LA2	LA2	30	303	0.3	30.3	24.16
	LA3	LA3	n/a	n/a	n/a	n/a	n/a
	LA4	LA4	n/a	n/a	n/a	n/a	n/a
	LA5	LA5	n/a	n/a	n/a	n/a	n/a
	LA6	LA6	n/a	n/a	n/a	n/a	n/a
Subtotal			140	1493	1.4	149.3	119.44

Watershed Name	BAER Label	LANL Label	Predicted Soil Loss (Total Tons) Pre-Fire	Predicted Soil Loss (Total Tons) Post-Fire	Estimated Soil Delivery (Total Tons) Pre-Fire <	Estimated Soil Delivery (Total Tons) Post-Fire	Estimated Soil Delivery (Total Tons) Post Treat
Sandia Canyon	SAN1	SAN1	22	24	0.22	2.4	1.92
	SAN2	BAS2	n/a	n/a	n/a	n/a	n/a
	SAN3	BAS3	n/a	n/a	n/a	n/a	n/a
	SAN4	BAS4	n/a	n/a	n/a	n/a	n/a
Subtotal			22	24	0.22	2.4	1.92
Mortandad Canyon	MOR1	MOR1	20	29	0.2	2.9	2.32
	MOR2	MOR2	22	24	0.22	2.4	1.92
	MOR3	MOR3	24	55	0.24	5.5	4.4
	MOR4	MOR4	74	88	0.74	8.8	7.04
	MOR5	MOR5	n/a	n/a	n/a	n/a	n/a
	MOR6	MOR6	n/a	n/a	n/a	n/a	n/a
Subtotal			140	196	1.4	19.6	15.68
Canada del Buey	CAN1	CAN1	56	96	0.56	9.6	7.68
	CAN2	CAN2	n/a	n/a	n/a	n/a	n/a
Subtotal			56	96	0.56	9.6	7.68
Pajarito Canyon	PAJ1	BAS1	93	1051	0.93	105.1	84.08
	PAJ2	BAS2	67	433	0.67	43.3	34.64
	PAJ3	2-MI	60	328	0.6	32.8	26.24
	PAJ4	BAS4	34	37	0.34	3.7	2.96
	PAJ5	3-MI	57	62	0.57	6.2	4.96
	PAJ6	BAS6	0	0	0	0	0
	PAJ7	BAS7	n/a	n/a	n/a	n/a	n/a
Subtotal			311	1911	3.11	191.1	152.88
Water Canyon	WAT1	BASW1	81	950	0.81	95	76
	WAT2	BASW2	52	162	0.52	16.2	12.96
	WAT4	BASW3	3	3	0.03	0.3	0.24
	WAT5	BASW4	n/a	n/a	n/a	n/a	n/a
	WAT7	BASW5	n/a	n/a	n/a	n/a	n/a
(Canon de Valle)	VAL1	BASV1	84	1983	0.84	198.3	158.64
	VAL2	BASV2	22	34	0.22	3.4	2.72
	VAL3	BASV3	19	32	0.19	3.2	2.56
(Fence Canyon)	FEN1	BASF1	n/a	n/a	n/a	n/a	n/a
(Potrillo Canyon)	POT1	BASP1	19	21	0.19	2.1	1.68
	POT3	BASP3	n/a	n/a	n/a	n/a	n/a
Subtotal			280	3185	2.8	318.5	254.8
Ancho Canyon	ANC1	BAS1	n/a	n/a	n/a	n/a	n/a
	ANC3	BAS4	n/a	n/a	n/a	n/a	n/a
	ANC5	BAS5	n/a	n/a	n/a	n/a	n/a
(Frijoles Mesa Canyon)	FM1	BAS2	2	3	0.02	0.3	0.24
(unknown canyon)	UNK1	BAS3	n/a	n/a	n/a	n/a	n/a
Subtotal			2	3	0.02	0.3	0.24
Frijoles Canyon	FRJ1	n/a	39	128	0.39	12.8	10.24
	FRJ2	n/a	14	35	0.14	3.5	2.8
	FRJ3	n/a	14	128	0.14	12.8	10.24
Subtotal			67	291	0.67	29.1	23.28
TOTAL							

RECOMMENDATIONS

1. Management (specification related)

Due to the imminent threat of flooding in the Cerro Grande Fire area, several watershed rehabilitation treatments are recommended to attenuate the projected watershed emergency. Treatments identified in Table 8, *Summary of Watershed Risk Analysis*, and shown on the map of Watershed Treatments (see appendix), are described in more detail below and correspond to specifications to be implemented.

1. **Log Erosion Barriers:** Situation: Several areas within the burn have high burn severity and soils that are strongly hydrophobic. These sites are very susceptible to surface soil erosion and will increase the surface runoff efficiency due to reduced soil permeability.

   Recommendation: Install Log Erosion Barriers (LEBs) on key portions of these hill-slopes to trap eroded soil and reduce runoff efficiency. LEBs are medium diameter logs (5-14 inches), fallen parallel to the slope contour, keyed behind other standing trees or stumps, with small basins dug into the uphill side of the log. The LEBs will only be installed on slopes that are smooth and straight (not on undulating slopes, nor slopes with surface rocks and stones). (BAER-Spec. # 1, W-4a, Log Erosion Barriers).

2. **Contour Raking:** Situation: There are portions of the high burn severity area with hydrophobic soil conditions that will shed rainfall, increasing runoff and surface soil erosion. The hydrophobic layer is approximately 1/8 to ¼ inch below the surface, and it is approximately ¼ inch thick. In some cases this condition can last for several years.

   Recommendation: Reduce the hydrophobic condition immediately on slopes that have high burn severity, are strongly hydrophobic, and contain soils with low surface rock content by contour raking slopes to a depth of ¾ to 1 inch. Use McClouds to accomplish the racking. After raking, seed and mulch these sites. (BAER Spec. #2, W-6a, Contour Raking).

3. **Contour Tree Felling:** Situation: Soils on many of the high burn severity areas are strongly hydrophobic. These sites are susceptible to surface soil erosion and will increase the surface runoff efficiency due to the reduced soil permeability. Some of the steep sites have more surface rock content than flatter slopes and present a safety concern for crews. Therefore contour felling is a more desirable treatment than LEBs.

   Recommendation: Contour fell standing snags on high burn severity sites on steeper slopes that have more surface rock than sites where Log Erosion Barriers (LEBs) are recommended. Felling trees on contour will reduce soil erosion and runoff efficiency. (BAER Spec. #4, W-6b, Contour Tree Felling).

4. **Straw Mulching:** Situation - Areas with high burn severity have no organic litter remaining on the soil surface. Application of mulch reduces the surface soil temperature, decreases erosion, and increases the success of grass seeding.

   Recommendation: Apply light straw mulch on sites where soil erosion potential is high and where a transportation system is available for bringing in straw bales. (BAER-Spec. #5, W-2a, Straw Mulching and #23, W-2b, Slope Stabilization).

5. **In-Stream Grade Control Structures:** Situation: Several stream channels in the fire area have entrained large volumes of fine to medium sediments (3 to 4 feet deep and 10 to 20 feet wide). These channels have few or no natural grade controlling structures (e.g. rocks or logs). With additional runoff following the fire there is a high potential for eroding these sediments downstream.

   Recommendation: Install log, rock, or straw-wattle grade control structures in stream channels, where these structures can be successfully installed to trap eroded soils moving downstream. (BAER Spec. #6, W-4d, Stream Grade Control Structures – Log, Rock and Straw Wattle).

6. **Contour Straw Wattle:** Situation: Steep slopes in high burn severity areas are subject to sheet wash, rill erosion and dry ravel. Straw wattles function as terraces to reduce erosion and facilitate revegetation.

   Recommendation: Place straw wattles on slopes identified for treatment where log erosion barriers and contour felling are less effective and more dangerous to workers. Straw wattles work well on steep slopes with more irregular micro-topography and on rocky surfaces when a barrier with flush contact to the ground is needed. (BAER Spec. #7, W-6c, Contour Straw Wattle – Slope Treatment).

7. **Clean Culverts:** Situation: Many of the culverts throughout the area of the fire are either undersized for the anticipated flows or are partially plugged with alluvial deposits.

   Recommendation: Remove sediment, debris, trash, floatable material and small trees from culverts and the floodplain above culverts to allow culverts to provide some of their functional purpose. (BAER Spec. #10, S-5, Clean Culverts).

8. **Aerial Seeding:** Situation - The fire area has many acres of moderate or severe burn severity. Natural revegetation on these sites will be too slow to prevent additional runoff and soil erosion.

   Recommendation: Grass seeding is recommended for the moderate and high burn severity areas of the fire area in order to reduce soil erosion, protect soil productivity and reduce run-off. The seed mix should be a combined mixture of warm-season, cool-season and nurse-crop seed mix. (BAER Spec. #11, W-1a, Aerial Seeding).

9. **Enhance Catchment Basins:** Situation – Headwaters of a Santa Clara tributary known locally as "Siouyacongae" have many acres of high and moderate burn severity with strongly hydrophobic soils. Such conditions allow for accelerated runoff and increased erosion. Steep slopes in this watershed contribute to a quick response to storm events, culminating in increased risk of floodwaters and debris torrents. Downstream values at risk include a stream along BIA Road 602 plus a power line and waterline supplying Puye Cliffs visitor center and campground. Two stock ponds exist along channels of "Siouyacongae."

   Recommendation – Enlarge existing stock ponds to serve as catchment basins for anticipated runoff, sediment, and debris to ameliorate downstream effects. Armor inlets and outlets for these ponds to reduce the risk of breaching and to maintain the integrity of the ponds. (BAER Spec #21, W-4b, Enhance Catchment Basins).

10. **Clean out Catchment Basins:** Situation – Two stock ponds and two fishponds on Santa Clara Pueblo lands can serve as catchment basins. In addition, three catchment basins will be constructed on National Forest lands. Based on past runoff events after local wildfires, it is anticipated that these basins will fill with sediment and

debris after each large storm event. An average of four storms per year have produced major runoff events in this area. Generally, after three years vegetation and soil conditions improve enough to reduce runoff.

Recommendation – schedule cleanout of these basins after each runoff event to restore capacity for future storm events. Anticipate four cleanouts per year for three years. (BAER Spec #22, W-4c, Cleanout Catchment Basins).

11. **Remove Small Floatable Debris in Stream Channels – Manual Method:** – Situation - Several tons of floatable debris lie upstream of culverts and infrastructure. Plugging and failure of drainage structures and damage to infrastructure such as water, sewer, and gas lines is likely.

    Recommendation – manually remove debris greater than 3 inches from stream reaches in Los Alamos, Rendija, Pajarita, Water, Pueblo, and Garcia Canyons to locations above flood stage. (BAER-Spec #35, W-9c, Manual Cleanout of Stream Debris).

12. **Remove Large Floatable Debris from Stream Channels - Manual and Aerial Method:** Situation – Large debris capable of moving downstream during high runoff lies upstream of culverts and infrastructure. Plugging and failure of drainage structures and damage to infrastructure such as water, sewer, and gas lines is likely. Los Alamos and Rendija Canyons contain very large fallen trees and debris. Not all debris could be cut into pieces small enough for manual removal.

    Recommendation – manually remove debris greater than 3 inches, up to a size and weight that an average adult can lift. All remaining large debris within the channels should be bundled and lifted by helicopter to locations above flood stage. (BAER Spec #34, W-9-b, Aerial and Manual Cleanout of Stream Debris).

13. **Assess Structures at Flood Risk:** Situation – Altered watersheds in the fire area will produce increased flows at magnitudes not seen before in downstream channels. Structures (many homes) are located in canyons not identified previously as floodplain. A more definitive delineation of flooding potential is needed to identify structures at risk.

    Recommendation – Assess flood stage for multiple flow discharges along canyons that head within the burn area and identify structures at risk to flooding under altered flow regimes. (BAER Spec #25, W-10, Assess structures at flood risk).

14. **Protect Power line Poles:** Situation – Several power line poles are located in the canyon bottoms of Rendija, Guaje and "Siouyacongae" Canyons. Flood flows are likely to scour around the base of these poles, cause toppling or breakage, and result in a disruption in power supply to water supplies.

    Recommendation – Place boulders greater than 24 inches around poles to a minimum height of 4 feet to reduce risk of scour and breakage of poles. (BAER Spec #19, I-1a, Protect power line poles).

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15. **Protect wellhead and transformer:** Situation – A wellhead, which supplies water to the Puye Cliff visitor center and campground along with an electrical transformer, are located at the confluence of Santa Clara and "Siouyacongae" Canyons. Flooding may occur in both canyons, putting the wellhead and transformer at risk of contamination and failure.

    Recommendation – Sandbag the perimeters of both the wellhead and the transformer to a minimum height of 2 sandbags to protect from floodwaters. (BAER Spec #20, I-1b, Protect wellhead and transformer).

16. **Armor road crossings:** Situation – As culvert capacity is overwhelmed a vortex can form in the upstream opening, resulting in scour that can threaten the integrity of the fill. If the road is overtopped, downstream fill can develop deep rills that may undercut the crossing.

    Recommendation – Armoring upstream and downstream faces of road crossings will reduce road failures related to scour and rill erosion. Typically the rock used for this treatment is angular 20" minus. Contact NRCS for specifications for size and quantity.

17. **Remove debris from culverts during flow:** Situation – During the rising limb of the hydrograph (when channels fill with flood water) turbulent flow will mobilize debris and material within the channel.

    Recommendation – Use a track-hoe or other appropriate equipment to unblock culverts. This should be done cautiously with an evacuation plan in place for the operator and equipment. This is not recommended if the road is on the verge of overtopping. Contact county Emergency Planning for location and specifications.

18. **Detain high flows:** Situation – Upstream treatments will not reduce all the potential flooding threats to certain facilities.

    Recommendation – There are limited possibilities for "skimming" water from an anticipated flood and redirecting that flow into temporary detention storage that can release flow back into the channel network at a slower rate. Work with NRCS, BOR and State Engineer for specifications.

19. **Increase capacity of existing structures:** Situation – Upstream treatments will not reduce all the potential flooding threats to certain facilities.

    Recommendation – Functioning impoundments (basins) should be evaluated for the potential to add permanent or temporary storage. Structural improvements must take into account the need for additional spillway capacity. Dredging for increased capacity should be considered after major runoff events. Work with NM State Engineer, NRCS and BOR for specifications.

20. **Trans-basin diversions:** Situation – Some canyons sustained higher burn severity, with greater potential for flooding and debris flows, than adjacent canyons. Additionally, certain canyons contain structures that are at risk for debris-flow damage.

    Recommendation – Where feasible, there are limited opportunities for trans-basin diversion to redirect high flows away from threatened facilities into a watershed with much less burn severity. A potential example of this could be a diversion from Los

Alamos Canyon (above the Ice Rink) to Sandia Canyon. Work with State Engineer, NRCS and BOR for specifications.

21. **Directional Tree Felling into Small Channels:** Situation – In upper Los Alamos Canyon and other subwatersheds there are a few 1st and 2nd order streams in ravines too steep for contour felling. Anticipated flows could move substantial debris through these feeder channels into the main canyons.

    Recommendation – Create stable log jams to trap debris and bedload. Precision fellers will drop large trees on opposite sides of a ravine so that the trees are angled slightly upstream with their crowns stacked in the channel and their trunks secured on the slopes. The felled trees will be cabled to standing trees for additional security. Logjams will be placed at approximate 75-foot intervals in appropriate channel reaches. (BAER Spec #57, W-4g, Channel Tree Felling).

22. **Install RAWS :** Situation – The community of Los Alamos, LANL and recreational areas in the Santa Clara Reservation and Santa Fe National Forest are located in and immediately downslope from headwater basins that have large areas of high and moderate burn severity. Inhabited areas of Santa Clara Pueblo Reservation and San Ildefonso Pueblo Reservation are located in downstream reaches below where tributaries of burned headwaters converge. The lives of people living, working and recreating in these areas are at risk of being caught in a flood or debris flow situation due to close proximity to flood-source areas or convergence of several channels accommodating storm flow.

    Recommendation – Install Remote Automatic Weather Stations (RAWS) in the mid- to upper slope range of watersheds that have high and moderate burn severity. Connect RAWS to the local emergency response dispatch center. Set RAWS to trigger a Flash Flood Warning of areas at risk when rain gages record sustained rain fall at a rate of one inch per hour. (BAER Spec #56, S-10, Public Safety, RAWS). Install fencing around RAWS units where needed. (BAER Spec #61, S-11, Public Safety, Fencing).

23. **Sediment Traps:** Situation – sites in Corral Canyon adjacent to Forest Road 445C,are suitable for developing sediment traps.

    Recommendation – Sediment traps should be constructed down gradient (within 200 ft.) of the crossing of Forest Road 445C and Corral Canyon and designated tributaries of Corral Canyon (BAER Spec #45, W-4f, Sediment Traps/Check Dam Structures).

2. Monitoring (specification related)

1. **Monitor Water Quality:** Situation – The burn intensities, area burned, and subsequent impacts on soils and vegetation put surface water quality at risk.

   Recommendation – Monitor water quality after significant storm-flow events for the next three years at selected points with the Santa Clara Pueblo, San Ildefonso Pueblo and National Forest System lands (BAER Spec. 59 M-1, Water Quality Monitoring).

Other assessments provide monitoring recommendations pertinent to various of the above recommended actions. Depending on weather events and apparent initial success of rehabilitation efforts, expended effectiveness monitoring may be needed for several or all of these recommended actions for the next three years.

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3. **Management (non-specification related)**

1. See U. S. Bureau of Reclamation recommendations for dam/embankment safety in "Breach Analysis of Los Alamos Reservoir," "Breach Analysis of Diamond Avenue Fill Bridge," "Analysis of Dam Break Floods in Pajarito Canyon," and "Analysis of Breach of Fill Bridge on Diamond Avenue across Pueblo Canyon - Summary. " (Wahl, Greimann, and Wittler, this document).

2. **Assessment of Flood Impact and Overflow Potential at Stock Pond #2 and Stream Crossing Above Stock Pond #1 on BIA Road 602:** Situation – These sites on the Santa Clara Reservation are upstream and contiguous to the primary access road into and through the interior of the reservation, which receives a lot of use. There are public safety concerns that neither the stock pond, nor the road fill will be able to withstand some of the stormflows that were modeled for this watershed.

   Recommendation – The Santa Clara Tribe should submit a technical assistance request to the NRCS to evaluate the hydrologic impacts to each of these structures and their inlets. Acre-feet capacity should also be determined and consequences of water and sediment retention failure. The NRCS should scope resolutions and provide a recommendation to the tribe. Santa Clara tribe may hire a consultant as a technical representative to work with the NRCS.

3. **Protection of Structures:** Situation - Los Alamos National Laboratory and Los Alamos County have many structures in canyon bottoms that are at risk from flooding, including LANL Technical Areas, well houses, pump stations, and the Skating Rink.

   Recommendation - LANL and Los Alamos County should systematically evaluate and implement methods to protect structures in canyon bottoms from flood damage. Flood protection measures should include maintenance of culverts, jersey barriers, or other obstructions to deflect large woody debris, and possibly channel rerouting and/or detention structures in canyon bottoms.

4. **Road Crossing Improvement:** Situation - Many road crossings have culverts that are underdesigned for expected floods and that may impound floodwaters when blocked by large amounts of sediment and/or woody debris. These crossings are susceptible to failure if water backs up and overtops the road fill, leading to disruption of the road system and possible generation of breach floods.

   Recommendation - LANL and Los Alamos County should systematically improve road crossings downstream of slopes with high or moderate burn severity. Culverts should be cleaned and designed to function during floods carrying large amounts of sediment and woody debris. Culvert design for major drainages with thick road fills could include vertical perforated stand pipes 1.5 times the diameter of the culvert with anti-vortex collars to allow drainage and trash racks to prevent blockage by floating debris. Standpipes should be keyed in at least 1 foot of concrete to provide stability. Downstream sides of major road crossings should be armored or otherwise protected from erosion if floodwaters overtop the road. Upstream sides of these crossings should be lined to minimize infiltration to help prevent seepage failure of the fills and armored to prevent erosion. Channels immediately downstream of major crossings may need armoring to minimize scour from floodwaters. Areas upstream of the crossings may require maintenance after floods to remove sediment and woody debris. Use of a track hoe with an arm to remove logs from the impoundments during floods may be required to ensure the stability and effectiveness of the standpipes.

5. **Floodwater Detention:** Situation – Old borrow pits near channels in several watersheds affected by the fire could be utilized and enhanced for purposes of decreasing flood discharges and trapping sediment. These include Cañon de Valle below NM 501 and Pajarito Canyon between TA-18 and White Rock, both on LANL land, and Guaje canyon above NM 502 on San Ildefonso Pueblo land. It may also be possible to construct new detention structures in critical watersheds.

   Recommendation - Enhance ability of existing borrow pits to decrease flood peaks and consider construction of new detention structures in critical drainages. Any such work needs to consider design flood flows and possible adverse affects of overtopping of detention structures.

6. **Protection of Utility Lines and Processing Lines:** Situation - Los Alamos National Laboratory and Los Alamos County have many utility lines and processing lines in canyon bottoms that are at risk from flood damage. Pipes suspended above channels could dam floating debris and/or be severed.

   Recommendation: LANL and Los Alamos County should evaluate methods to prevent or reduce damage to lines in canyon bottoms and/or establish contingencies in case flood damage occurs. Wastewater lines should be shut off in the event of flood damage to minimize contamination of canyon bottoms. Small diameter pipes suspended above stream channels or shallowly buried should be removed or relocated.

7. **Protection of Monitoring Wells:** Situation - Los Alamos National Laboratory has many monitoring wells in canyon bottoms that may be subject to flood damage by bank erosion, channel scour, and/or impacts from large woody debris.

   Recommendation - Install steel pipes set in concrete and/or other barriers to help protect wells from damage by floating debris. Bank stabilization may also be appropriate in some cases.

8. **Floodwater Diversion:** Situation - Because of the location of LANL Technical Areas TA-2, TA-18, and TA-41 on floodplains in Los Alamos Canyon and Pajarito Canyon, downstream of extensive areas with high burn severity and expected major increases in runoff, extraordinary methods involving large-scale diversion of floodwaters may be required to reduce the flooding risk to acceptable levels.

   Recommendation: LANL should consider diversion of floodwaters from Los Alamos Canyon and/or Pajarito Canyon and its major tributaries into nearby areas where the impact of floodwaters would be less. For example, a large trench excavated along the north wall of Los Alamos Canyon from the vicinity of the Skating Rink could allow diversion of floodwaters into Sandia Canyon or into Los Alamos Canyon downstream from TA-2. Similarly, trenches may allow the diversion of floodwaters from the Pajarito Canyon basin into Cañon de Valle. Any such potential diversions should be designed by licensed engineers and should consider possible floodwater discharges, the probability for damage to critical structures, and the level of acceptable risk.

9. **Reduction of Runoff on Los Alamos National Laboratory Land:** Situation – There is strong potential for structural impacts and contaminant transport at LANL. Moderate and high severity burn areas at LANL are expected to increase storm runoff relative to pre-burn conditions. Although modeling indicates a relatively small hydrologic impact from LANL, treatment of these areas is important because of the risk of contaminating floodwater, and will reduce local runoff and may reduce the size of some floods downstream.

Recommendation - If LANL desires to take all reasonable actions possible to reduce runoff from burned slopes, the following prescriptions are recommended for all moderately and severely burned slopes. 1) Aerial seeding using a seed mixture approved by LANL, including a fast growing, non-persistent annual to provide rapid soil stabilization. 2) For hydrophobic soils, mechanically break up or scarify the soil on contour using hand rakes or tractors with tines or brush rakes. 3) For non-hydrophobic soils on smooth slopes between 10% and 60%, install log erosion barriers (LEBs, or log terraces) along contour. 4) For non-hydrophobic soils on hummocky topography or slopes with abundant rocks, install straw waddles along contours. 5) Hydromulch all slopes reachable from roads or from vehicles, and use a weed-free straw mulch in remaining areas. 6) Lop and scatter burned branches to increase ground cover; in piñon-juniper woodland, branches thinned from adjacent areas of low burn severity can also be scattered. Note that since piñon-juniper woodlands typically provide relatively high runoff at LANL, additional reductions in runoff could be achieved by using similar lop and scatter methods on unburned areas and areas with low burn seventy.

D. **Future Assessment or Analysis Needs (non-specification related)**

1. **Assessment of Flood Magnitude Impacting Los Alamos County and Los Alamos National Laboratory:** Situation - Exceptionally large floods are expected to occur in and downstream of the burn area and potentially impact Los Alamos County and LANL. Preparations for these floods necessarily rely on rainfall-runoff models that have numerous assumptions and that could either overestimate or underestimate actual flood magnitude. Refinement of rainfall-runoff models during the rainy season using site specific data would allow modifications to response plans if necessary.

   Recommendation: LANL and/or other entities should install a dense network of temporary rain gauges in headwater basins west of LANL and collect discharge data from the major drainages west of LANL to rapidly validate existing rainfall-runoff models and to refine these models if required. Design of a stream gauging system needs to anticipate the exceptionally large floods expected after the fire and possible impoundment of floodwaters above road crossings. Site-specific data on infiltration and runoff characteristics from hillslopes with varying degrees of burn severity and hydrophobicity would aid in model validation.

2. **Assessment of Contaminant Transport from LANL:** Situation - A variety of contaminants, including radioactive wastes, occur in canyon bottoms affected by LANL operations, and are susceptible to remobilization by flooding and transport offsite. A program is required to measure the concentrations and amounts of contaminants transported by floods and deposited offsite and to identify specific locations that may require stabilization or excavation during the rainy seasons if unacceptable downstream impacts are found or anticipated. Better knowledge of pre-existing contaminants and any new contaminants related to the fire (e.g., runoff from burned buildings, fire retardant, and ash) are also required as a baseline.

   Recommendation - LANL should implement a systematic monitoring program that 1) measures flood discharge, sediment concentrations, and contaminant concentrations at the eastern LANL boundary, 2) evaluates contaminants in off-site sediment deposits resulting from post-fire floods, and 3) identifies specific source areas for erosion of contaminated sediment. Design of the monitoring system needs to anticipate the exceptionally large floods expected after the fire. Evaluation of contaminant source areas should incorporate detailed documentation of pre-fire channel characteristics using surveyed cross sections and other methods as appropriate (e.g. laser altimetry) and repeat measurements after floods. LANL should also conduct a sampling program to fill in data gaps regarding existing contaminants in poorly characterized canyons and new contaminants related to the fire, in both surface water and sediments.

3. **Assessment of Sediment and Surface Water Input to Los Alamos National Laboratory:** Situation - All sediment and dissolved components in surface water carried by floods past the eastern LANL boundary will be considered attributable at least in part to erosion of contaminated sediment on LANL lands, although large sediment inputs are expected from burned areas east of LANL. Data are required to quantify the input of sediment and surface water onto LANL land to distinguish non-LANL from LANL contributions. In addition, negative downstream effects may result from sediment deposition regardless of contaminant levels, and quantification of sediment sources areas in headwater basins would allow interim stabilization efforts to occur during the rainy season, if required, and allow improved prediction of sediment yield as an aid to design of downstream engineering structures.

   Recommendation - LANL should coordinate or implement a systematic monitoring program that 1) measures flood discharge, sediment concentrations, and contaminant concentrations at the western and eastern LANL boundaries, and 2) identifies the relative contributions of different locations in headwater basins to total sediment yield (e.g., hillslopes, low-order channels, high-order channels) and contributions assimilated from LANL.

4. **Assessment of Burn Impacts to Los Alamos National Laboratory:** Situation - The BAER burn severity mapping focused on data requirements to evaluate major watershed-scale hydrologic impacts, and was not intended to provide data at a fine enough resolution to identify comprehensively values at risk on LANL sites (e.g., LANL potential release sites [PRSs] or archaeological sites) or propose site-specific rehabilitation. The BAER map may also not be detailed enough for any rehabilitation that may be required for long-term ecosystem management.

   Recommendation - LANL should prepare a more detailed burn severity map for their lands, focusing on their specific data needs for evaluating and mitigating impacts to PRSs, archaeological sites, and other uses.

5. **Protect and Sign Upper Crossing Trail:** Situation - The Upper Crossing Trial in Bandelier National Park is the main trail accessing Frijoles Canyon from Apache Mesa. The fire did not infringe on this trail as it did several other trails in the community of Los Alamos. It is expected that local use of this trail will increase. This trail crosses an unnamed tributary to Frijoles Canyon below steep headwaters of a small watershed. Eighty two percent of the watershed above the trail burned; 24% at a high burn severity. The channel is narrow and confined at the trail crossing and vegetation conceals the burned portion of the watershed above.

   Recommendation- Post a flood hazard warning sign at each of these four locations: (1) trailhead at Ponderosa Campground; (2) alternate trailhead at gate where the fire road meets NM 4; and (3) two at the stream crossing (one on each side just outside of the channel). Construct an energy dissipator (rock armor) the downstream side of the trail at the stream crossing. Use small boulders (~ 2 feet diameter; angular preferable to rounded). Taper the toe of the armor into the streambed. Remove small to medium sized floatable debris from the channel above the trail. Go no further than the base of the escarpment. Place flagging across the channel at a discrete distance from the trail, in both directions, to discourage people from hiking in the channel. Place two water bars behind the tank trap (S side of channel) on the first old logging road above the escarpment.

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Glossary of Watershed Terminology

burn severity
: a relative measure of the degree of change in a watershed that relates to the intensity of the effects of the fire on watershed conditions; delineated on topographic maps covering the area of the fire as a mosaic of polygons labeled high, moderate, and low burn severity

burned area emergency rehabilitation - watershed
: projects undertaken following wildland fires that are necessary to minimize negative effects on soil productivity and water quality, and to minimize sources of damage to human life and property[2]

debris flow
: a high-density mudflow containing abundant coarse-grained materials (poorly sorted hillslope colluvium) and resulting almost invariably from an unusually heavy rain[1], or less intense rain on bare, exposed ravelly slopes

dry ravel
: the dry, unconsolidated flow of small particles downslope under gravity; common in most steep terrain; principle effect is to deliver large amounts of debris to dry stream channels where it is available for mobilization when flow occurs; dry ravel cones are a common sight at the foot of recently burned slopes[3]

emergency watershed condition
: existence of watershed conditions in which watershed processes can accelerate in response to fire effects on the watershed leading to excessive watershed response

excessive watershed response
: occurs when watershed functions, such as runoff and sediment yield, will approach the upper limit of the natural range of variability of the stream channel, and may exceed our ability to protect the values at risk from accelerated water yield (floods), release of stored sediments (mud and debris flows), and degraded water quality (suspended sediment and chemical enrichment from ash)

fire effects
: consequences of the combustion process on resources; fire and its effects are ecosystem processes affecting vegetation, soils, fauna, air, and watersheds; fire effects on watersheds include reduced overstory and ground-cover density, increased hydrophobicity of soils, and increased sediment release potential

fire intensity[4]
: (1) rate of heat release (from combustion) per unit time per unit length of fire front (BTU/sec/ft);
(2) depends upon (a) rate of spread, (b) heat of combustion, (c) total amount of fuel consumed[5]; (flame length, violence, temperature, destructive energy of the fire);
(3) accounts for convective heat that rises in atmosphere (outward heat flow);
(4) accounts for fire effects on the overstory;
(5) flame length and size of residual fuels are visible indicators;
(6) relative fire intensity scale: low = up to 1/4-inch diameter fuels consumed; moderate = greater than 1/4-inch, but less than 3/4-inch fuels consumed; high = fuels 3/4-inch diameter and larger consumed

fire severity[4]
: (1) BTU/minute/foot;
(2) depends upon moisture content of duff and large fuels (lying on the ground);
(3) accounts for amount of conductive and radiant heat that goes down (e.g. into the soil);
(4) accounts for fire effects on the understory;
(5) amount of duff consumption and depth of char (ash color and depth) are visible indicators[6];
(6) difficult to measure; qualitatively defined; relative fire severity scale: low (or partial consumption) = black ashes; moderate = grey or mixed ashes; high = white or red ashes
(7) in part defined by its effect on ecosystems; e.g. a function of plant responses to fire

flood-source area
: land area subjected to high-to-moderate intensity burn and long fire residence time sufficient to significantly increase the watershed runoff efficiency; flood water runoff originates on these areas due to the effects of the wildfire on the watersheds; the post-fire hydrologic condition may include water-repellent soils, low ground cover density, stored sediments released by the fire, crusting of soil surface, and consumption of plant root crowns[2]

geologic/hydrologic hazard area
: ground area that is a potential source or target for transmitting and/or receiving uncontrolled storm-water runoff or earthen debris, such as mudflows, debris flows, and landslides. Originating within the burned area, these events may extend beyond the burn perimeter.

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ground cover density
: relative degree of ground surface area, especially soil, protected from direct exposure to erosive forces (wind, rain, flowing water); includes composition of existing protective material (e.g. rock fragments, organic litter, plant basal area, mat-forming vegetation)

gully
: any erosion channel so deep that it cannot be crossed by a wheeled vehicle or eliminated by plowing, especially one excavated in soil on a bare slope[1]

gully erosion
: the removal of soil or soft rock material by running water that forms distinct, narrow channels that are larger and deeper than rills and that usually carry water only during and immediately after heavy rains or following the melting of ice or snow[1]

hydrophobicity
: the water repellency of soils impacted by fire; waxes released from volatilized organic matter move downward into the soil and condense around individual soil particles to form a water repellent layer which restricts water movement; soil penetration may be a few millimeters to several centimeters below the surface and the impervious barrier may be a few centimeters thick; site conditions favorable for hydrophobic development include: high fire severity, long fire residence time, deep leaf-litter layer consumed by the fire, high burn severity, and coarse-grained soils (permeable for liquefied waxes); depth and thickness of barrier determined by the water-drop penetration time test (The longer the duration or greater the depth the greater will be the watershed response)

inner gorge
: a geomorphic feature consisting of the unbroken slope adjacent to a stream channel that usually has a slope gradient of 65 percent or greater; it is the area of channel side slope immediately adjacent to the stream channel and extending upward to the first break in slope above the stream channel[2]

reaction intensity[7]
: (1) rate of heat release per unit area of ground along the fire front (I_R = BTU/ft^2-min);
(2) depends upon fuel parameters from the fuel bed complex: particle size, bulk density, moisture, and chemical composition;
(3) rate of release of energy of the fire front produced by burning gases released from the organic matter in the fuels

rill
: one of the first and smallest channels formed by surface runoff, especially in soil[1]

rill erosion
: the development of numerous, minute, closely spaced channels resulting from the uneven removal of surface soil by running water that is concentrated in streamlets of sufficient volume and velocity to generate cutting power; an intermediate process between sheet erosion and gully erosion[1]; in burned areas with little to no vegetative ground cover rill erosion is catalyzed by a layer of water-repellent soil that forms a few millimeters below the soil surface during fire[3]

sediment bulking
: the suspension and transportation of sediments in a flood flow, relative to the energy carrying capacity of the flow; a fully bulked flood flow is transporting sediments up to its carrying capacity[2]

sediment release potential
: availability of sediment and soil to erode following wildfire where barriers to downslope movement have burned; common sources are sheet and rill erosion, above plant-root crowns, mass wasting, channel bedload and burned-out logs; usually estimated by location

sediment storage
: accumulation and retainment of sediment on hillslopes and in dry stream channels behind barriers (vegetation, downed logs, rocks), held in place by root masses, or stabilized at angle of repose

sheet erosion
: the gradual removal of thin layers of surface material more or less evenly from an extensive area of gently sloping land by broad, continuous sheets of running water rather than by streams flowing in well-defined channels[1]

slope wash
: soil and rock material that is or has been transported down a slope by mass-wasting (gravity) assisted by running water not confined to channels (sheet erosion)[1]

soil texture
: the relative proportions of the various soil separates (sand, silt, clay) in a soil[8]

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soil structure
: the combination or arrangement of individual soil particles into definable aggregates, or peds, which are characterized and classified on the basis of size, shape and degree of distinctiveness[1]

subsurface plant material
: viable plant material in soil with the potential to stabilize soil; includes fibrous roots, fungal mycelium and seed bank

suppression damage
: resource or other damage occurring as a result of fire suppression activities[2]

values at risk
: resources that are vulnerable to impact from excessive watershed response (fire/burn-caused hydrologic or geologic events)[2]; includes onsite and downstream threats to human life, property, and natural and cultural resources; onsite and instream site productivity; and loss of control of water onsite, instream and downstream

water-drop penetration time test
: relative measure of hydrophobicity by timing duration of a water drop beading/penetrating exposed soil after gently scraping ash away from the surface, and at successive depths in the soil; USFS classification standard is: less than 10 seconds = weak hydrophobicity; 10-40 seconds = moderate hydrophobicity; longer than 40 seconds = strong hydrophobicity[2]

water repellency (*see hydrophobicity*)

watershed response
: a qualitative and/or modeled measure of how a watershed will respond to precipitation following a fire; based on characteristics of the watershed and changes within the watershed brought about by the fire.

watershed treatment
: a host of techniques to regulate the adverse effects of fire on watersheds in order to maintain a healthy and safe environment; the emphasis is to regulate, or moderate the natural processes, not to stop, or prevent them.

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

GEOGRAPHIC INFORMATION SYSTEMS (GIS) RESOURCE ASSESSMENT

I. OBJECTIVE

Evaluate the implementation of GIS support for BAER Team implementation for the Cerro Grande Fire.

II. ISSUES

Data – Availability of a uniform base data for use for the assignment, with consistent projection systems, precision, datums, and descriptive attributing, and with metadata.

Hardware/Software – Configurations available with computers, plotters, printers and GIS application software for the GIS specialists to perform the analyses and mapping.

Networking – A hub/router with cabling to network computers and plotters in an efficient routing configuration, including Internet access for data and plot transfer.

Outputs – Timely table and map outputs for resource specification

Data and Plot Management – When the GIS staff settled furiously into their tasks, each of the three computers on the network was established with a different folder structure. This became difficult to manage when the machines were networked.

The GIS staff was overrun at any given moment with requests for plots, data, and basic information, making concentration on GIS very difficult.

The data/plot production unit and the final map production unit is a very good idea. They proceeded in parallel, the Little BAER facility able to focus on their task.

III. OBSERVATIONS

See issues above.

Our heartfelt thanks to Steve Lloyd and Sheila Wasfey, LANL; Elaine, Jeff, Tim and the other staff of the LANL Compaq Team; Jack McCarthy and Lisa Ward of the ESRI Boulder, CO staff; Kathy, Sam and Steve, LANL Ecology group; Joan Stokum and Mona Valencia; Mike Loggne and other Los Alamos City/County staff; Bob Davenport and Jerry Lopez of LANL telecommunications; and many others who helped GIS support the Team.

IV. RECOMMENDATIONS

For the Cerro Grande Fire. Establish the incident data on a local LANL and local BLM or Forest Service FTP sites. Reestablish the data on the NIFC ftp site.

For all future events: a uniform method of naming folders with only an incident name changing. An organized method to control requests to GIS staff for graphic output. (BAER Spec #58, U-1, GIS BAER Implementation Support).

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V. CONSULTATIONS

None

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

SANTA FE NATIONAL FOREST RESOURCE ASSESSMENT

I. OBJECTIVES

The objectives of this section of the report are:

- Provide information on pre-fire stand conditions on Santa Fe National Forest lands.
- Provide information in assessing both reforestation and potential salvage areas.

II. ISSUES

- Tree hazards threatening public safety both in the short-term and long-term.
- Reestablishment of forest cover.
- Potential for utilizing fire-killed timber.
- Reestablishment of vegetation and expected responses.
- The potential for re-burn within several years, especially in lightly burned areas to the south and west of the Lab and Los Alamos.
- Disturbances to archeological sites, wildlife, and soils.

III. OBSERVATIONS

A. Background

Existing Conditions Prior to the Cerro Grande Fire

The Santa Fe National Forest's Rocky Mountain Resource Information System (RMRIS) stand data base was queried for acres by forest cover type within the Cerro Grande Fire (see appendix cover type map for the Santa Fe National Forest). The following table summarizes *number of acres by cover type* on Santa Fe National Forest lands within the Cerro Grande Fire and acreage by cover type with detailed stand exam data.

Table 1. *Forest Cover Types and Surveyed (Stage II) Acreages by Cover Type Within the Boundaries of the Cerro Grande Fire on National Forest Lands*

Forest Cover Types	*Total Acres*	*Acres of Stage II Exam By Cover Type*	*Percent of Total With Stand Exams*
Ponderosa Pine	13,837	7,600	55%
Douglas-fir	6,196	2,140	35%
White fir	657	657	100%
Aspen	1,177	234	20%
Piñon-juniper	2,613	1,910	73%
Spruce-fir	75	35	47%
Rocky Mountain Juniper	726	478	66%
Oak Woodland	824	311	38%
Other Hardwoods	66	66	100%
Non-Forest Grasslands	330	-0-	-0-
Total	26,501	13,431	51%

Queries on RMRIS stand exam data were run to determine average stand condition by ***forest cover type*** (see Appendix). Due to differences in elevation and productivity, average stand conditions were determined for two distinct areas within national forest lands involved in the Cerro Grande Fire.

The area to the north and west of Las Alamos and south of Guaje Canyon is referred to as the **Valle area.** National forest lands to the north and east of Los Alamos and north of Guaje Canyon are referred to as the **Garcia** area. The stand queries for each of the two general areas are included in the appendix. A summary table for each cover type is included in the report body.

Garcia Area

The Garcia area prior to the burn was characterized by ***ponderosa pine*** draws with ridges consisting of primarily ***piñon-juniper*** or open grassland. The range in elevation for the area involved in potential salvage harvesting and reforestation is 6,800-7,200 feet.

Piñon-Juniper (PJ) stands dominated by piñon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*) averaged approximately **100 sqft.** of basal area per acre (BA/acre) or approximately 530 trees/acre (tpa). Site productivity was slightly less than 20 **cuft./acre/year** and site index values averaged approximately 47' on a 100-year index (trees averaged 47' tall at 100 years of age). Average cubic feet volume live averaged approximately **400** cubic feet/acre. The PJ forest community is located within the lowest elevations of the fire along the eastern side of the burn. PJ is not considered a commercial species other than for fuelwood.

Total Basal Area >1"	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
98 sqft./acre	531	393	1,550	47	18 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

Ponderosa pine stands within the Garcia area were generally confined to the draws and north slopes. Total basal area in ponderosa pine (*Pinus ponderosa*) averaged approximately 100 BA/ac or 500 tpa. Site index averaged approximately 60 (60' tall at 100 years of age) and site productivity was approximately 30 cubic feet/acre/year. Pre-burn gross standing volume in the ponderosa pine averaged approximately 765 cubic feet/acre or 2,500 boardfeet/acre. Understory ground vegetation consisted primarily of bunch grasses and New Mexico locust (*Robinia neomexicana*).

Total Basal Area >1'	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
99 sqft./acre	500	765	2,589	59	29 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

Preliminary estimates of tree kill are high in the Garcia area. Much of the Garcia area had been recently thinned, but slash had not been burned in some treatment areas and only partially burned in others. Stands where slash had been completely treated faired relatively well in the Cerro Grande fire. Some completely treated areas were consumed in the fire because treatment areas were small and unthinned PJ areas between the treated ponderosa pine units had not been controlled burned as planned prior to the Cerro Grande Fire.

Valle Area

The Valle area ranges in elevation between 7,500-9,900 feet. Vegetation types included *piñon-juniper, ponderosa pine, Douglas-fir, white fir, aspen,* and *Engelmann spruce*. Most of the white fir (*Abies concolor*), Douglas-fir (*Pseudotsuga menziesii*) and spruce (*Picea engelmannii*) existed in association with each other and will be referred to in this report as ***mixed conifer***.

Piñon-Juniper (PJ) stands within the Valle area averaged approximately 80 sqft. of basal area per acre (BA/acre) or approximately 400 trees/acre (tpa). Site productivity was 14 cuft./acre/year and site index values averaged approximately 37 on a 100-year index. Average cubic feet volume live prior to the burn averaged approximately 360 cubic feet/acre. No PJ fuelwood is factored into salvage volume. Most PJ areas are limited to lower elevations and south-facing slopes.

Total Basal Area >1'	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
82 sqft./acre	407	357	1,334	37	14 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

Ponderosa pine stands within the Valle area averaged approximately 110 BA/ac or 530 tpa. Site index averaged approximately 60 (60' tall at 100 years of age) and site productivity was approximately 30 cubic feet/acre/year. Pre-burn gross standing volume in the ponderosa pine averaged approximately 765 cubic feet/acre or 4,500 boardfeet/acre. Understory vegetation was dominated by ponderosa pine regeneration, bunch grasses, shrubs, oak, and New Mexico locust depending upon habitat type.

Total Basal Area >1'	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
108 sqft./acre	527	1,361	4,485	62	32 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

Mixed conifer(dominated by Douglas-fir and White fir) stands within the Valle area averaged approximately 135-165 BA/ac or 450-600 tpa. Site index averaged approximately 65-70 (65' tall at 100 years of age) and site productivity was approximately 45-50 cubic feet/acre/year. Pre-burn gross standing volume in the mixed conifer averaged approximately 3,273 cubic feet/acre or 12,000 boardfeet/acre. Ponderosa pine existed as scattered remnants in the overstory. Understones consisted of primarily Douglas-fir, white fir, aspen *(Populas tremuloides)* and gambel oak (*Quercus gambelii*), grasses, and shrubs. Mixed conifer existed above the ponderosa pine zone in the upper reaches of all drainages above Los Alamos.

Douglas-fir

Total Basal Area >1"	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
165 sqft./acre	591	3,273	12,100	66	50 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

White fir

Total Basal Area >1"	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
134 sqft./acre	443	2,370	8,865	70	47 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Apendix

Spruce-fir

Spruce-fir associations occur in the highest elevations, in deep canyons and north-facing slopes. The association is made up of **Engelmann spruce** (*Picea engelmanni*) and **corkbark fir** *(Abies lasicarpa var. Arizonica)*. There is generally an aspen and white fir component in most stands of spruce-fir. Stands averaged about 190 BA/acre or approximately 300 tpa. Site index averaged approximately 75 with a site productivity of approximately 80 **cuft./acre/year**.

Total Basal Area >1"	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
191 sqft./acre	287	5,146	21,328	75	79 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

Aspen stands within the Valle area averaged approximately 200 BA/ac or 635 tpa. Site index averaged approximately 80 (80' tall at 100 years of age) and site productivity was approximately 60 cubic feet/acre/year. Pre-burn standing volume in aspen averaged approximately 4,000 cubic feet/acre or 7,750 boardfeet/acre. Aspen stands existed mostly on steeper north or east-facing slopes and in draws. Aspen will be the primary seral tree species in many areas moderately to severely burned. Most aspen stands prior to the fire had a substantial component of conifer understory along with various grasses, forbs, and sedges. Acreage identified as aspen cover type had more than 50% of the basal area stocking in aspen. White fir and Engelmann spruce were often in association with aspen.

Total Basal Area >1"	Trees/acre >1"	Cubic Feet/acre	Boardfeet/acre	Site Index	Site Productivity
202 sqft./acre	634	3,928	7,751	80	58 cuft/ac/yr.

Data from Santa Fe National Forest Stand Data Base- see Appendix

Oak and other hardwoods areas are dominated by Gamble oak and New Mexico locust. These areas are generally confined to exposed ridges and south-facing and west-facing slopes where site conditions are harsh.

Montane Grasslands are dominated by native grasses and forbs. Shrubs often included currant (*Ribes spp.*) and common juniper *(Juniperus communis)*

Management Direction

Management direction for the Santa Fe National Forest is included in the 1987 Forest Plan, as amended. Management areas C, N, L, and Q exist within the Cerro Grande Fire. The following is a brief summary of the management direction in each of the management areas:

- ***Management Area C*** – These are the transportation corridors and areas that provide essential habitat for threatened and endangered species along with outstanding opportunity for developed recreation and viewing scenery. Management emphasis is on enhancement of visual quality and developed recreation opportunities while protecting essential wildlife habitat and riparian zones.
- ***Management Area N*** – These are areas of land that contain essential habitat for threatened and endangered species. The emphasis is management that protects and enhances essential wildlife habitat.
- ***Management Area L*** – These areas offer outstanding opportunities for dispersed recreation. Emphasis is on providing semi-primitive non-motorized recreation opportunity.
- ***Management Area Q*** – These areas provide a broad range of recreational opportunity and visual quality and contain a rich resource of historic and prehistoric habitation sites. Management emphasis is on resource site location, inventory, nomination, and protection. Emphasis is also placed on providing dispersed recreation while providing for timber and firewood production. Emphasis is also on maintenance and enhancement of wildlife habitat.
- ***Management Area M*** – Canada Bonito Research Natural Area

Tree Damage and Mortality

Many factors influence post-fire tree mortality, including: season the fire occurred, pre-fire tree vigor, site quality, extent of crown damage, extent of cambium damage, post-fire stand density, competition, post-fire climatic conditions, and insect/disease damage (Wagener, 1961).

Conifers are most susceptible to fire damage early in the growing season. Because the fire occurred just as buds were beginning to elongate, even moderate levels of crown scorch can be expected to have serious effects on tree vigor and mortality. Fires that occur after bud set have much less impact on tree survival (Wagener, 1961).

Reconnaissance Methodology and Results

Following database queries of the RMRIS stand database, field reconnaissance was conducted to determine salvage possibilities and the need for reforestation. Criteria used in assessing the potential for ***salvage cutting*** were as follows:

a) The existing road network is to be used with no new road construction.
b) Conventional ground skidding equipment is to be used- no cable systems, though a potential for helicopter logging should not be ruled out.
c) Slopes over 25-30% will not be salvage harvested due to concerns over soils unless helicopter logging is used.
d) Harvest volumes generally will achieve a minimum of 1,000 boardfeet/acre.
e) Commercial species include ponderosa pine, Douglas-fir, white fir, and spruce. Aspen and piñon-juniper species are not considered commercial.
f) Minimum tree diameter for salvage is estimated to be 12".
g) An appropriate number of snags/acre will be retained on salvaged lands. Historically, this has involved 3 or more trees/acre of the larger trees.

h) Salvageable trees will be trees determined to be dead as a result of the fire. No pre-fire snags will be salvaged.
i) Several areas west of Hwy 501 where to be thinned under the Valle Fuels Reduction Project. These areas may have live trees removed to thin out lightly burned stands in the area. There is a concern of re-burn in the near future west of the Lab and the City.
j) Salvage logging west of the City above Los Alamos County lands was considered for conventional skidding but later dropped from consideration. If helicopter logging is considered, these types of areas may be logged. Generally, soils in this area are extremely shallow, potential volumes are light except in very small, scattered north slope areas, trees may be needed for "contour felling", and logs would need to be removed via residential streets along the City's north and west sides unless helicopter logging was utilized.
k) Salvage logging in the Garcia area is dependent upon access across a corner of the Santa Clara Reservation.

The following criteria were used in assessing *reforestation* needs within the Cerro Grande burn:

a) A lack of sufficient seed trees. Soils are generally conducive to natural regeneration if adequate seed source exists.
b) Areas that had good pine stocking prior to the burn. Areas that were stocked with smaller trees, primarily the result of fire exclusion over the past century, were not considered candidate areas for reforestation.
c) Soils need to be fairly deep with evidence of past large-tree stocking. Numerous areas of shallow, rocky soils exist that will be very difficult to plant. Areas with a potential to regenerate to aspen will be excluded from conifer reforestation.
d) Except for rocky sites discussed previously, areas to be salvage logged will be considered for planted.
e) Some areas may require planting to satisfy public sentiment though site conditions may be too harsh to guarantee reforestation success. Semi-primitive, non-motorized areas west of the City are potential areas falling within these criteria.
f) The Forest has approximately 550 lbs. of excess ponderosa pine seed that can be used to direct seed rocky sites west of the City on NFS lands.

Most of the ground reconnaissance for reforestation and salvage logging on the Santa Fe National Forest was done without the aid of a fire severity map. In most cases, potential salvage areas and potential reforestation areas occur within *moderate* and *high* severity burn areas. Small areas of salvaging and/or planting may occur even in light severity areas.

When determining potential salvage areas, tree scorch was used to identify potential treatment areas. In most cases, trees were either lightly scorched and not in need of removal or trees were completely scorched. With the overall severity of the burn and the amount of moderate or high severity, trees with as little as 10% live crown would be retained. Some literature on fire crown scorch states that more than 35% of the live crown must remain following a spring burn. Therefore, retaining trees with as little as 10% live crown is conservative.

Based upon preliminary results, Ryan (1990) has reported that in the absence of significant crown injury, most trees survive up to 25% basal girdling, whereas few survive more than 75% girdling. In our reconnaissance, only trees with more than 75% girdling were considered for salvage. Again, a very conservative approach was taken.

While Potter and Foxx (1979) speculated that climatic regimes the first few years following a fire are particularly important in terms of recovery, Wagener (1961) counters that drought may not necessarily exacerbate scorch effects due to reduced competition and reduced transpirational moisture loss associated with crown reduction. No allowance was made for what some meteorologists project as a dry cycle in the up coming years. Projected tree mortality was based primarily on percent live crown and percent cambial damage and the potential for an extended

drought was not factored into our estimates of tree mortality.

B. Findings

Two general areas have been identified for both salvaging and reforestation and a third area west of Los Alamos was identified for reforestation. The area south of the Santa Clara Reservation (Garcia area) will require a road easement from the Santa Clara Pueblo if the areas including Garcia, Sawyer, Chupadero, and Alimitos canyons are to be treated.

Potential Salvage Treatments

A "potential salvage" area map has been developed. This map is in the appendix of this report. Though helicopter logging is being discussed between the Regional Office and the Santa Fe Forest's Supervisor's Office, helicopter logging was not analyzed in this report due to the high possibility that helicopter logging will not be considered economically viable. Salvage logging has been split into three priority areas based on the following criteria:

1. Removal of fire-killed hazard trees along roads, trails, powerline rights-of-way (r/w's), and near structures in the Valle area. Hazard trees are defined as dead trees resulting from the Cerro Grande fire.

2. Removal of fire-killed trees and excess live trees to protect both the Lab and City property in the Valle area.

3. Removal of fire-killed trees in the Garcia area pending an access agreement with the Santa Clara Pueblo.

Priority 1

Salvage along existing roads, powerline r/w's, and trails to remove fire-killed trees. Proposed salvage work would occur along existing forest roads powerline corridors and trails for a distance of 150-200' on either side of system roads, powerline r/w's, and trails when trees can be removed. Salvaging in these areas would achieve the objective of removing hazard trees and would provide an opportunity to generate commercial volume. **Estimate ~1,700 MBF.**

Priority 2

The area west of Hwy 501, primarily south of Los Alamos Canyon along the Camp May Road, and north of Hwy 4 would be **treated to remove both salvage material and excess live trees to reduce the threat of a re-burn.** Both fire-killed trees resulting from the Cerro Grande Fire and remaining dense tree stands will pose a threat to both LANL and the City of Los Alamos in a few years when dead standing trees begin to fall.

In an area proposed for live fuels reduction prior to the fire, the Cerro Grande Fire modified existing stand conditions considerably. Selected treatment units that still pose a threat to both the LANL labs and the City, have been identified and volume estimates were made.

Estimate ~ 2,000 MBF of salvage in addition to fire-killed trees along roads/ powerlines, and trails covered in priority 1, and approximately 830 MBF of green timber.

Priority 3

The third priority level of treatment involves the Garcia, Alimitos, Sawyer, and Chupadero canyons. Access to the area involves crossing a short segment of the Santa Clara Reservation. Without that access, material would need to be removed via Guaje Canyon. Assess across San Ildefonso Pueblo land would be needed to reach Hwy 502 via Guaje Canyon. Without access

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across pueblo land in Guaje Canyon, the only other route to paved road is via FR416 out of Guaje Canyon through residential area in northern Los Alamos. Hauling through residential area would not be desirable. Due to flooding potential in Guaje Canyon, this is not a desirable haul route. Use of FR416 out of Guaje Canyon. . **Estimate ~5,700 MBF.**

Potential Salvage Areas and Volume Estimates (Assumes 15% defect) R/w volume is included in Potential Net Volume, Column 4, but is identified separately in Column 3 in case only priority 1 salvage activity is undertaken. Volume estimates from possible helicopter logging areas are not included.

Valle Area Priority 1 and 2

Unit Number	Acres	R/W Net Salvage Volume *Priority 1*	All Potential Net Salvage Volume *Priority 1 and 2*	Potential Live Net Volume *Priority 2*
1	145	(120 MBF)	230 MBF	100 MBF
2	119	(350 MBF)	430 MBF	-0-
3	325	(600 MBF)	1,380 MBF	-0-
6	73	(30 MBF)	100 MBF	120 MBF
7	367	(600 MBF)	1,560 MBF	-0-
8	79	-0-	-0-	140 MBF
9	45	-0-	-0-	80 MBF
10	53	-0-	-0-	90 MBF
11	28	-0-	-0-	50 MBF
16	138	-0-	-0-	250 MBF
TOTAL	1,372	(1,700 MBF)	3,700 MBF	830 MBF

Garcia Area Priority 3

Unit Number	Acres	Potential Net Salvage Volume *Priority 3*
4	634	1,900 MBF
5	330	730 MBF
12	74	160 MBF
13	306	680 MBF
14	167	400 MBF
15	638	1,900 MBF
TOTAL	2,149	5,740 MBF

Most or all of the stands on National Forest System (NFS) lands proposed for salvage logging have been logged in the past with ground-based skidding systems. Should the decision be made to salvage timber on these sites, determination of logging feasibility within these areas will require additional field reconnaissance. Decisions regarding salvaging will require National Environmental Policy Act compliance.

Timber volume estimates were determined on NFS lands by utilizing stand exam summaries within the potential salvage units. These were extrapolated by forest vegetation type to determine pre-fire standing gross volume per acre. Net salvage volumes where estimated from gross standing volume figures by applying a standard defect amount of 15%. Recognizing the speed at which fire-killed trees can begin to degrade, volume estimates where based on trees 12" or larger, even though commercial sawlogs start at 9" on the Santa Fe National Forest.

Potential Reforestation Treatments

A "potential reforestation" area map has been developed. This map is in the appendix of this report. Reforestation has been broken into three general categories based upon funding sources. The three categories are as follows:

1. Reforestation efforts that may be covered by emergency rehabilitation ***BAER funds***
2. Reforestation efforts covered by regular ***appropriated and trust funds***
3. Reforestation of County lands immediately west of the City that will require some type of ***collaborative agreement*** between the Forest Service and the County of Los Alamos.

Category 1

This category includes areas proposed for emergency rehabilitation BAER funds west of Los Alamos County lands immediately west of the City. The areas proposed for reforestation are within ***NFS semi-primitive, non-motorized areas***. There is an extensive network of hiking trails in the area. Reforestation efforts would cover approximately 1,000 acres of National Forest Lands. Most of these areas consist of very shallow soils. Planned reforestation efforts will include ***direct seeding*** of ponderosa pine on harsh sites, along with ***tree planting*** in areas with a deeper soil profile. Container stock is recommended for these areas because of the harsh site conditions and shallow soils.

Category 2

These areas fall within the Forest's suitable timber base and include much of the area proposed for salvage logging. This will be a 3-5 year planting program and would be covered out of appropriated and trust fund accounts. Estimates of reforestation on suitable timber base lands include approximately 3,000 acres (see Ref. Map).

Category 3

This area lies directly west of the City of Los Alamos on county lands proposed for planting. Reforestation work in this area will require an agreement between the Forest Service and the County. Possible treatment scenarios include planting of trees utilizing volunteer groups under the direction of Forest Service employees.

Areas proposed for reforestation, generally are on slopes less than 40% where little or no seed source exists. Most isolated, steep slopes on NFS lands have not been included as potential reforestation areas.

Most of the steep slope area will regenerate naturally over time. Areas dominated by aspen prior to the fire will most likely come back quickly as dense young aspen stands. Much of the mixed conifer had a minor aspen component still present and may well regenerate to aspen. Conifers will slowly become established beneath the aspen.

Sites with shallow soil, south and west slopes, and ridges may only regenerate to gambel oak, New Mexico locust, and other shrub species in the short-term (20-50 years). It may require many decades before the first conifers become reestablished in these areas.

Conventional tree spacing of 12' x 12' (~300 tpa) would not apply in some harsh areas. Trees would be planted only where microsite conditions afford adequate seedling survival. Areas with rocky, shallow soils would be direct seeded by ground application. Aerial seed application would not afford adequate microsite selection. Direct seeding of tree seed is generally not approved in

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the Southwestern Region of the Forest Service unless seed has been determined to be "excess" to a forest's immediate needs or has declined in viability below a given level. The Forest currently has approximately 550 lbs. of "excess seed" that it can purchase from the Lucky Peak Nursery and apply on shallow soil areas immediately west of the City in what was once a scenic backdrop.

Valle Area Categories 1, 2, and 3

Unit Number	Planting Acres	Direct Seeding Acres	Total Acres
1	50	-0-	50
2	100	-0-	100
3	300	-0-	300
7	360	-0-	360
13	300	-0-	300
14	160	-0-	160
15	630	-0-	630
17	*200	*500	700
18	*300	-0-	300
TOTAL	2400	500	2900

** acres proposed for BAER funding 2001,2002*

Garcia Area Category 2

Unit Number	Planting Acres
4	630
5	330
12	70
13	300
14	160
15	630
TOTAL	2,120

No acres proposed for BAER funding

IV. RECOMMENDATIONS

A. Management Recommendation (specification related)

- Direct Seed ponderosa pine seed on 500 acres to help reestablish a ponderosa pine forest community on *non-timber base, semi-primitive, non-motorized* National Forest lands that serve as a scenic backdrop to the City of Los Alamos. (BAER Spec #52 N-4c, reforestation - direct seeding on Santa Fe National Forest).
- Planting 500 acres of *non-timber base, semi-primitive, non-motorized* National Forest lands that serve as a scenic backdrop to the City of Los Alamos. (BAER Spec # N.4a, Reforestation - planting on Santa Fe National Forest and #40, 0-2, Reforestation Survival Survey).

B. Monitoring

- Stocking/Survival surveys to be conducted 1 year following direct seeding in FY 2001 and planting in 2002 to determine the success and to prescribe further reforestation activities if needed. (BAER Spec #51 N-4b, Reforestation – stocking surveys on Santa Fe National Forest and #40, 0-2, Reforestation Survival Survey).

C. Management Recommendation (non-specification related)

- Planting approximately 4,000 acres of National Forest lands within the Forest's suitable timber base over the next 3-5 years followed by *survivail* and *stocking* surveys needed to ensure management objectives are being met.
- Consider closure of Forest Service lands for a period of time for vegetative recovery for the protection of cultural sites.

V. CONSULTATIONS

James Dick- Reforestation and TSI, USDA Southwestern Regional Office, Albuquerque.

Tom Mott- Forestry Staff Officer, Santa Fe National Forest Supervisor's Office.

William Armstrong- Forestry Tech, Espanola Ranger District, Santa Fe National Forest.

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

OPERATIONS ASSESSMENT

I. OBJECTIVES

- Identify, inventory, and map fire suppression impacts on the various jurisdictions affected by the Cerro Grande Fire including lands of the Santa Clara Pueblo, San Ildefonso Pueblo, Santa Fe National Forest, Bandelier National Monument, and Los Alamos City/ County.
- Prescribe measures to mitigate fire line suppression impacts.
- Coordinate with Fire Incident Management Team(s) to implement short and long term rehabilitation treatments.
- Protect natural and cultural values during rehabilitation efforts.

II. ISSUES

- Important natural and cultural resources.
- Extensive soil disturbance to highly erodible soils from fire suppression activities.
- Urgent need to immediately implement short term rehabilitation treatments across a large landscape to protect watershed resources and reduce risk to life and property.

III. OBSERVATIONS

A. Background

The Cerro Grande Fire started on May 5 when an escaped prescribed burn was declared a wildfire. During the first burning period the fire burned through heavy mixed conifer and pine under extremely dry fuel conditions (1-Hr. Fuel Moisture =1%, 1000-Hr. =11%). During the afternoon of May 7 the fire exhibited extreme behavior spotting across initial control lines with rates of spread at 55-60 chains per hour. By May 8th the fire had spread N/NE towards Los Alamos and Los Alamos National Laboratory (LANL) consuming 3,044 acres.

A Red Flag warning with very strong winds, low relative humidity, and a Haines Index of 6 was called for on May 11. At 1300 hours a crown fire pushed by winds up to 40 MPH spread into Los Alamos Canyon. All personnel on the line were directed into safety zones as the fire activity became extreme on all fronts. The fire bore down on northwest Los Alamos destroying over 200 dwellings. Local fire departments were generally able to hold the fire's advance to the outer perimeter streets but in some locations the fire destroyed houses three streets deep. By the close of the day the fire had advanced an additional 4 ½ miles. On May 11 and 12 the fire continued to threaten Los Alamos and the National Laboratory as well as moving considerably north into steep, inaccessible terrain near Santa Clara Canyon and Santa Clara Pueblo. The fire was now 30,000 acres with only five percent of the perimeter contained.

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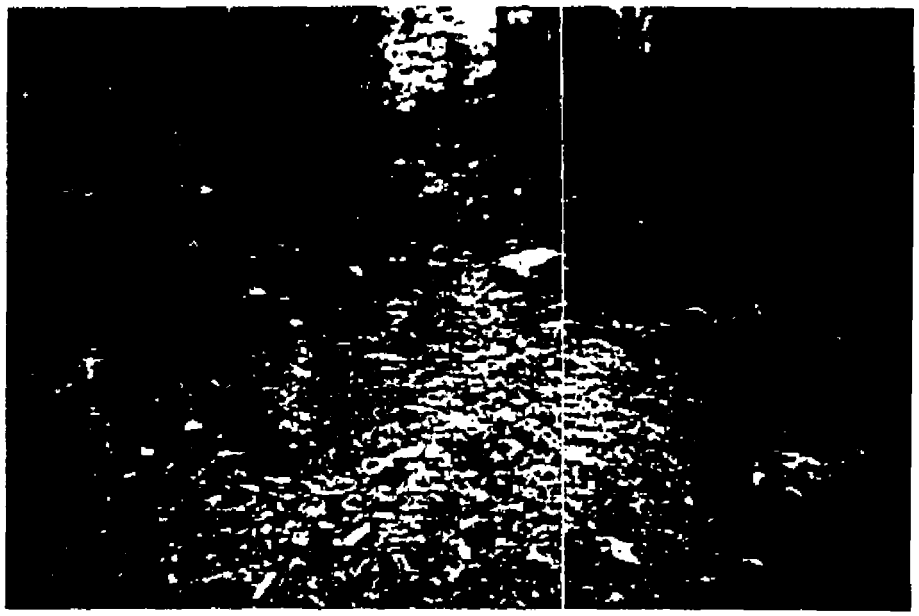
Over the next several days the fire spread into the canyons north of Pajarito ski area and the East Jemez road within the Lab. On May 16 and 17 the fire subsided considerably in Guaje and Santa Clara Canyons as cooler temps and higher relative humidities helped suppression efforts. Finally on May 20 fire line was completed around the fire perimeter.

Incident commanders contained the fire by building nearly 40 miles of dozer line, 15 miles of hand line, and tactical use of numerous miles of existing primary and secondary road. Due to varied terrain, fire lines were built across terrain features including slopes in excess of 50%. Dozer impacts varied according to topography with light, one blade width surface scrapes along valley bottoms and some ridge tops. Moderately deep down-cutting occurred on steep slopes and ridges where fuels were larger and more dense.



B. Reconnaissance Methodology and Results

On May 16, BAER Team personnel began evaluating resource impacts caused by the suppression effort. Central to the assessment was cataloging the location of all dozer and hand lines, assessing the degree of resource impact, and finally prescribing treatment to rehabilitate the sites. Information was gathered from field reconnaissance by BAER personnel, interviews with Division Supervisors, and exchange of data and information from the Situation Unit attached to the Fire Incident Management Team.

Rehabilitation treatments for dozer and hand lines were developed and then reviewed by local agency representatives before implementation. An important part of the plan included the provision to have an archeologist or Pueblo member complete a field survey on any disturbed soils prior to equipment or crew work. All suppression related impacts throughout the fire perimeter are being rehabilitated regardless of jurisdiction with the exception of LANL lands. Because of security and safety concerns LANL personnel are performing their own assessments and rehabilitation actions.

The table below summarizes by agency the location, type of suppression line, and length of line to be rehabilitated.

USFS - Santa Fe Nat'l Forest	Division D	Dozer Line	1.2
USFS - Santa Fe Nat'l Forest	Division E	Dozer Line	6.6
USFS - Santa Fe Nat'l Forest	Division F	Dozer Line	0.2
USFS - Santa Fe Nat'l Forest	Division U	Dozer Line	1.0
USFS - Santa Fe Nat'l Forest	Division Y	Dozer Line	2.8
USFS - Santa Fe Nat'l Forest	Division Z	Dozer Line	0.4
USFS - Santa Fe Nat'l Forest	Division B	Hand Line	0.1
USFS - Santa Fe Nat'l Forest	Division D	Hand Line	0.5
USFS - Santa Fe Nat'l Forest	Division E	Hand Line	0.5
USFS - Santa Fe Nat'l Forest	Division Z	Hand Line	1.2
NPS - Bandalier Nat'l Monument	Division B	Dozer Line	0.3
NPS - Bandalier Nat'l Monument	Division D	Dozer Line	0.2
NPS - Bandalier Nat'l Monument	Division A	Hand Line	2.2
NPS - Bandalier Nat'l Monument	Division B	Hand Line	3.6
NPS - Bandalier Nat'l Monument	Division F	Hand Line	0.4
BACA Ranch	Unnamed	Contingency HL	0.4
BACA Ranch	Unnamed	Contingency DL	3.2
BACA Ranch	Division E	Dozer Line	2.6
BACA Ranch	Division F	Dozer Line	2.2
BACA Ranch	Division F	Hand Line	3.4
Santa Clara Pueblo	Unnamed	Contingency HL	0.2
Santa Clara Pueblo	Division X	Dozer Line	0.1
Santa Clara Pueblo	Division Y	Dozer Line	2.5
Santa Clara Pueblo	Division Y	Hand Line	0.7
Los Alamos Nat'l Laboratory	Division C	Dozer Line	0.3
Los Alamos Nat'l Laboratory	Division D	Dozer Line	15.1
Los Alamos Nat'l Laboratory	Division B	Hand Line	0.1

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Los Alamos Nat'l Laboratory	Division D	Hand Line	1.2
Los Alamos County	Division D	Dozer Line	1.1
Los Alamos County	Division D	Hand Line	1.5
San Ildefonso Pueblo	Division D	Dozer Line	3.2

Treatments are being directed in a cooperative effort with incident personnel and BAER team resource advisors. As areas of the fire cool and are safe for rehabilitation, BAER planners coordinate scheduling of personnel and equipment with fire commanders. Rehabilitation of dozer and hand suppression lines are designed to restore soil disturbance to natural contours and to prevent slope erosion through the use of water rills and water bars. Additionally, vegetation is being scattered on dozer lines to further control water energy and conceal visual scars. When completed according to specifications all evidence of suppression lines will be obliterated within a 3-5 year time frame.

As of June 4 the majority of all suppression lines assessed for rehabilitation have received treatments. Most lines have been water barred and recontoured but not naturalized (vegetation scattered to conceal the scar) as fire commanders are still concerned about potential fire flare-ups. These lines will be scheduled for completion when monsoon rains completely suppress remaining hot spots.

Resource advisors also surveyed the fire area and adjoining lands for damages to County, State, and Federal roads damaged by the suppression effort. Work to rehabilitate damaged roads back to their pre-fire condition has begun and will continue as long as fire vehicles are using public roads to access the burn. See Appendix III, Fire Suppression Impact Map for suppression line and road rehabilitation status as of May 28, 2000.

Normally the short term rehabilitation measures above are the extent to which BAER operations personnel implement treatments. However due to the potential of catastrophic flooding when the monsoon season arrives it was recognized a larger organization was needed to implement the volume of treatments being proposed. To facilitate the planning effort, on May 20 a short overhead team was brought in composed of an incident commander, planning chief, logistics chief, finance chief, and public information officer. The operations specialist from the core BAER team served in a dual capacity with the new team and continued to serve as the primary link with the fire incident management team for implementation.

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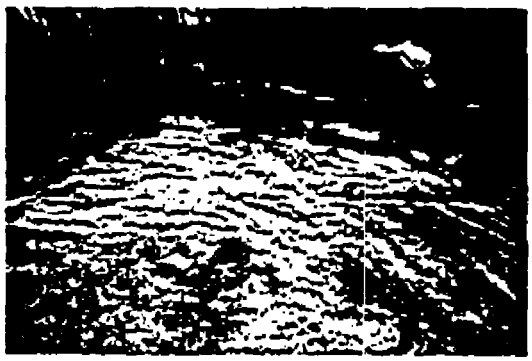
Watershed treatments designed by BAER hydrologists and soil scientists were first implemented May 22. Over the next several days, as the fire suppression effort diminished, crews were reassigned to the BAER effort focusing primarily on watershed protection. Treatments included log erosion barriers, contour falling, contour raking, and mulching. Other high priority assignments initiated involved rehabilitation of archeological sites damaged by the fire and the launching of a widespread effort to remove hundreds of hazard trees.

With the magnitude of treatments and a proposed target date of completion set for July 1, it became apparent the organizational structure would again need to change. On May 26, Area Commanders made a decision to mobilize two Type 2 incident management teams (IMT). One team would replace the existing IMT which had reached their 14 day limit and the second IMT would be brought in given the amount of work to be completed.

A 30 day work plan was developed on May 29 which outlined the number and type of resources needed to complete all the treatments prescribed by the BAER team. Highlights include the following:

- -35,000 straw wattles installed
- -26,000 bales of straw distributed as mulch
- -3500 grade control structures built
- -2500 acres of contour falling (prescription requires 30-40 trees felled per acre)
- -175 crew days (defined as 20 person fire crew work a 12 hour day)
- -400 falling team days (defined as 4 fallers working at a production rate of 6 acres per day)

To date rehabilitation treatments are progressing well and expectations are high that all work will be completed by July 1.



1. Findings

The current status of suppression line and suppression access road rehabilitation is as follows:

Dozer lines: Status as currently known as of May 28, 2000 at 1500.

Div. B: Approx. 150 ft. remains to be reshaped near the jct. of St. Hyw 501 and 4.
Div. D: Dozer line on San Ildefonso needs to be rehabbed, pending approval of Tribal contacts and archaeological evaluations.
Dozer line in Rendija Cy is located in the bottom of the canyon in either the access road or in the drainage bottom. Nothing is to be done to rehab this due to the light level of disturbance (except near the Pines Cemetery) due to anticipated debris flows which will obliterate the dozer line.

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Div. D: Short segment near water tank near Pueblo Cy needs rehab.
Div. E: Dozer lines have temporary (not to spec) waterbars in place to control potential for thunderstorm events and associated erosion on unrehabed line. Waterbars will need to be reconstructed when segments are allowed to be rehabbed. Wildfire line control concerns prevent current need to complete rehab according to specifications. There are Threatened and Endangered sp. (TES) and Research Natural Area concerns in this Division. Consult the Wildlife Specifications needed prior to rehab (see attached maps).
Div. F: Same concern as Div. E.
Div. U: Same concern as Div. E.
Div. V: Same concern as Div. E.

Hand lines: Pending rehabilitation as of May 28,2000.

Div. B: Reopened May 26, (?) due to continued hot spot mop up within 200 ft. of line. Line was originally rehabbed on May 23.
Div. E: Handlines are open due to continued concerns with control all along west boundary.
Div. U: Same concerns as Div. E.
Div. V: Same concerns as Div. E.
Div. W: Same concerns as Div. E.
Div. X: Same concerns as Div. E.

Suppression access road: Status as of May 30, 2000.

Status of Suppression access roads by Division as of 05/30/2000. PLEASE NOTE: Much of the suppression access road rehabilitation will occur concurrently with the dozer line rehabilitation. There should be no duplication of equipment needs to address dozer line and access road rehabilitation.

Div. A: **Highway 4**, paved highway, in good condition, no action necessary.
Div. B: Same as Div. A. Also American Springs Forest Road, no action necessary.
Div. C: Same as Div. A with no effects on **State Highway 501**, no action necessary.
Div. D: **Los Alamos National Labs (LANL)** roads used by Suppression Forces are on LANL lands. These roads will be restored or maintained as per LANL specifications, personnel and equipment, and will not involve fire suppression accounts or personnel.
Div. D: **San Ildefonso Pueblo Lands**; existing roads were used by suppression forces to build dozer lines. These roads were doubled in width. Some impacts on archaeological resources occurred and need to be avoided in the rehabilitation process.
Div. D: **Santa Fe National Forest (SFNF), FR182**, same as Div. D, **San Ildefonso Pueblo Lands**
Div. T: **City of Los Alamos**, specifically the NW edge of town at **Rendija Canyon (FR57** as it extends from SFNF onto DOE and San Ildefonso Pueblo lands; no rehabilitation will be performed here due to anticipated channel altering debris flows which may obliterate this road for most of its length. No rehabilitation action is planned for this road.
Div. Y and Z: Forest roads. **FR416 (Chupaderos Canyon), FR445 (Garcia and Corral Canyons), and FR446, FR446G (Chupaderos Canyon)** were used by Suppression Forces to attack spot fires and were enhanced as control lines by dozer. These roads were stabilized and need no further work. Div. Z also requires the use of a motor grader in Guaje Canyon west of **FR57 in Guaje Canyon**, at jct. of **FR416** and **FR442** east (down canyon) to jct with **State Highway 4**, crossing SFNF, DOE and San Ildefonso Pueblo lands.
Div. X and **Baca Contingency road**; this section of road is currently being used by suppression forces up **Santa Clara Canyon** up to Fish Pond #4. This road is a maintained gravel road. This road should receive one last "Motor Grader" blading after the first of the seasonal monsoons. This road should not be bladed until all suppression actions are completed and the road is sufficiently moist to respond to the grader

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treatment.

Santa Clara Canyon road west from Fish Pond # 4 to jct. of **Pipeline Road on the Baca Land and Cattle Co., Inc** (Baca Ranch) along the Rito de Los Indios: This road requires the installation of eleven rolling grad dips (flagged on May 23) to stabilize the road after Suppression Forces used the road for its preparation as a "contingency line". These segments of road should not be treated with the eleven rolling grade dips until the beginning of the monsoons. As of May 30, these road segements were too dry for any treatment to be effective. Because of the travel distance involved, a D5 or D6 dozer should be transported up Santa Clara Canyon as far as possible and then walked in to each proposed grade dip site. Archaeological clearance for this has been received.

Pipeline Road on the Baca Land and Cattle Co., Inc. (from the jct. with Rito de Los Incios) east to point where road leaves pipeline near Baca Ranch and Santa Fe National Forest (SFNF) boundary: Perform maintenance on this road same as stated Div. X and **Baca Contingency Road.** Please note that the Baca Contingency Road is not the same as the Baca Contingency "Line". The Baca Contingency line is primarily a road enhanced dozer line and is mentioned in the Dozer line rehabilitation specifications.

Rincon de Los Soldados/Valle Grande access road. This road is the principal western access road to access Divisions E, F, U, V, and access to the Pipeline road and the Baca Contingency Road. This road will require blading by a "Motor Grader" and should not be bladed until the beginning of the monsoons when soil moisture is conducive to grader treatment.

Div. W. Suppression access roads not affected by Suppression Forces here.

Div. V. Same as Div. W.

Div. U. Access road used by Suppression Forces located adjacent to the natural gas pipeline (south side) will require Waterbars and or rolling grade dips. This work should be accomplished at end of the work shift of May 30 or May 31.

Div. E. Same as Div. U. In addition, a 4 x 4 road runs north from **Camp May** and **Los Alamos Canyon** toward the divide of **Canada Bonita** and Quemazon Canyon. This area is **Canada Bonita Research Natural Area (RNA)** which had successfully closed this 4 x 4 trail from ATV and other motorized access. This road was opened up during suppression activities. Per instructions from Mary Orr (Wildlife Biologist, Espanola Ranger District – Resource Advisor; this trail is to be re-closed. Successful closure of this road will entail use of a "Excavator" (Track hoe) to put the road to bed and blend road to the natural contours. DO NOT USE A DOZER! Threatened and Endangered species are also a concern on portions of the road as well as Visual Quality objectives. Please view the attached maps and recreation specs for more detailed information. The recreation specifications state that "Berms" are unacceptable for road closure structures.

Div. F. Restoration/installation of rolling grade dips on a 4 x 4 access trail located immediately east of the East Fork of the Jemez River at beginning at a reservoir in the east edge of the Valle Grande on the Baca Ranch (north end of Div. F.). Grade dips on this road have been flagged and cleared archaeologically as of May 29 with installation of grade dips on same day.

HEAVY EQUIPMENT USE SUMMARY:

Logistics: Motor grader use is to be delayed until seasonal monsoons arrive and suppression activity ceases and rehabilitation activities significantly reduce in scope and level. Motor grader use is only scheduled for the following roads: Guaje Canyon, Santa Clara Canyon, Pipeline Road (Baca Ranch), Baca Ranch main access to pipeline road from the Valle Grande to the Rincon de los Soldados.

Dozer use is for grade dip and waterbar installation on suppression access roads. Use of a dozer on the Santa Clara Canyon and Baca Ranch-Ritos de los Indios should wait until about the same time as motor grader use. Focus working the dozer to end all work at a central point such as Camp May in all other divisions and other roads. The Parajito Ski area road is the best place to provide for transport of heavy equipment.

Excavator use should be coincidental with dozer line rehabilitation on the 4x4 road

mentioned in Div. F. The excavator is not mentioned in cost estimates here for roads since it is more appropriately addressed in the Dozer line rehabilitation specs which also addresses the concerns of Div. F as stated herein.

Suppression line site specific concerns (see discussion of divisions and geographic areas listed above).

IV. Recommendations

1. Management (Specification Related)

- Rehabilitate Dozer and Hand Line. Continue to rehabilitate remaining fire lines and other sites directly or indirectly impacted by fire suppression activities (BAER Spec #8, W-8a, Rehabilitate to Dozer Line, and #9, W-8b, Rehabilitate Hand Line).

- Implementation Leader. Designate a lead person from each agency to serve as a liaison with incident command staff on implementation of short and long term specifications - particularly those involving watershed protection. Past experience has revealed that an operation of this magnitude will present formidable challenges and frustrations if ongoing communication breaks down once the BAER team departs (BAER Spec #54, C-6, Implementation Leaders).

- Volunteer Coordination. Provide funding for a Volunteer Coordinator/Public Affairs Officer to coordinate and oversee volunteer, public involvement and information exchange for the Cerro Grande Fire rehabilitation program in cooperation with Los Alamos County.

- Suppression Road Rehabilitation. Within the next 30 days prioritize road rebuilding and grading projects to maximize work periods following rain events this coming summer.

2. Management (Non-Specification Related)

- Insure rehabilitation specifications involving watershed treatments are clearly understood by new personnel assigned to the incident.

- Guarantee safety of personnel assigned to operational assignments in the fire area during periods of precipitation over the burn.

V. CONSULTATIONS

Personal Communication with:
Walter Cramer, BACA Ranch
Andy Dunnigan, BACA Ranch
Henry Gallegos, Engineer, Santa Fe National Forest
Grant Loomis, Forest Hydrologist, Tonto National Forest
Buff D. Jenson, BAER Coordinator, BIA Northern Pueblo Agency
Brian Jacobs, Vegetation Specialist, Bandelier National Monument
John Miera, Espanola District Ranger, Santa Fe National Forest
Nancy Noshaskas, New Mexico State Forestry
Don Serrano, Range Management Specialist, Santa Fe National Forest

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Dean Sirucek, Soil Scientist, Flathead National Forest
Elmer Torres, 2nd Lieutenant Governor, Santa Ildefonso Pueblo

VI. REFERENCES

USDI, 1995. BAER Field Team Leader Reference Book

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Chris Holbeck	Operations Specialist	760-367-5527
George Long	Resource Advisor	505-737-5464

INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

RECREATION RESOURCE ASSESSMENT

I. OBJECTIVES

- Inventory and evaluate fire impacts to recreation and trail resources within the burned area
- Prescribe measures to provide a reasonably safe recreation environment and to mitigate fire-damaged recreation and trail resources

II. ISSUES

- Direct and indirect fire damage, including suppression effects, to trails and recreation facilities
- Impacts to recreational uses such as hiking, mountain biking, rock climbing, fishing, picnicking, horseback riding and throw-down camping
- Mountain bikers displaced from closed Forest Service trails in the burned area are increasing use on community/county trails. Mountain bike use may conflict with pedestrians.

III. OBSERVATIONS

The Cerro Grande Fire had a major impact on the recreation facilities and opportunities in Los Alamos County and the surrounding area. All of the burned area was closed to public access during the period of significant fire activity and will remain closed until the fire is controlled. Closures in the burned areas are projected to be in place through the summer monsoon period. Storms are expected to cause fire-damaged trees to fail, and significant flood events are anticipated for the burned watersheds, which were prone to flash floods prior to the fire.

The fire has also had, or will have, direct and indirect impacts on some recreation facilities on Santa Clara Pueblo. These facilities are located in Santa Clara Canyon and include Puye Cliff Dwellings, the fishing ponds, and Santa Clara Campground.

Primary recreation resource impacts are resulting from continued area closures, fallen trees and rocks blocking trails, burned trail signs and markers, mountain bikers displaced to primarily pedestrian community/county trails, and degradation of trail condition. Additional recreation resource impacts will result from severely decreased tree canopy offering less shelter from sun and wind, reduced aesthetic appeal to visitors who do not appreciate a scorched and charred landscape, and additional damage resulting from floods as a result of the changed watersheds. Some trails were subject to high erosion rates before the fire. Erosion is expected to increase over the next few years if overland flow from heavy rain events exceeds pre-fire conditions and until soil and slopes are stabilized and revegetated.

A. Background

Los Alamos is well known for its dependence on outdoor recreation. Popular recreational activities include hiking, mountain biking, rock climbing, ohv (off-highway vehicle) use, fishing, picnicking, camping, horseback riding, skiing, skating, wildlife and scenery viewing, visits to heritage sites (i.e. Bandelier National Monument and Puye Cliff Dwellings), and driving for pleasure. Many of these activities can be enjoyed year-round. Because of the close proximity to Los Alamos National Laboratory and Los Alamos townsite, pedestrians and mountain bikers routinely and heavily use the trails in and around Los Alamos for exercise, pleasure, endurance racing and competition, and

commuting to and from work. Rocky cliffs and high altitude canyons offer some of the most technically difficult climbs in the area, as well as popular spots for summer climbs. Community/county trails are generally shorter in length and are used mostly by pedestrians. Forest Service trails are longer and are used by both pedestrians and mountain bikers.

B. **Reconnaissance Methodology and Results** – Literature review (see References), consultation with local residents and trails users, community meetings, aerial photographs, burn severity map, trail maps. General assumptions on the condition of trails were based on field visits to segments of trails in areas of high, moderate, and low burn severity by BAER team members and two community volunteers who are very familiar with the trails. Two 2-person trail crews will field these assumptions and will determine what emergency rehabilitation work is required to return trails to pre-fire conditions.

C. **Findings**– Roads and Trails: (Roads in this chart refer to those non-highway roads used primarily for mountain biking and hiking, as described in Los Alamos Trails—Hiking, Biking and Cross-Country Trails and as shown on Hiking Trails and Jeep Roads of Los Alamos County, Bandelier National Monument and vicinity.) There are approximately 266 miles of designated trails in the Los Alamos area, including trails managed by the Forest Service, National Park Service, Department of Energy, and Los Alamos County. Of this total, approximately 206 miles are within the Los Alamos/Bandelier area. As shown in Table 1, the Cerro Grando fire burned over or along approximately 99 miles (49%).

Table 1

	Trails and Roads within area			Distribution within burn severity areas (%) *(miles displayed in italics)*		
	Total distance (miles)	Outside burn area (miles)	Within burn area (miles)	Low	Mod	High
SFNF/ Española District	**116.8**	**19.1**	**96.7**	**44.5** *(52 mi)*	**2.7** *(3.1 mi)*	**35.6** *(41.8 mi)*
Guaje Ridge Area	41.7	8.0	32.7	34.3	2.4	41.7
Northern Plateau	33.3	8.8	24.5	54.7	0	18.9
Ski Area	5.8	2.1	3.7	63.8	0	0
Townsite	3.9	0	3.9	0	0	100
West of NM501	25.1	0	25.1	59.8	5.6	34.7
W of town	7.0	0.2	6.8	11.4	10.0	75.7
County Land	27.9	27.6	0.3	0	100	0
DOE	21.1	19.9	1.2	100	0	0
NPS	About 40	About 40	0.5	0	0	100
TOTALS	205.8	106.6	98.7			

Santa Fe National Forest trails received the brunt of the fire damage, while trails on Bandelier National Monument, Department of Energy/Los Alamos National Laboratory and Los Alamos Country escaped relatively unscathed. Based on preliminary sample field checks of trails within the burned areas, the amount of damage will vary greatly depending on burn severity, degree of slope trail is on, original condition of trail, surfacing (i.e. native soil vs. bedrock), and number of constructed features.

Most of the trails within the burned area were inventoried using GPS equipment prior to the outbreak of the Cerro Grande Fire. In addition to picking up the alignment of inventoried trails, the existing (pre-fire) conditions were documented. Information was collected on number, location, and condition of constructed features such as water bars, drainage dips, other drainage structures, and trail surfacing. Data collected during the inventory is now valuable baseline information of the pre-fire condition of the trails. Because of the number of trail miles impacted by the fire, it was not possible to assess the post-fire conditions during the initial BAER team analysis. As part of the BAER team's implementation phase, trail crews will be assigned to inventory trails in the burned area prior to the monsoons. Trail logs will be developed detailing what emergency rehabilitation work is needed. This work will then be incorporated into work projects and submitted for supplemental emergency fire rehabilitation funding.

An indirect impact of the fire is the change in user patterns on undamaged trails. Since most of the trails in the closed area are on Forest Service land, use on county/community trails is increasing. User groups frequenting these trails are changing as well. Community trails, used primarily by pedestrians during pre-fire conditions, are now being used to a greater extent by mountain bikers displaced from Forest Service trails. This may lead to conflicts between user groups and they compete for space on these shorter trails.

Trails around Los Alamos hold special significance for the local residents. These facilities offer places of refuge and solace and are vital to residents' mental and physical health. Even residents who have lost their homes consider trail restoration an important aspect of the recovery of the town. A few people are beginning to venture back on to the trails, despite the closure orders. It is critical that the facilities be rehabilitated as soon as possible and before users start creating their own trails.

Rock Climbing: Popular areas for rock climbing are located in Los Alamos and Pajarito canyons, and off Mitchell Trail #69. Rock climbers have permanently installed their own anchors and bolts over the years. These walls are all located within the burned area. Before the area can be opened up to public use, the walls must be evaluated for public safety. A geologist and certified technical rock climber will be assigned to assess the structural integrity of the rock, anchors, and bolts. Recommendations will be made to either continue climbing on these walls or relocate to new rock faces.

Developed Recreation: While most of the recreation opportunities in the burned area are dispersed (undeveloped), there are a few developed recreation facilities such as Pajarito Ski Area, the winter ice-skating rink and Los Alamos Reservoir located in Los Alamos Canyon, and Puye Cliffs Dwelling located on Santa Clara Pueblo. The fire burned all around the ski area, but the facilities were left intact.

Likewise, the ice rink and Los Alamos Reservoir were not damaged. However, they are at risk of damage from floodwaters because of their location within Los Alamos Canyon. Emergency measures are being proposed to protect the ice rink from floodwaters, such as positioning Jersey barriers around the facility to deflect some of the energy of flooding water. The condition of the facility after the monsoons will need to be evaluated by Los Alamos County engineers to determine necessary rehabilitation work.

Los Alamos Reservoir will be drained and dredged and the spillway modified to increase its storage capacity in anticipation of flooding during the monsoon season. After danger of flooding has lessened, it will be important to evaluate the condition of the reservoir and determine what rehabilitation measures would be needed to restore public access to this highly popular recreation area.

As the fire moved toward Santa Clara Canyon, fire crews decided to create a safety zone with the parking area at Puye Cliffs Dwelling on Santa Clara Pueblo, resulting in the loss of several trees and visitor parking area near the visitor center. This area will need to be rehabilitated to its pre-fire conditions as part of the Emergency Fire Rehabilitation work.

Further up Santa Clara Canyon are four fishing ponds and a campground owned and managed by the Pueblo and open to the public. Although Cerro Grande Fire impacted none of these facilities, there may be some indirect effects as a result of flooding. The fire did reach the upper slopes to the south of the first two ponds, but did not damage the ponds. However, these two ponds have been closed to public access since 1997 due to the Oso Complex Fire, and will likely remain closed indefinitely in anticipation of flooding and sediment flows related to the Cerro Grande fire. The continued closure of these facilities represents a major financial impact on Santa Clara Pueblo due to the loss of revenue from visitors.

The campground is outside the burned area, but also may be impacted by flooding. The Pueblo should monitor the campground and ponds to determine if any flood-related damage occurs as a result of the monsoons. In addition, the Pueblo should determine whether the campground is within the 100-year floodplain. If it is, the Pueblo may want to consider converting the campground to day-use only to minimize risks of sleeping campers getting trapped by floodwaters at night.

IV. RECOMMENDATIONS

A. Management (specification related)

- Survey and inventory post-fire condition of trails within burned area and develop trail log of necessary emergency rehabilitation work to return trails to pre-fire conditions (BAER Spec #26, S-5, Trail Stabilization, Inventory of Existing Trail Conditions and Development of Reconstruction Specifications) on Forest Service and Pueblo lands.
- Evaluate structural integrity of rock face and affixed climbing bolts and anchors of climbing walls in Pajarito and Los Alamos Canyons and near Mitchell Trail. Make recommendations to either allow climbing along the same wall or relocate to a different rock face (BAER #26, S-5, Trail Stabilization, Inventory of Existing Trail Conditions and Development of Reconstruction Specifications).
- Identify hazard trees within 150 feet of main state, county, and Santa Fe National Forest roads and within 1-2 tree lengths of trails identified on the Hiking Trails and Jeep Roads of Los Alamos County, Bandelier National Monument and vicinity. Flag for removal to minimize health and safety hazards to people entering the burned area (BAER Spec#44, S-8, Imminent Hazard Tree).
- Hire contractor to work with Santa Clara Pueblo on rehabilitation of Puye Cliffs Dwelling parking area that was damaged during suppression efforts (BAER Spec #28, W-1, Surface Stabilization, Puye Cliffs Dwelling Parking Area Rehabilitation).
- Inventory impacts of emergency rehabilitation efforts on Los Alamos Reservoir and develop specifications in conjunction with the Department of

Energy for necessary work to ensure recreation facility is accessible to, and usable by, the public (BAER Spec #24, W-4E, Los Alamos Reservoir).

B. **Monitoring (specification related)**

- Monitor effectiveness of emergency rehabilitation efforts on trails within burned area (BAER Spec #27, M-2, Monitoring and Evaluation of Emergency Treatments, Trail Conditions and Stabilization).

C. **Management Recommendation (non-specification related)**

- Los Alamos County should evaluate condition of ice skating rink after monsoons and determine what, if any, emergency rehabilitation work is needed to return rink to pre-fire conditions
- Santa Clara Pueblo should monitor conditions of the fishing ponds and campground during and after the monsoon season to determine any damage as a result of post-Cerro Grande Fire flooding
- Consider opening up undamaged trails as soon as possible, based on concerns for public safety and resource protection
- Work jointly with Santa Fe National Forest, Los Alamos County, and community organizations to develop integrated recreation management plan for the area around Los Alamos. Collaboratively determine opportunities for non-motorized and motorized trails, and what existing trails should be obliterated or relocated. Develop opportunities for community volunteers to help in reconstruction of trails.

V. CONSULTATIONS

Miles Standish, Santa Fe National Forest, 505-753-7331
Joan Hellen, Gila National Forest, 505-539-2481
Craig Martin, author, local resident, and member of Los Alamos Pathways Association
Janie O'Rourke, local resident and member of Los Alamos Pathways Association

VI. REFERENCES

Hiking Trails and Jeep Roads of Los Alamos County, Bandelier National Monument and vicinity, by Andrea Kron, published by Otowi Station Science Museum Shop and Book Store, 1993

Los Alamos Trails: Hiking, Biking and Cross-Country Skiing, by Craig Martin, published by All Season Publishing, 1999

Ruth Doyle, Santa Fe National Forest, 505-438-7823

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

SCENIC RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess change to the visible landscape resulting from the Cerro Grande fire and emergency rehabilitation efforts
- Explore ways to define a desired future condition for the Los Alamos view shed
- Recommend mitigation to achieve Landscape Character and Scenic Integrity goals

II. ISSUES

- The scale and intensity of the burned area will dominate the view shed for several growing seasons. The vegetative patterns that emerge as a result of or in spite of rehabilitation efforts will affect scenic quality and recreation settings for decades.
- Built features, such as roads and fire lines will be more visible now because of less vegetative cover and because of the light color of the exposed mineral soil. Rehabilitation efforts such as contour felling, straw wattles, etc. could create temporary visible effects on the landscape. The landscape will appear somewhat less natural as a result.
- Landscape Character Objectives for the area will need to be re-defined with extensive public involvement (per USDA Forest Service Scenery Management System policy). People have a need to know what to expect as the landscape heals and changes following the fire and rehabilitation efforts, including how to influence the emerging vegetative pattern.

III. OBSERVATIONS

Background: People are concerned about the quality of their environment, including aesthetic values of landscapes, particularly scenery and spiritual values. High quality scenery, especially scenery with natural-appearing landscapes, enhances people's lives and benefits society. People need natural-appearing landscapes to serve as psychological and physiological "safety valves" for a variety of reasons—the world's urban population pressures are increasing, people's lives are becoming more complex, and once plentiful natural-appearing landscapes are becoming more scarce, among others.

As is true for many southwestern mountain towns, the natural appearing mountain forest and scape setting is very important to residents' lifestyle and visitors' perceptions of the area. It is a major factor influencing people's decision to live in Los Alamos and the surrounding area. The beauty of the outdoor environment has helped define the communities' self image. Visitors are drawn to the rugged mountain landscape for spectacular views, climatic relief, and an escape from the congestion of area cities. The Cerro Grande Fire has drastically altered this setting and has had a profound effect on people's lives. Nonetheless, comments people have made in community gatherings indicate that they are as concerned with restoring the landscape as they are with rebuilding their lives. Understanding the impacts of the fire and emergency rehabilitation efforts on the scenic resources and the resulting changes in the landscape may help residents and visitors better accept the alterations, ease the trauma of the experience, and create a new sense of community identity.

Reconnaissance Methodology and Results: Field investigation, aerial photographs, burn severity maps, community meetings.

Findings: The Pre-Fire landscape of the Cerro Grande burn area was a fairly uniform matrix of ponderosa pine and mixed conifer vegetation with patches of mature aspen and of "oak woodland" type vegetation. Rocky bluffs and outcrops were, and still are, prominent throughout the area. This dominant vegetative pattern graded into a Piñon - Juniper forest at lower elevations to the east and south. High elevation spruce - fir stands and alpine grasslands along the ridges and peaks defined the upper extent of the Santa Clara, Quemazon, Guaje, and Rendija canyon watersheds.

The Cerro Grande fire burned across most of the middle and foreground views to the west and north from Los Alamos and reached into the background. The impacts of the fire are evident from all roads leading into and out of Los Alamos, to the north-northeast from Espanola and Santa Clara Pueblo, and to the south/southeast from White Rock and Bandelier National Monument.

The Post-Fire landscape immediately following the fire is a mosaic of black and gray. Black burned tree trunks and thick black/gray ash contrast with lighter colored exposed mineral soil in changing patterns shaped by wind and weather. Scattered patches of unburned vegetation occur throughout the area, offering visual relief from the otherwise charred landscape.

This condition may persist well into this growing season and beyond in areas which burned hottest and where rehabilitation treatments may not be immediately effective. Both live root mass and viable seed could be absent, and soils tend to be sterile and hardened in some of these areas. However, a substantial amount of the visibly burned area will have green sprouts (grass and forbs) and seedlings (oak, mountain mahogany, aspen) following and in some cases preceding the onset of summer rains.

The post-fire vegetative pattern that emerges from the burn will feature more non-conifer species such as aspen, oak, and grasses than the pre-fire pattern. Proposed management intervention includes grass seeding and reforestation with conifer seedlings. Artificial reforestation will be marginally successful in some areas because of thin, rocky soils, and the drought. Even with these measures, it can be assumed that exposed rock out crops, grasslands with conifer patches and stringers, oak brush and aspen patches will be much more extensive and visually dominant than in the pre-fire landscape. Trends to expect in the emerging vegetative pattern include:

- Broad grasslands will tend to develop especially in areas where grass seeding is successful and where reforestation is not done or is not successful. Other than aspen and oak sprouting, reforestation will be a long-term effort. Conifers may take 15-20 years to reach heights of 4'-5'. Without persistent reforestation efforts, the extensive grassy areas which developed following La Mesa Fire (circa 1977) along State Road 4 adjacent to Bandelier National Monument are likely to be duplicated in areas with similar conditions within the Cerro Grande burn. The Bandelier grasslands developed without seeding or rehabilitation efforts. It is expected that grasslands will tend to be the dominant matrix vegetation through much of the less steep or rocky areas of the burn. Meadows and grasslands can add scenic diversity to the vegetative pattern but can decrease the desirability of recreation settings and decrease scenic values if the extent and homogeneity of grasslands is too great.

- Oak brush could be the dominant vegetation over some of the rockier sites and will be a major persistent element in the vegetative pattern defining the post-fire Los Alamos view shed.

- Aspen clones occur throughout the burned area and will sprout anywhere the extensive clone root systems were not destroyed. Aspen stands are an important scenic and recreational asset and could normally be expected to rapidly soften the visual effect of the burn and to set the stage for forest re-vegetation. There is some risk that recent increases in local elk populations, fire impacts on elk grazing areas, or future migrations of elk could limit or eliminate aspen regeneration in some areas of the burn.

Experience near Flagstaff, Arizona following large hot fires through established and latent aspen stands show that an 8-foot high elk fencing in place for at least 10 years is necessary for aspen survival if elk populations are high and the site is not too steep or rocky. Such fencing could assure survival of sprouting aspen clones and enhance scenic values, e.g., along Camp May Road. Since aspen is a "pioneer" seral species, establishment of aspen stands will assure viability of many conifer species if or where desirable.

- Pine and mixed conifer trees will be slow to naturally re-establish dominance barring the rare occurrence of favorable regeneration conditions. Forest Service policy and tradition is to regenerate the prevailing valued timber species within their natural range following such a fire. Plans for re-planting conifers are usually part of rehabilitation planning.

As seen from popular viewing sites within and around Los Alamos, some road cuts are more visible throughout the area, as are extensive rock outcrops, and other cultural and natural features. Some newly visible elements have become an additional blight on the landscape. For example, the gas pipeline access road located in an area of high burn severity with close to 100% tree mortality immediately to the west of Los Alamos townsite. Once screened by a dense stand of ponderosa pine, it is now highly visible from Trinity Drive, Central Avenue, and Canyon Road. Its alignment and location draws viewers' eye straight up the road. It is constructed perpendicular to the contours up a rocky, steep (50-60%) slope and extends across Forest Service and private lands. The soil on either side of the access road is black, while the pipeline is lighter colored. The stark contrast of color makes the pipeline more visible as a scar running up the hillside. This scar will be visible for many years, even if revegetation of the slopes around it is successful. The access road should be rehabilitated to reduce the visual contrast and minimize erosion.

The pipeline is operated by PNM (Public Utilities Company of New Mexico) under a special use permit administered by the Santa Fe National Forest. There is also a water line operated by Los Alamos County in the same area. Engineers with PNM and the county would like to maintain vehicular access along this road, but are not opposed to erosion control measures such rock check dams. Installation of these dams would slow water flow, reduce erosion, and provide places for sediment to be trapped, encouraging pockets of revegetation. The specification for this work (Section F, Specification W-9 Pipeline Rehabilitation) requires the check dams to be installed on alternate edges of the access road in herringbone fasnion. This arrangement would force water flows off the access road, prevent the road from becoming the main drainage channel, and require vehicles to move in a zigzag pattern along the road. Sediment trapped behind the check dams would encourage revegetation within the first season. This would help soften the stark visual contrast of the road and make it appear more like two thinner lines rather than a wide swath moving up the hillside. Erosion would still occur to a certain extent if vehicular access, however sporadic, were permitted on these slopes, and the tracks of vehicles would remain evident as the surface soils are washed down slope and lighter subsoil layers were exposed.

The scenic resources would be improved to an even greater extent if vehicular access were eliminated along this road. As shown on the pipeline map, Appendix III, vehicular access to the pipeline is provided at Point A and Point B along the original access road. Use of these access points would require pipeline inspectors to walk portions of the line. The pipeline extends down from point A approximately ½ mile, while the distance of pipeline between vehicle access points A and B is approximately 1/4 mile. The Santa Fe National Forest should explore this option with PNM. In addition, the landowner may be interested in rehabilitating the portion of the access road on private land.

A variety of emergency measures are planned for the burned area to reduce erosion and minimize impacts from flooding. Proposed activities include contour felling, installation of straw wattles, hand raking, and construction of rock or log erosion barriers (refer to the Watershed Assessment for a complete description and list of emergency work). The objective of this work is to slow down the movement of soil and help stabilize slopes. These activities would be quite evident immediately after

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implementation, but would blend in within the first year or two. For example, tufts of grass and forbs would quickly sprout in pockets of sediment trapped behind the log barriers and straw wattles, while vegetation in areas without erosion barriers would tend to be sparse until the slope was stabilized. The visual contrast of the erosion control measures should begin to recede after one or two growing seasons, helping the slopes take on a more natural appearance. However, stumps remaining after trees are cut for contour felling and log barriers will remain evident for decades. To minimize the visual impact along trails and roads, scenic corridors (i.e. NMSH 502, Camp May Road, etc.), and near residential areas, stumps should be left no more than 6" high. This may require sawyers returning a second time after the tree has been felled to reduce stump heights. Cuts should be straight or slightly angled away from travel ways and residences.

The Department of Energy (DOE) is exploring measures to help stabilize the earthen dam at Los Alamos Reservoir in anticipation of increased runoff and sedimentation during the monsoons. Final plans had not been developed at the time this assessment was completed. Among the measures DOE is considering is to use concrete to armor the dam and substantially widen the existing spillway. These measures, although critical to protect downstream resources, could have an impact on scenic resource values, as well as impede public access to the reservoir. To help blend any new concrete structure into the setting, the Forest Service has recommended that the concrete be tinted with a color additive that is a shade or two darker than the native soil. The Forest Service Landscape Architect would be available to help in the selection of an appropriate color. The Forest Service has also requested the opportunity to review what is being planned for the reservoir if time allows.

Public involvement is key in determining long-range goals for the changed Los Alamos view shed. To help the public understand what the landscape will look like over the years and how it will recover, realistic graphic simulations should be created of existing and potential vegetative patterns and built features such as roads, trails, and the effects of various rehabilitation techniques. This would also clearly define the visible effects of management activity options on the landscape.

Information gathered during public involvement and the visual simulations will help managers define public attitudes about recreation and scenic landscape attributes such as: forested vs. more open landscapes, desire for more or less limits on motorized access, the influence of recent fire on landscape preferences, and attitudes towards "restoration forestry" techniques and objectives. Through this process, resource managers and stakeholders could collaborate to develop desired scenic and recreation setting conditions and to discuss resource "trade offs". This should be done as early in the restoration process as possible since the process is likely to be very public in nature and would benefit from the clarity that good simulations could bring to it.

IV. RECOMMENDATIONS

- Rehabilitate the pipeline access road to reduce erosion and visual contrast, and restore to a natural appearing condition (BAER Spec #29, W-9, Pipeline Access Road Rehabilitation).

- Explore willingness of landowner to rehabilitate portion of pipeline access road on private land as per specification W-9

- Discuss option of eliminating vehicular access along pipeline access road with PNM and Los Alamos County

- Forest Service to review emergency measures planned by DOE for Los Alamos Reservoir dam and spillway if time permits. If concrete is used at reservoir to armor dam or expand spillway, a color additive should be incorporated in the concrete mix that will tint concrete a shade or two darker than the native soil. Forest Service Landscape Architect would be available to assist in selection of color.

- Define the visible effects of management activity options on the landscape through graphic simulations. Hire a consultant who specializes in such technology to work with managers and stakeholders to help define desired scenic and recreation setting conditions and to discuss resource "trade offs.

- Long-term: Work with stakeholders to define Landscape Character goals for the Los Alamos, Santa Clara, and San Ildefonso view sheds.

- Closely monitor emerging aspen for signs of over-browsing by elk. Strategically placed elk "exclosure" fences could help define grazing thresholds and could be installed with little commitment of time or resources in lieu of a final decision on whether more extensive fencing is wanted.

- Conduct early and comprehensive public education program detailing the rehabilitation efforts and expected long- and short-term effects from the fire.

V. CONSULTATIONS

Jim Beard, Forest Landscape Architect, Coconino National Forest

VI. REFERENCES

Landscape Aesthetics: A Handbook for Scenery Management, USDA Forest Service Handbook Number 701, 1995

Ruth Doyle, Santa Fe National Forest, 505-438-7823

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

THREATENED AND ENDANGERED PLANT RESOURCE ASSESSMENT

I. OBJECTIVES

- Identify and locate threatened and endangered plant species impacted by fire and/or suppression actions

II. ISSUES

- Determine impacts of fire to threatened and endangered plant species and/or habitat.

III. OBSERVATIONS

Emergency consultation was initially held with the U.S. Fish and Wildlife Service (USFWS) on May 7, 2000 for threatened and endangered (T&E) species known to occur within the Cerro Grande fire area by the Chief of Resource Management, Bandelier National Monument. A current U.S. Fish and Wildlife species list was obtained on May 19, 2000 by the wildfire Biologist of the Santa Fe National Forest, Espanola District from the U.S. Fish and Wildlife Service web site. Not T&E species were listed by the USFWS for lands within the fire area. Contacts were made with local experts to determine if additional sensitive species of concern were potentially affected by the fire and suppression actions.

A. Background

Refer to Vegetation Assessment.

B. Reconnaissance Methodology and Results

On May 19, 2000 the BAER Team received Vegetation Specialists met with natural resource staff from the Santa Clara Pueblo, National Park Service, and Santa Fe National Forest to obtain baseline information pertaining to known T&E plant species. No T&E plants were known to exist within the fire area.

Upon consultation with local staff, reviewing available literature and species lists, and after reviewing the burned areas within the fire perimeter, it has been determined that no direct fire impacts have occurred to T&E plant species.

IV. RECOMMENDATIONS- None

V. CONSULTATIONS

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Donald Serrano, Range Conservationist, Santa Fe National Forest
Gilbert Gutierrez, Lands Inspector, Santa Clara Pueblo
Norman Jojola, Natural Resources Officer, BIA- Northern Pueblo Agency
Dr. Samuel Loftin, Los Alamos National Laboratory
Brian Jacobs, Vegetation Specialist, NPS-Bandelier National Monument
Dr. Craig Allen- Research Ecologist, US Geological Survey
Paul Montoya-Resource Specialist, Natural Resources Conservation Service

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LANL. 1999. Threatened and Endangered Species Habitat Management Plan Overview.

USDI-DOI. Effects of Fire on Threatened and Endangered Plants: An Annotated Bibliography.

USDI-BIA. 1997. San Ildefonso Pueblo Forest Management Plan.

USDI-BIA. 1998. Forest Management Plan and Environment Assessment, Northern Pueblos Agency.

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire

VEGETATION RESOURCE ASSESSMENT

I. OBJECTIVES

- Evaluate and assess fire and suppression impacts to vegetative resources and identify values at risk associated with vegetative losses.
- Determine rehabilitation and monitoring needs supported by specifications to aid in vegetative and soil stabilization.
- Evaluative potentials for invasive species encroachment into native plant communities within the fire area.
- Provide management recommendations to assist in vegetative recovery, watershed stabilization, site productivity and species habitat protection and rehabilitation.

II. ISSUES

- Suppression effects and short/long term impacts to plant communities and vegetative resources within Cerro Grande Fire on federal, county, private, and Trust lands.
- Protection and enhancement of other resource values including site productivity, wildfire habitat, vegetative resources, and cultural resources and watershed stability.
- Management strategies, which provide for the stabilization, natural regeneration and recovery of impacted areas.
- Monitoring of the seeding effectiveness of rehabilitation efforts.
- Monitoring of impacted lands for the early detection and control of invasive and noxious weed species.

III. OBSERVATIONS

This report identifies and addresses known and potential known and potential impacts to vegetative resources within the Cerro Grande Fire at Los Alamos, New Mexico.

The burned area consists of approximately 42,878 acres of riparian, grass, piñon juniper, ponderosa pine, mixed-conifer, aspen, white fir forest communities. Vegetative resources provide forage and cover for a variety of wildfire species, aesthetic values, watershed stability, and biologically diverse plant associations.

Findings and recommendations contained within this assessment are based upon information obtained from personal interviews with federal, county, private and tribal staff; private landowners, BAER Team specialists, literature research, and field reviews of the fire area.

Reconnaissance of impacted areas included aerial and ground survey methods. This assessment will attempt to capture the concerns expressed by the Santa Clara and San

Ildefonso Tribes, Bureau of Indian Affairs (BIA), Us Forest Service (USFS), National Park Service (NPS), Natural Resources Conservation Service (NRCS), Loa Alamos National Laboratory (LANL) staff and private land owners. Many entities have been impacted by this fire and all have demonstrated a cooperative spirits and concern for the future management of these lands. This report will detail the known damage to vegetative resources; will discuss revegetation processes and future monitoring criteria; and will outline management considerations for recovery of the vegetative resources.

A. Background

The Cerro Grande Fire began on May 4, 2000, near the community of Los Alamos, New Mexico as a prescribed fire. Fueled by erratic winds and extremely dry conditions, the fire ultimately escaped established control lines and was declared a wildfire on May 5.

Vegetative resources were extensively impacted by this fire on federal, county, private and tribal lands. As detailed later in this report, fire impacts ranged from total loss of understory species, varying degrees of loss in overstory species, to the total removal of all plant communities within many watershed.

Resource concerns expressed by federal, state, county and private sources concerning vegetative resources include: vegetative loss and the short long term impacts to wildlife habitat, archaeological resources, watershed stability, site productivity, aesthetics, public safety, impacts to threatened or endangered plant and animal species, and potential long-term affects to the forest and woodland ecosystems.

The Pajarito Plateau of the eastern Jemez Mountains exhibits a diverse flora. For example, the vascular plant flora of Bandelier National Monument includes collections of 720 species in 347 genera representing 86 families (Jacobs and Jacob 1989). These plant species are arrayed across the landscape in a general vegetation pattern similar to that found throughout the southern Rocky Mountains, with a zonation of communities based on elevation and slop exposure. Moving upward from the Rio Grande to the Jemez peaks one passes though juniper grasslands (*Juniperus monosperma, Bouteluoa sp.*) from about 1,600-1,900 m; piñon-juniper woodlands (*Pinus edulis*) at 1,900-2,100m; ponderosa pine forests (*Pinus ponderosa*) at 2,100-2,300 m; mixed-conifer forests of ponderosa pine, Douglas-fir (*Pseudotsuga menziesii*), white-fir (*Abies concolor*), aspen (*Populus tremuloides*), and limber pine (*Pinues flexilis*) at 2,300-2,900 m; and finally into spruce-fir forests of Engleman spruce (*Picea engelmanni*) and corbark fir (*Abieslasiocarpa Var. Arizonica*) on the north slopes of the highest peaks above 2,900 m. High elevation montane grasslands of Thurber fescue(*Festuca thurberi*) *and mountain oats Danthonia parvi*) occur as large breaks in the mixed-conifer forests on upper south-facing slopes, and large moist meadows occupy the interior basins of the Jemez Mountains such as the Valle Grande.

B. Reconnaissance Methodology and Results

On May 17, 2000, the Interagency BAER Team assembled at the Northern Pueblos Agency to begin rehabilitation assessments. On May 18-19, 2000 the Vegetation Specialist met with representatives from NPA, BIA, Santa Clara and San Ildefonso Pueblos, LANL, and the USFS to obtain issues and objectives for emergency rehabilitation actions, baselines information pertaining to known impacts, and information related to vegetation resources. Upon consultation with local staff, and after reviewing the burned areas within the fire perimeter, direct fire impacts have been documented for all plant communities.

Aerial reconnaissance of the burned area was conducted on May 18, 2000, and again on May 21, 2000, to map burn intensity and tree mortality and to determine and document

losses of vegetative resources. The fire burned in a mosaic fashion on approximately 60% of the fire area. Due to extremely dry conditions vegetation resources were significantly impacted in the moderate and high burn severity areas. On 40% of the fire area there was either total overstory species. Burn intensity was greatest on the south facing and easterly facing slopes on USFS lands above the town of Los Alamos and the Santa Clara Indian Reservation.

Field reconnaissance of the fire was conducted between May 19 and May 25 with the aide of local resource experts from federal and tribal agencies. Each plant association type was inspected to determine vegetative losses, requirments for rehabilitation efforts, recovery potentials, and long-term rehabilitation needs. Reconnaissance included the anaysis of plant associations impacted by previous fires adjacent to the Cerro Grande fire area. Observations were made of fire impacts to duff layers, live crown tissue on grass and shrub species, and on impacts of the fire to existing seed banks.

A literature review was conducted to obtain baselines data on soils, hydrologic processes, plant communities and the importance of vegetative species. Many well-written documents exist that detail historic and present day vegetation descriptions. Excerpts from these documents have been included to provide the reader with a better understanding of vegetative community structure and provide insight into the fragility of these watersheds.

1. Vegetation

The Cerro Grande Fire burned approximately 48,878 acres of federal and private lands in and around the communities of Los Alamos and Espanola, New Mexico. Due to extreme fire behavior, fuel conditions, topography, and weather varying amounts of vegetative cover was lost.

Primary plant communities impacted by the fire included piñon-juniper, ponderosa pine, mixed-conifer, aspen, and white fir communities.

Juniper Grassland: dominated by a one-seed juniper overstory with an understory of grass and forbs.

Piñon-Juniper: dominated by piñon pine and one-seed juniper overstory with a mixed grass, herb, shrub understory.

Ponderosa Pine: dominated by a ponderosa overstory with a variety of understories depending on stand density and recent fire history.

Mixed-conifer: dominated by an evergreen, coniferous species overstory including Engleman and blue spruce (in wet meadows), limber pine, Douglas-fir, white fir, ponderosa pine (on dry sites), and corkbark fir (at the highest elevations).

Aspen Groves: dominated by aspen with an understory of grasses and forbs. This community is considered a fire dependent seral stage which converts to mixed-conifer in the absence of fire.

Montane Grassland: dominated by native grasses including Thurber fescue, mountain brome *(Bromus marginatus)* and mountain oats with an assortment of perennial herbs on the upper mountain slope areas. Shrubs usually occur on rocky sites (felsenmeers) within the grassland type. Wet meadow areas are also included within this category. Often interdispersed with or bounded by mixed-conifer and aspen. This community is considered a fire dependent seral stage, which converts to mixed-conifer in the absence of fire.

Vegetative conditions within the Jemez Mountains influence hydrology and watershed stability of the local area in several ways. Vegetation intercepts rainfall, thereby reducing rainfall impact energy and increasing the opportunity for infiltration into the soil. Plant root structure creates a "webbing" within the soil profile that holds soil in place. Plants also utilize soil moisture reducing runoff potential and reduce water runoff velocities of overland flow.

Vegetation resources provide valuable wildlife forage and habitat, watershed protection, and comprise a visually pleasing landscape. Past land management practices (i.e. timber harvest) have shaped plant community composition in the Los Alamos area. The effects of this fire will have both positive and negative short and long-term influences on these plant communities and in the natural regeneration processes of the impacted watersheds.

It was observed during field reviews that burn severity and burn intensities were often directly related to vegetative conditions and growth form within each of these communities. That is, some stands that were recently thinned or had been treated using prescribed fire sustained less damage than those that contained large quantities of brush species, heavy duff layers, or "dog-haired" thickets of trees.

The literature reviewed showed that prior to the 1800's, southwestern forests, particularly in the ponderosa pine type were more open with fewer trees per acre (Allen 1989, Swetnam and Baisan 1996). The forest floor was predominantly covered with herbaceous vegetation (grasses, sedges, forbs) and frequent fires consumed the branches, needles, seedlings, and fallen trees maintaining an open parklike condition. Fuel accumulations did not reach levels high enough where fires could burn hot enough to alter the overstory.

Additionally and topography also play an important role in plant community cover and species composition. Hot temperatures and deficient early summer moisture create severe growing conditions for most plants in the lower elevations and southern and western exposures. North and east exposures at higher elevations are characterized by higher summer moisture and more favorable growing conditions, resulting in more uniform and dense vegetative cover.

TABLE A:

FOREST COMMUNITY	FIRE FREQUENCY (YRS)
Piñon-juniper	15-40
Ponderosa Pine	2-15
Mixed-conifer	10-30
Spruce-fir	+150

Altering the fire regime by lengthening the fire return interval resulted in a substantial increase in tree numbers, density, and fuel accumulations (Allen 1989, 1998). As witnessed in the Cerro Grande Fire, this increase in fuel and understory vegetation in these fire influenced communities created a condition for a large, high intensity, stand replacing event on approximately 34% of the fire area.

Within the closed canopy communities of the ponderosa pine, piñon-juniper, and mixed-conifer communities, grasses such as little bluestem and brush species such as some gamble oak *(Quercus gambellii)* provided ladder fuels for fire to quickly spread into the overstory canopy. In areas where underburning or forest thinning projects were present fire impacts to vegetative resources was greatly reduced. In some cases, the fire was slowed or stopped within treated areas.

In order to better quantify impacts to vegetation, four mortality classes were developed and utilized to map the fire area. The four classes developed were:

Class1: 0-10%
Class2: 10-40%
Class 3: 40-70%
Class 4: 70-100%

Using these four mortality classes, the vegetation specialist took into account the impacts of the fire on grass, forb, shrub, and tree species. In some areas where the fire moved very quickly through the stand in a mosiac burn pattern, understory vegetative losses may have been classed in the 40-70% whereas actual overstory losses may have been higher. The intent of mapping vegetation in these classes was to determine impacts to wildlife habitat, native plant associations and their recovery ability, watershed stability, and potential treatment recommendations.

Outlined below in Table B is a summary of acres by plant community type by mortality class:

TABLE B:

Plant Associations	0-10% Mort	10-40% Mort	40-70%	70-100%	Totals
Aspen	349	297	128	550	1 324
Grass	215	1 392	293	153	2 063
Grass-Shrub Complex	133	622	140	32	927
Meadow	25	13			38
Mixed-conifer	1.605	2.209	938	4.989	9 741
Oak	7	220	84	462	773
Piñon-Juniper	109	2.213	1.117	1 608	5.047
Ponderosa Pine	805	6.872	5.252	8 886	21.815
Ripanan/Evergreen		50			50
White Fir		18	280	379	677
TOTALS	3.248	13.906	8.232	17.059	42.445

Table C gives an accounting of acres by mortality class by landownership:

TABLE C:

OWNERSHIP	0-10% Mortality	10-40% Mortality	40-70% Mortality	70-100% Mort.
NPS-BAND	485	248	1	94
USFS	1.103	4.512	5.990	13.996
Santa Clara	1.004	2.230	1.258	2.189
San Ildefonso		222	42	28
LANL	48	6.047	798	509
Private	33	778	325	223
BACA Ranch	553	109	5	35
TOTALS	3.231	14.152	8.419	17.076

Watershed personnel mapped burn severity throughout the fire area (please refer to watershed assessment for parameters and survey methodologies). The BAER Team vegetation specialist utilized this mapping effort to assist in documenting vegetation mortality. Although there was not a direct correlation between burn severity and burn

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intensity, burn severity was utilized to pre-type expected vegetation impacts followed-up by field verification inventories.

Generally speaking, most high severity burn areas experienced greater than 70% vegetative loss. On approximately 90% of the high burn severity areas, complete consumption of vegetative resources was observed. Most tree, shrub, grass and forb species and downed woody debris were removed from the site indicating extreme fire intensity, and long residency times. In many areas, only standing tree boles remain. Ninety percent of overstory trees were killed and all ground vegetation was consumed. Brush species will likely resprout in many of these areas, however, seed bank sources in the soil were negatively impacted.

In most moderate burn severity areas, a mosaic burn pattern was observed whereby some plant associations experienced greater than 70% mortality but the majority experienced a 10-40% loss.

Low burn severity areas experienced localized losses greater than 10% but were primarily characterized as having less than 10% vegetation mortality with good native seed banks remaining.

Below are general observation on each ownership pertaining to fire effects on vegetation:

Santa Clara Pueblo: Fire impacts to Santa Clara Pueblo lands include 3,317 acres of low, 1,312 acres of moderate, and 2,052 acres of high burn severity primarily within the piñon-juniper, ponderosa pine and mixed-conifer plant communities. Stand-replacing events occurred primarily in the Sawyer Canyon, Burnt Mesa, and the headwaters of the Garcia Canyon. Intensive fire behavior also impacted some mixed-conifer stands on the North-facing slope of Santa Clara Canyon. Santa Clara Canyon was also impacted as fire backed down the slope into the valley. As the fire underburned these stands, intensive heat created by understory species. In the next 2 years, higher mortality rates may occur throughout the fire area due to the extent of the current drought situation and the tree's inability to repel bug attacks and disease.

San Ildefonso Pueblo: Fire impacts on San Ildefonso lands include 222 acres of low and 70 acres of moderate burn severity primarily within the piñon-juniper and Ponderosa pine plant communities. Overstory losses were high within the Sacred Area in the mixed-conifer plant community. Fire effects were primarily uniform on the mesa top and valley bottoms. However, it was noted that a significant amount of native vegetation remained adjacent to and inside of the burned perimeter. This will aide in the natural regeneration of the piñon-juniper and ponderosa pine plant communities.

Santa Fe National Forest Lands: Fire impacts on national forest lands include 12,174 acres of low, 1,109 acres of moderate, and 12, 318 acres of high burn severity within all plant communities. Ponderosa pine stands were severely impacted within the Los Alamos, Pueblo, Guaje, Chupaderos, and Garcia Canyon areas. Watersheds above the town of Los Alamos was the most severely impacted as the fire removed 90% or more of all vegetative species. Mixed-conifer stands were impacted similarity to those on the Santa Clara Reservation. Many species such as aspen, mountain mahogany and oak will resprout and recover quickly but may impact reforestation efforts on the hotter, dryer sites. Grass species such as a blue grama and bluestem will recover quickly on those sites where fire residency time was short. However, on many of the high burn severity areas, natural regeneration will be slow for all species due to the reduction of native seed banks within the soil and harsher, drier growing conditions.

LANL: Fire impacts to vegetative resources at LANL include 6,376 acres of low, 824 acres of moderate, and 203 acres of high burn severity. Overall, burn severity was low across the majority of Department of Energy (DOE) lands. However, there are concerns of soil movement on steeper canyon slopes within the project as a result of high and moderate burn severity impacts. Piñon-juniper and ponderosa pine plant communities were primarily impacted. Rehabilitation efforts on LANL lands may vary from public lands due to downstream values and risks. LANL personnel are currently working on rehabilitation treatment recommendations for DOE lands.

NPS- Bandelier National Monument: Fire impacts on NPS lands include 694 acres of low, 39 acres of moderate, and 94 acres of high burn severity. Primary impacts were to montane grasslands, Ponderosa pine and mixed-conifer stands. Burn severity does not dictate the need for revegetation of NPS lands. Natural regeneration processes will be allowed to revegetate impacted lands.

2. **Vegetation/Structural Impacts:**

Vegetation resources were directly impacted by the Cerro Grande Fire and by suppression tactics utilized to control the fire. Documented impacts to vegetation resulted from:

a) Construction of dozerline, safety zones and handline within subdivisions, and on roads, old skid trails, ridgetops and previously undisturbed sites.

b) Impacts to native tree, shrub, and grass species during line construction, suppression and mop-up activities.

c) Reduction of fuels and vegetation ahead of the fire-front by nighttime dozer operations.

d) Vegetation losses due to fire intensity. Many tree species were badly scorched by 150+ flame lengths and many will die later.

e) Loss of the organic litter layer on approximately 80 percent of the fire.

f) Impacts to riparian vegetation by dozerline construction across drainages and fire effects on riparian species.

In the high burn intensity areas, seed within the soils have either been consumed or viability significantly reduced by the intense heat. In moderate burn intensity areas, seed banks have been impacted as well, but some natural regeneration via sprouting will occur for shrub species such as oak. On low intensity burn areas, seed banks within the soil were not severely impacted by the fire.

In places, evidence was seen of very erratic fire behavior based upon scorch heights, single tree torching, and "frozen needles" on trees. Trees were killed by extreme heat, but the needles were not consumed by the fire. These needles will fall and provide a natural litter cover over the soil surface and reduce raindrop impact on bare soils.

In areas of high heat concentration, where total consumption of needles and smaller diameter tree branches did occur, natural regeneration from seed sources will be low and will take many years. Discussions on direct tree mortality, imminent mortality, potential salvage and reforestation recommendations can be found within the Forest Resource Assessment. Additionally, it was noted that many smaller diameter trees had roots burned out deep into the soil profile. Stump holes were as much as six feet deep in some

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cases. This is an indication of very low fuel moistures within live tree species before the fire. Drought stress combined with fire effects will increase tree mortality.

Complete loss of canopy cover and vegetative cover in high intensity burn areas can now be mapped, but direct fire impacts to ponderosa pine, piñon-juniper and mixed-conifer communities will continue for many years. Tree mortality will continue for the next several years on those pine trees with less than 50% crown cover (Potter and Foxx, 1979) (Foxx 1996), and Douglas fir with less than 30% crown cover. As these impacted trees die, potential negative impacts can occur in the successional recovery of understory plant communities and impact their suitability as wildlife habitat. Extensive research done following the La Mesa Fire of 1977 has shown that a) mortality of tree species, and b) the percent of post-fire tree canopy, has a linear relationship in the successional recovery of understory species (Foxx, 1996).

The nearby Oso fire, which occurred in 1998, shows a good recovery of grasses and forbs on the northern portion of the fire. Within the Cerro Grande Fire area, competition between shrub and tree species will occur as some communities will become shrub dominated. Shrubs will prevail in the early successional stages during recovery. Wildland fire moved these plant communities back to an early successional stage. It will take decades to reshape these communities back to pre-fire levels. It is anticipated that some species, such as aspen, will expand across the landscape as a result of this fire event. However, use of aspen regeneration by elk may be high enough to prevent not only spread of former aspen clones, but recovery to pre-burn densities.

Revegetation of the fire area, either through seeding/planting or natural processes must be timely to ensure soil stability and maintain watershed integrity. Records show the major influence resulting in accelerated erosion in Jemez Mountain soils is concentrated water flows. The alteration of hydrologic processes on upland slopes by roads and the removal of vegetative cover and rapid decomposition of forest litter are the primary causes for concentrated flows.

Although most vegetation has been temporarily removed in the moderate and high intensity burn areas, species are expected to recover through natural processes in time. Many shrub species, such as Gambel oak and New Mexico locust will aggressively resprout following fire disturbance. Observations of sprouting vegetation (grasses, forbs, and shrubs) one week following the fire have been made by the BAER Team Vegetation Specialist and Hydrologist.

Negative impacts from the loss of vegetation include loss of wildlife habitat, increased potential for the delivery of sediment to the Rio Grande, visual quality degradation, increased non-native invasion potentials, bare soils, and reduced species diversity. The loss of wildlife habitat, and potential impacts to Threatened and Endangered Species are discussed further within the Wildlife Assessment.

Discussions with local USFS and Tribal staff revealed there are active grazing allotments for livestock on federal and tribal lands within the fire area. The USFS utilizes one grazing allotment in the Guaje Canyon area to winter three head of USFS horses. Approximately 3,100 acres providing 200 Animal Unit Months of forage were lost on the Santa Clara Reservation. Grazing on these allotments should be deferred for at least three years to allow for vegetative recovery. On Santa Clara Pueblo lands, the reconstruction of an existing fence has been

proposed to aid livestock producers in the management of their livestock on lower elevational range lands during this recovery period. It is imperative that revegetation processes take hold and provide the necessary root structure and vegetative cover to reduce erosion potentials on these lands and to protect downstream life and property.

Additional losses surveyed during field reviews were fire impacts on pasture and boundary fences. Pasture fences and the Reservation boundary fence between Santa Clara Reservation and National Forest lands were damaged. Stretch posts, wire, and cattleguards will require repair.

On USFS lands, a big-game guzzler and exclosure fence were damaged. This watering facility played an important role in water delivery for wildlife and livestock in the Guaje Canyon area. Repair of this watering facility is now imperative for wildlife. Many water sources within this area are now dry due to the prolonged drought. This facility requires repair prior to the monsoon season to ensure that wildlife species impacted by the fire have adequate water in this area.

Other direct impacts to vegetation include the loss of shrub-lands and forest communities previously occupied by dense vegetation which are now open and traversable. Increased visitor use into areas off of designated trail systems can be expected and could have negative impacts to wildlife, vegetative recovery, and cultural resources. Currently, the amount of open roads within the USFS lands is of great concern for revegetation efforts. Without a temporary closure of roads, an increase in off-road, foot, ORV, and equestrian travel can be expected. Lands that were once inaccessible to visitors because of brush, and dense forest timber stands are now wide open. Impacts to revegetation efforts and the protection of cultural resources will be jeopardized if travel within the fire area is not regulated for the remainder of this calendar year.

3. Noxious Weed Establishment

During the initial BAER Team briefing, the concern of invasive species introduction into the fire area was discussed with the vegetation specialist. Concern was expressed concerning species introduced during seeding operations on the Dome fire and potentially from suppression forces on NPS, USFS and tribal lands.

During fire suppression efforts, equipment and personnel were summoned from throughout the United States. The establishment of invasive species and noxious weed, which will compete with native vegetation recovery, is likely. Noxious weed establishment and spread is most likely to occur on disturbed sites such as dozerlines, handlines, helispots, and safety zones. Invasive species and noxious weed seed may have been introduced to these disturbed sites through seed transport on equipment, vehicle under-carriages, movement of equipment through established populations during line construction, or inadvertently by personnel during suppression or rehabilitation actions.

Another potential source of invasive species introduction may come from reseeding efforts. Prior to seed purchase for the Cerro Grande Fire, certification of seed purity and germination were obtained. However, it is possible that non-

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desirable species may be present within the mix. To ensure that seed applied to the fire area met, quality standards established by the rehabilitation team, grab samples were obtained during seeding operations. These samples will be sent to an independent laboratory for analysis. Tests results will be shared with all impacted agencies.

Disturbed sites within the fire area should be inventoned by each respective management agency utilizing funds allocated within this plan. Each agency should establish their own monitoring protocols and ensure that surveys are conducted during the 2001 calendar year. Upon the discovery of new noxious weed populations, accurate population information should be collected through the use of GPS to determine infestation size, original source and potential control methods. Control efforts will be implemented in accordance with Agency management guidelines and protocols.

4. Revegetation

Following the review of the fire area and after consulting with local revegetation specialists, soil scientists and hydrologist, it was determined revegetation of the moderate to high burn intensity areas would be needed. Due to the highly erosive nature of these soils, the importance vegetation plays in site stabilization and watershed integrity, and to protect downstream life and property values, a rehabilitation seed mixture was ordered to treat approximately 20,000 acres of the fire. Of particular concern are the communities of Los Alamos, White Rock, Santa Clara, and those communities downstream from the LANL facilities.

On May 19, 2000, a meeting was held with vegetation and watershed specialists from NPS, BIA, LANL, USFS, USGS, NRCS to compile a list of acceptable native and introduced species for revegetating high and moderate burn intensity areas. The BAER Team vegetation specialist had been in contact with a major seed supply company and received a cursory list of available native seed species in the quantities that would be recommended for the Los Alamos area.

A seed mixture was established by the interagency BAER team and local resource specialists to treat the emergency watershed conditions within the moderate and high burn intensity areas. Factors taken into account when compiling the mixture included: 1) the lack of available native seed from the local area in quantities that would treat the entire fire area; 2) the need to immediately address the watershed emergency conditions; 3) the need to mitigate immediate threats to life and property; 4) professional experience and knowledge of grass species that would establish quickly.

The BAER Team vegetation specialist, with the aid of an interagency contingency and input from the Santa Clara and San Ildefonso resource advisors, derived a seed mix consisting of two cereal grain species and two native species (consisting of one warm season and one cool season species). A mix consisting of annual ryegrass, barley, mountain brome, and slender wheatgrass was recommended. The intent of this mix is to provide seed with both a record of good regeneration success in plant community types in the high and low elevational zones, and good root mass production capabilities. Seeding success of this treatment will depend upon favorable weather and precipitation patterns during the up coming months.

Drawing from the seeding efforts on the 1996 Dome fire, concern was expressed concerning the use of only Annual ryegrass (*Lolium multiflorum)* in the mixture.

Barley (*Hordeum vulgare*) was added to provide a mixture of annual species that have fast root growing capacity and will aid in site stabilization. Concern was expressed concerning the use of grain crops in the mixture instead of native seed species. Annual ryegrass has proven to be an effective ground cover that develops root mass quickly and will aid in breaking up hydrophobic layers in the soil and is effective in holding soils in place. Both of the grain species may persist within the environment for a 3-5 year period and then will die out. Proponents of rygrass seeding agree that ryegrass may interfere with native species regeneration but it does not threaten long-term integrity of ecosystems. (Schultz et al. 1955, Krammes and Hill 1963, Corbett and Green 1965, Biswell 1974, Conrad 1979, Dodge 1979, Kay et al. 1981, Gauber 1982.) Opponents to rygrass seeding share the opposite view. However, in the case of the Cerro Grande fire, this mixture was selected in order to protect downstream life and property values.

Once compiled, the seed mixture was forwarded to the Multi-Agency Coordination (MAC) Group for approval. MAC recommended purchase of the seed mixture and bids were entertained from companies from throughout the United States. A successful bidder was chosen and seed began arriving at the Los Alamos airport on May 29, 2000. Seeding started on June 1, 2000.

Permission has been obtained for seeding USFS, county, Santa Clara Pueblo, San Ildefonso Pueblo, and DOE lands. Seed will be applied to high and moderate burn severity areas.

Concern was expressed by both tribes regarding the loss of culturally significant plant species. The tribes expressed concern that they would require assistance in cultural plant identification and in obtaining seed to grow and replenish culturally significant species. In discussing this matter with other vegetation specialists from the NRCS and USGS, Bandelier National Monument personnel provided information that native seed had been collected and grown for their use by the NRCS Plant Material Laboratory. This seed could be made available for use by the Santa Clara and San Ildefonso Tribes if they so desired. San Ildefonso management guidelines call for the use of native seed in all rehabilitation actions. As discussed above, adequate seed sources are available within the Sacred Area for natural regeneration processes to stabilize fire impacted lands however the Bandelier seed can provide other vegetation rehabilitation options for the tribes.

Seed application during the beginning of the summer season will inevitably reduce seeding success. Seed predation prior to germination will most likely occur. Seed application rates have been designed to provide 60 seeds per square foot across the high and moderate burn intensity areas. A target for establishment is 9-15 plants per square foot. Weather patterns, soil conditions, available micro-sites, etc. will determine seeding success for this area.

After the completion of proposed seeding operations, follow-up surveys will be required to determine seeding establishment and effectiveness. Utilizing procedures outlined below, vegetative surveys should be conducted to ensure that adequate establishment is obtained from seeded and native species to achieve watershed stabilization goals. Additional re-vegetation treatments may be required to achieve watershed stability and reduce threats to downstream life and property values this fall. It is recommended that a seeding success survey be conducted, and an additional seeding treatment be initiated with native species as weather conditions permit. A specification for the second seeding application has not been included within this plan as seeding areas, seed mixtures, etc. will need to be prescribed for the lands requiring additional treatment. All tribal, federal, county, and private entities should coordinate these treatments to ensure treatment success.

Increased water flows from the fire can be expected. As soils become saturated, and with the absence of vegetation to assist in water infiltration, higher than normal flows will result. Aerial seeding has been determined to be necessary to aid in vegetative establishment within the high and moderate burn intensity areas for soil retention, protection of site productivity, but primarily for the protection of downstream life and property.

The Cerro Grande Fire has burned lands owned and managed by many different entities. Within the fire area, multi-agency cooperation has been utilized and will need to continue in order to facilitate stabilization processes in impacted watersheds.

Privately owned lands in the community of Los Alamos have also been evaluated and factored into the seeding treatment acreage. The BAER Team, in a public meeting held May 31, 2000 detailed treatment options available for private landowners. With the assistance of the NRCS, private landowners will be encouraged to initiate identified rehabilitation measures for mitigating fire effects

and for the protection of downstream life and property values. Final implementation of seeding treatments on private lands will be at the discretion of the private landowner. It is recommended that private landowners, once seed and mulch is applied to their lands, water these areas to promote early germination and grass establishment this summer.

The BAER Team assessment has determined that the vegetative losses resulting from the Cerro Grande Fire cross all geopolitical and ownership boundaries. Likewise, the treatments contained within this assessment are based upon the need to treat entire watersheds on all land ownership's for the protection of downstream life and property values. Failure to treat federal and private lands in a similar manner may result in treatment failures and further watershed degradation and could cause additional damages to private, state, county and federal lands, property and resources.

A potential conflict may exist between timber salvage within the fire area and emergency watershed treatment actions. While salvage operations may be attempted to capture value from standing dead timber, impacts to natural resources will occur which may further degrade watershed conditions. Further disturbance of the soil surface coupled with logging impacts on remaining live vegetation could be detrimental to vegetative resources. Should salvage operations be initiated, additional rehabilitation treatments and mitigation actions will be necessary to protect downstream life and property values. Interdisciplinary planning efforts will be required to ensure the protection of revegetation efforts. Cooperative planning and timber sales using helicopter logging techniques can accommodate both tribal and federal needs in this situation. Cooperation and communication will be necessary between the USFS and Pueblos to ensure that vegetation and cultural resources are protected during any salvage operation.

IV. RECOMMENDATIONS

A. Management (specification related)

The following recommendations are offered to assist in the timely recovery of Cerro Grande Fire:

1. **Aerial Seeding:** Apply seed mix at the rate of 36 pounds per acre of Pure Live Seed (60 seeds per square foot) over high and moderate burn intensity sites. Treat all high and moderate burn intensity areas within identified watersheds. Seeding is required to achieve watershed stabilization, protect site biological integrity and protect downstream life and property. (BAER Spec #11, W-1a, Aerial Seeding).
2. Install Range Fence- Repair and replace 3.5 miles of range fence on the Santa Clara Reservation approximately 3/4 miles east of Puye' Cliff dwellings to protect revegetation efforts within the fire area from livestock grazing. (BAER Spec #16, S-1b, Repair Permanent Range and Boundary Fence).
3. Should seeding effectiveness monitoring reveal significant negative impacts from elk use, fencing is recommended as a means to control oversue by elk.

B. Monitoring (specification related)

1. **Monitor Seeding Effectiveness:** Establish transects in moderately to high burn intensity areas for each plant community type reseeded in June, 2000. Site selections should be made by agency representatives. Transects will be

established and methodologies designed to determine seeding effectiveness utilizing the following criteria:

a) A minimum seedling establishment of 9-15 plants per square foot.
b) Sampling should determine species composition, root depth and area, plant height and vigor.
c) Count seedlings per square foot (i.e. Seeded species, Native species, and Total#). Compare to seeding rate /sq. Ft for treatment success.
d) Estimate root mass/square ft.-Pull a few plants up from soil surface on a representative area. Measure diameter of root wad. Utilizing the following formula, seeding success may be measured.

Example: Where root mass is equal to 2" diameter:

$$\frac{2" \times 3.1416}{144 \text{ sq.in}} = \frac{6.2832}{144} = .0436 \text{ sq.ft} \times 10 \text{ plots} = .44 \text{ sq. ft.}$$

e) Test for hydrophobic layer (H2P) in root mass to estimate treatment effectiveness of grass roots in penetrating to H2P.
f) Estimate effective root cover area due to grasses and other sources.
g) Sampling methodologies shall represent all plant communities, all aspects, and slope variations support with photographs on data records
h) Observations should be documented to record other factors such as surface erosion, animal browsing, etc.
i) Monitor any salvage sale operations for adverse impacts to establishment of herbaceous vegetation.
j) Monitor elk use for significant adverse impact to establishment or regrowth of herbaceous and woody vegetation.
k) A final report shall be published that documents sampling techniques, areas sampled, and summary of findings.

(BAER Spec #12, 0-2a, Monitor Seeding Effectiveness)

2. **Invasive Species Monitoring:** Develop monitoring protocols and conduct field inventories on disturbed sites including but not limited to dozerlines, handlines, safety zones, and helibases to map, and initiate control measures on invasive species infestations that threaten native plant community recovery as discovered. (BAER Spec #13, 0-2b, Monitor Invasive Plant Species).

C. **Management Recommendations (non-specification related)**

1. Initiate administrative road closures within the Cerro Grande Fire area for the protection of revegetation efforts and cultural resources.
2. Create informational articles for the public during the course of the rehab efforts to keep residents updated on progress. Continue to produce timely news releases to educate the general public about the forest ecosystem developmental and recovery periods following fire.
3. Utilize the NRCS and RCD programs to assist with rehabilitation on private lands and information dissemination.
4. Encourage landowners to water and care for seeding and straw mulch applications during remainder of summer months.
5. Cooperatively initiate repairs to fencelines, cattleguard wings, and big game guzzler.
6. Defer grazing on Pueblo and USFS lands for a period of 3 years.
7. Establish photo trend/vegetation monitoring plots in 2001 to document vegetative recovery in each plant association within the fire area.
8. Evaluate seeding success in an interagency forum and develop additional

seeding needs cooperatively.

9. Work cooperatively on salvage sale options that will minimize disturbance to revegetation and natural regeneration process.

10. Conduct surveys to locate, identify, replant, and maintain sites suitable for sustaining culturally important plant species.

IV. CONSULTATIONS

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Edward Tafoya- Ranger- Santa Clara Pueblo
Walter Dasheno, Former Governor, Santa Clara Pueblo

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INTERAGENCY
BURNED AREA EMERGENCY REHABILITATION TEAM

Cerro Grande Fire Complex

WILDLIFE RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess effects of fire and suppression actions to Threatened, Endangered, Proposed and other significant agency listed species (TEPS) and their habitat, including birds, mammals, amphibians, reptiles, fish and insects.
- Initiate Emergency Section 7 Consultation as required by the Endangered Species Act.
- Assess effects of fire and suppression action to habitat improvements.
- Assess effects of proposed emergency rehabilitation actions to TEPS species and habitat.
- Prescribe emergency rehabilitation measures and/or monitoring.

II. ISSUES

- Three federally listed species occur or have habitat within, or down stream of, the fire perimeter.
- Ten culturally significant species and two agency sensitive species occur within the fire area.
- Potential effects to these species from the fire, suppression actions and potential post fire effects to down stream species.
- Potential effects to these species from proposed emergency rehabilitation actions.

III. OBSERVATIONS

A. Background

The purpose of this Burn Area Emergency Rehabilitation (BAER) Wildlife Assessment is to document the effects of the fire, suppression actions, proposed emergency rehabilitation work, and potential post fire flooding, to all federally listed and culturally significant mammals, birds, amphibians, reptiles, fish, invertebrates, and their habitat, which may occur within or downstream from the fire area. This assessment also discusses information that is included in the detailed documentation of Emergency Section 7 Consultation, as required by the Endangered Species Act, with U. S. Fish and Wildlife Service (FWS). The federally listed species are the Mexican spotted owl (MSO), bald eagle and southwestern willow flycatcher. Other species of concern include elk, mule deer, black bear, bobcat, mountain lion, golden eagle, wild turkey, barred tiger salamander, rainbow trout, Rio Grande cutthroat trout, Jemez Mountains salamander (JMS), and peregrine falcon. This species list was developed by FWS; Mary Orr, Santa Fe National Forest (SFNF); Norman Jojolla, Northern Pueblos Agency, Bureau of Indian Affairs; Elizabeth Withers, Department of Energy (DOE); Steve Fettig, Bandelier National Monument (BAND); and Jon Klingel, New Mexico Department of Game and Fish (NMGF). Species occurrence discussed in this assessment is based on formal surveys and habitat inventories conducted prior to the Cerro Grande Fire, and post fire reconnaissance. Documents, inventory data, sighting records, vegetation maps and other species specific information referenced in this report are on file at the various agency offices.

The Cerro Grande Fire burned approximately 42,878 acres between May 4 and May 28, 2000. This fire was ignited as a prescribed burn on the Bandelier National Monument. Lighting and line control occurred through the early morning of May 5. Sporadic wind caused spotting and the fire slopped over the control lines. The prescribed burn was declared a wildfire on May 5 at 1300 hours. The fire was contained by May 6. However, a significant increase of strong, gusty winds on May 7 resulted in major fire activity that caused the fire to crown into the trees and to move east onto the SFNF. On May 10, the fire was carried by high winds to the north, south and east, burning 15,000 acres of County and private lands within the town of Los Alamos, and DOE lands. The fire continued to spread each day until May 16. After May 16, the fire continued to burn but there was little expansion of the fire boundaries. The fire also burned other private lands and portions of San Ildefonso and Santa Clara Pueblo's lands. This was primarily a wind driven fire with conditions exacerbated by high temperatures, continuous low relative humidity and low fuel moisture. The fire had not yet been declared contained as of May 31 and the projected control date was July 9. Land ownership affected by the fire includes approximately 6,681 acres of Santa Clara Pueblo reservation lands, 292 acres of San Ildefonso Pueblo reservation lands, 25,601 acres of National Forest System lands, 7,402 acres of DOE lands, 828 acres of Bandelier National Monument lands, and 2,061 acres of Los Alamos County and private lands.

Fire suppression actions included construction of 16 miles of handline, 39 miles of dozer line, and safety zones (however, none were observed or recorded on the fire incident maps). Fire suppression records regarding backfiring indicate that no burning was done on the Santa Clara or San Ildefonso Pueblo lands. Some backfiring may have occurred west of the town of Los Alamos on the mesa north of Canyon de Valle, and at least 289 acres (the only record available for this assessment was acres of MSO territories affected) of DOE lands were backfired. Air support included constant use of helicopters for water drops and crew transport, and deployment of approximately 135,800 gallons of fire retardant (unable to obtain records on type used), primarily around the town of Los Alamos. Suppression forces used many pre-existing water sources. Six-drop points were used, 32 miles of unimproved roads were improved, and 44 miles of gravel roads were used, including some vegetation removal within 100 feet of either side of the roads. Unimproved roads on DOE lands were not used for suppression actions.

Vegetation resources were impacted to varying degrees as burn severity varied across the landscape. 14,728 acres (34%) were impacted by very intense fire resulting in high burn severity (defines effects to soils and hydrologic function of the affected watersheds), 3,578 acres (8%) experience moderate burn severity, and 24,572 acres (57%) experienced low burn severity or remained unburned (see Soil and Watershed Assessment, Appendix IV). The low severity fire resulted in removal of all or part of the duff layer, with little effect to the grasses, forbs, shrubs and trees. Much of the low to moderate burn severity areas still have 1,000 hour fuels remaining on the ground, and live tree canopies overhead. In other moderate burn severity areas, the fire killed between 10 and 70 percent of the vegetation. Areas of high burn severity experienced 90 to 100 percent mortality of all vegetation.

The overall fire effect to vegetation included 17,076 acres of 70 to 100 percent mortality of all vegetation, 8,419 acres of 40 to 70 percent mortality, 14,152 acres of 10 to 40 percent mortality and 3,231 acres with none to less than 10 percent mortality (reference Vegetation Mortality Map, Forest Mortality Map, Appendix III). A detailed account of fire effects to the vegetative resources is documented in the Cerro Grande Fire BAER Vegetative Resources Assessment (Appendix IV).

Elevation within the fire area ranges from 5,120 to 11,020 feet. The climate of the Jemez Mountains is dry, with precipitation occurring primarily during summer monsoons and

winter snows. The area has experienced lower than average amounts of rainfall since 1997 and is considered to be experiencing drought conditions.

Plant communities within the fire area include piñon-juniper, ponderosa pine, mixed conifer, spruce fir, desert grassland, montane grassland, aspen groves, meadow and cottonwood bosque riparian. Primary riparian vegetation includes box elder narrow leaf cottonwood, and coyote willow. Santa Clara Canyon is the only perennial stream in the fire area. Los Alamos Canyon flows year around above the reservoir but is intermittent below. The remaining drainages are ephemeral, with springs in Garcia and Guaje Canyons. The last major wildlife fire which burned through the Cerro Grande Fire area occurred in 1883. Many smaller fires have occurred since then, including the La Mesa Fire (BAND, 1977), Dome Fire (BAND, 1996) and Oso Fire (Santa Clara Pueblo and SFNF 1998).

The Jemez Mountains provide habitat for a wide variety of species, including elk, mule deer, bobcat, mountain lion, striped skunk, long-tailed weasel, black bear, gray fox, coyote, porcupine, Mexican woodrat, white-throated woodrat, blue grouse, deer mouse, western harvest mouse, Botta's pocket gopher, Abert's squirrel, golden mantled ground squirrel, rock squirrel, Colorado chipmunk, black-tailed jackrabbit, mountain cottontail, spotted bat, hoary bat, big brown bat, four-legged myotis, fringed myotis, long-eared myotis, vagrant shrew, wild turkey, piñon jays, nuthatches, woodpeckers, blue birds, hummingbirds, doves, hawks, owls, crows, ravens, rainbow trout, and native Rio Grande cutthroat trout.

The portion of the fire that occurred on the Santa Clara Pueblo lands occurred in Timber Management Area 1, described as 8,000' elevation with primarily Ponderosa pine forest growing on rocky and shallow soils.

The portion of the fire that occurred on the San Ildefonso Pueblo lands is in the Canada del Buey and Mortendad Canyons, with Forest Land Classes including Commercial Timberland, Commercial Woodland and Other Woodland.

The portion of the fire on SFNF occurred in the following Management Areas: "C" Recreation, Visual, Wildlife and Timber, "N" Threatened and Endangered Species Habitat; "M" Research Natural Area (Canada Bonito Research Natural Area); "Q" Cultural Resources, Dispersed Recreation, Visual and Timber, and "L" Dispersed Recreation.

The portion of the fire on BAND is in the headwaters of Frijoles Canyon.

B. Reconnaissance Methodology

Information used in this assessment is based on a review of relevant literature, agency management planning documents, agency wildlife sighting and habitat inventory data, consultation with FWS, personal communication with Tribal and agency biologists (listed at end of report), and reconnaissance of the fire area on May 17 through 27, 2000. Reconnaissance included helicopter flights over the fire area on May 18 and 21. Field notes were recorded in Incident Command System Unit Logs (ICS Form 214) and included in the BAER file provided to the various agency representatives. Burn severity was mapped by the BAER Watershed Team, and vegetation mortality was mapped by the BAER Vegetation and Wildlife Specialists. Habitat information and mapping for the various species is based on agency records and post fire reconnaissance. Reconnaissance and analysis included review of the Oso, Dome and La Mesa Fires regarding effects to species and vegetative recovery.

Information used in the DOE portion of this assessment is based on a review of relevant literature, Los Alamos National Laboratory (LANL) wildlife sighting and habitat inventory

data, consultation with FWS, personal communication with University of California (UC) biologists, and reconnaissance of the Cerro Grande Fire area. Reconnaissance included ground review on May 25, 26 and 30, and a helicopter flight over the fire area on May 25. Carey Bare, UC Natural Resources Team Leader; Leslie Hansen, UC T&E Species Habitat Management Plan Program Manager; David Keller, UC Wildlife Biologist; and James Biggs, UC Wildlife Biologist, participated in the fire reconnaissance. The University of California operates and manages LANL under contract to DOE. UC employees support DOE environmental compliance requirement. Loss of vegetative resources was estimated by LANL-UC personnel using 1:50,000 color infrared imagery acquired by the BAER team on 5/20-5/21. Boundaries of MSO and Southwestern willow flycatcher habitat, previously identified in LANL's Threatened and Endangered Species Habitat Management Plan, were overlaid on the imagery using an ARC/INFO GIS system. Areas that appeared moderately to severely burned were digitized by hand. A subset of areas within the Area's of Environmental Interest (AEI) was ground-checked during field reconnaissance. Documentation included in this assessment was provided by Leslie Hansen.

During the 6/2/2000 BAER Report Closeout Briefing with the San Ildefonso and Santa Clara Pueblos, the concern was expressed that other culturally significant species were not addressed in the BAER Wildlife Assessment, such as blue birds, flickers and western tanagers. There may be a need to address these species in the future.

C. Findings

To better understand the species and habitat information discussed in this wildlife assessment, it is important to review the Cerro Grande Fire BAER Vegetation, Forestry, and Watershed Resource Assessments. These reports contain more detailed descriptions of pre-fire vegetation, post-fire vegetative recovery estimates, and effects to the watersheds.

Effects to general wildlife species are not discussed. This assessment is not intended to definitively answer the many questions of effects to specific species that are inevitably raised during an incident such as the Cerro Grande Fire. The focus of this assessment is to determine the potential for immediate, emergency actions that may be necessary to prevent further effects to these species. Because the species discussed in this assessment have ranges or territories which extend beyond the fire area, it may be important to include information at a larger scale, across land ownership boundaries, for species which may require assessment for long term rehabilitation or restoration needs. This assessment does not include analysis or discussion of potential effects that may have occurred to LANL facilities or potential contaminant release sites. DOE and LANL-UC personnel are currently assessing this situation to determine potential effects from radioactive and chemical waste material to species and habitats occurring on DOE lands and in the watersheds below.

BIOLOGICAL ASSESSMENT

Direct effects as described in this report refer to mortality or disturbance that results in flushing, displacement or harassment of the animal. Indirect effects refer to modification of habitat and/or effects to prey species.

MEXICAN SPOTTED OWL: Habitat for this species occurs on Santa Clara Pueblo, SFNF, DOE and BAND lands. No critical habitat has been designated in the State of New Mexico. This discussion will provide information by landownership, with a summary of effects at the end.

MSO requirements in the Jemez Mountains include nesting, roosting and foraging habitat. Nesting habitat includes cavities in cliffs and small rock outcrops. To date, all known MSO nests

in this area have been found on cliffs, with stands of mixed conifer in the vicinity. Roosting habitat consists of any area with suitable microclimate for roosting during hot summer months. Foraging habitat is described as widely varying, requiring the presence of perches from which to hunt available prey (woodrats, etc.). The 1996 Dome Fire affected habitat of 3 MSO territories. Post fire reconnaissance documented that the majority of the fire effects to vegetation in those territories resulted in mortality of less than 30% of the over story trees. Post fire occupancy of these territories is not known.

SANTA CLARA PUEBLO: MSO habitat within the fire area is considered to be low quality for nesting/roosting. It is considered to be potential foraging habitat. The habitat was surveyed in 1994 using FWS protocols. No Mexican spotted owls were detected.

DIRECT EFFECTS: It is probable that no direct effects occurred because it is thought that there are no owls occupying this habitat.

INDIRECT EFFECTS. Habitat within the fire area was marginally affected, with some loss of overstory canopy cover on the ridge tops and mesas. Vegetation loss within the Santa Clara drainage was primarily limited to understory trees, shrubs and grasses. Habitat for prey species was marginally reduced.

POST FIRE OBSERVATIONS: No MSO were observed. The habitat within this portion of the fire appears to be low quality, with some fragmented pockets of moderate quality nesting/roosting along the drainage. Potential nesting cavities were not observed in the rock formations and may be a limiting factor. The Santa Clara Canyon is used year around for recreation, hunting, and fishing. All of these factors indicate that the habitat is marginally suitable for MSO.

In high burn severity areas where most of the vegetation was killed, the underground roots of the smaller trees, generally less than 6 inches diameter, appeared to have been completely consumed by the fire. This may be an indicator of the drought conditions and very low live fuel moistures before the fire.

SANTA FE NATIONAL FOREST: Two Territories, totaling 6,282 acres, occur within the Cerro Grande Fire area. The Guaje Canyon Territory was last surveyed in 1997 resulting in documentation of a resident single owl. The Los Alamos Territory was last surveyed in 1995, with no owls found.

DIRECT EFFECTS: It is possible that the single bird, if still present in Guaje, was displaced by the fire and suppression actions.

INDIRECT EFFECTS: The habitat for both territories was mostly degraded to unsuitable by the fire.

POST FIRE OBSERVATIONS: 5,979 acres (95%) of the habitat was either killed by the fire or is expected to die within the next few years because of insects and/or the added effects of drought conditions.

Overstory vegetation loss within Mexican spotted owl Territories

PAC & Restricted	ACRES SUITABLE	0-10% MORTALITY (still suitable)	10-70% MORTALITY	70-100% MORTALITY
GUAJE & LOS ALAMOS				
Nesting Roosting	1889			
Foraging	4393			
TOTAL BEFORE FIRE	6282			
Nesting Roosting	253	253	673	963
Foraging	50	50	1153	3190
TOTAL AFTER FIRE	303	303	1826	4153

No MSO were observed. It appears the nesting/roosting and foraging habitat was severely degraded by the fire. Although the potential nest cavities were probably not affected, the associated conifer habitat will not be suitable for at least 50 years. No salvage logging was proposed in MSO territories.

DEPARTMENT OF ENERGY: Suitable Mexican spotted owl core and buffer habitat on DOE was identified in the LANL Threatened and Endangered Species Habitat Management Plan, which received USFWS concurrence on Feb. 12, 1999. Six Mexican spotted owl habitat areas (Areas of Environmental Interest, or AEIs) were partially or completely included in the fire area. Those areas included the Rendija Canyon AEI, the Los Alamos Canyon AEI, the Sandia-Mortandad AEI, the Pajarito Canyon AEI, the Three-Mile Canyon AEI, and the Cañon de Valle AEI. An additional Mexican spotted owl habitat area, the Pueblo Canyon AEI, was not burned, but is likely to be affected by flash flooding. However, less than 3 percent of this AEI is within DOE boundaries.

The results of Protocol Surveys (FWS 1992) completed during April 1-May 4, 2000.

AEI	Survey Dates	Results
Cañon de Valle	4/12	Mexican spotted owls found
Pajarito Canyon	4/18, 4/24, 5/1	No Mexican spotted owls found
Three-Mile Canyon	4/18, 4/24, 5/1	No Mexican spotted owls found
Los Alamos Canyon	4/19, 4/25, 5/2	No Mexican spotted owls found
Lower Pueblo Canyon	4/21, 4/27, 5/4	No Mexican spotted owls found
Sandia-Mortandad	4/21, 4/27, 5/4	No Mexican spotted owls found
Rendija Canyon	No surveys completed	

DIRECT EFFECTS: A helicopter overflight on May 25 and ground survey on May 30 suggested that the area where the Mexican spotted owls traditionally nest in the Cañon de Valle AEI experienced a very low intensity of fire. Smoke, fire, and/or suppression activities, including air attack, may have disturbed the owls. Rendija Canyon is not a historically occupied Mexican spotted owl territory, and no Mexican spotted owls were detected in this AEI during partial surveys (<4) in 1998 or during a complete set of surveys in 1999. There probably were no Mexican spotted owls within the Rendija Canyon AEI during the fire. Mexican spotted owls were not present in any of the other AEIs, based on three surveys per AEI.

INDIRECT EFFECTS: UC biologists used color infrared imagery and spot ground checks to estimate the proportion of each AEI that experienced loss of overstory cover because of the fire. Low/moderate loss was considered 0–40% mortality of trees, moderate/high loss was considered 40-70% mortality of trees, and severe loss was considered > 70% mortality of trees.

Overstory vegetation loss within Mexican spotted owl AEIs

AEI	Area (ac)	Acres/percent of 0-40% Mortality	Acres/percent of 40-70% Mortality	Acres/percent of > 70% Mortality
Cañon de Valle				
Core	1366	1098/80.4	22/1.6	246/18.0
Buffer	1981	1894/95.6	34/1.7	55/2.8
Pajarito Canyon				
Core	701	573/81.7	13/1.8	115/16.5
Buffer	1252	1108/88.5	75/6.0	69/5.5
Three-Mile Canyon				
Core	417	251/60.3	161/38.7	4/1.0
Buffer	842	583/69.2	101/12.0	158/18.8
Los Alamos Canyon				
Core	434	434/100	0	0
Buffer	483	401/83.1	77/15.9	5/1.0
Sandia-Mortandad				
Core	1166	1023/87.7	99/8.5	45/3.9
Buffer	1388	1256/90.5	18/1.3	114/8.2
Rendija Canyon				
Core	128	29/22.3	7/5.4	93/72.3
Buffer	427	290/67.9	94/22.0	43/10.1

Before the fire, there were a total of 4,212 acres in core areas and 6,373 acres included in the buffers. Of the core areas, 504 acres experienced severe mortality (12% of core); 302 acres moderate (7%); 3,408 acres burned at low (81%). 6,373 acres were included in buffer habitat before the fire. Of the buffer areas, 444 acres experience severe mortality (7%); 399 acres moderate (6%); 5,532 acres burned at low (87%). Overall, 10,585 acres were included in core and buffer areas before the fire. Assuming that low and moderate mortality areas remain suitable, it is estimated that 9,637 acres (91%) of habitat remain suitable after the fire. Note that the numbers in the tables do not match the sums exactly. The numbers were not refined to eliminate some existing overlap of buffer areas for different AEI's, and some overlap of buffers with core areas of other AEI's. The totals provide a close approximation. If more accuracy is needed, the LANL-UC Biologists can recalculate using GIS maps.

Based on post fire observations from the La Mesa fire, it is thought that trees with more than 50 percent crown remaining unscorched may survive. Post fire observations in the La Mesa Fire area indicated that trees with more than 50 percent crown remaining survived over five years. However, the drought conditions at this time may decrease the survival rate.

Information on fire suppression efforts on DOE was obtained as personal communication from Doug Tucker, Deputy Fire Chief, Los Alamos County. At least five AEIs experienced habitat alteration caused by fire suppression activities, but the size of areas affected was small. No information is available on fire suppression activities in Rendija Canyon, where the fire was fought by crews from other agencies. In addition to the acreages listed in the table, individual hazard trees have been cut near roads and buildings. Excluding overlap acres, 289 acres of MSO core and buffer habitat were affected by backfire operations.

Area of Mexican spotted owl AEIs affected by fire suppression activities.

AEI	Area Thinned (Ac)	Fireline Area (Ac)	Burnout Area (Ac)
Cañon de Valle			
Core			109.8
Buffer			45.2
Pajarito Canyon			
Core			7.5
Buffer			11.8
Three-Mile Canyon			
Core			12.9
Buffer			
Sandia-Mortandad			
Core	5.0		77.5
Buffer	2.0	2.2	32.3
Los Alamos Canyon			
Core		5.4	
Buffer	11.0		54.9

Mexican spotted owl prey species located in the fire area were directly affected if unable to escape the flames, and indirectly affected in terms of habitat loss. Woodrats will return quickly and be re-populated from remaining populations within the fire area. This should occur fairly rapidly because of the many unburned and lightly burned patches spread throughout the fire area which should still be inhabited by small mammals. These populations will act as sources for repopulating the burned areas.

POST-FIRE OBSERVATIONS: UC biologists planned to survey for Mexican spotted owls the night of May 31, 2000.

Bandelier National Monument: Less than 2 acres of habitat occurred within the fire area. The quality of this small portion of the Frijoles MSO territory was degraded. However, it is thought that no MSO were present in that area, therefore the determination of effects from the fire, suppression and emergency rehabilitation actions is no effect. A map is included in the Emergency Consultation package.

SUMMARY OF OVERALL EFFECT TO MSO: The fire caused displacement of any MSO present (estimate one pair in Canon de Valle AEI and a resident single in Guaje Territory). Suppression actions likely also caused displacement. Displaced owls might attempt to return to the area after the suppression and rehabilitation actions decrease. Because most of the territories were not previously occupied, if the single MSO in Guaje returns, it may be able to occupy one of the previously unoccupied sites. The Canon de Valle pair may return to that habitat or be displaced into another of the previously unoccupied territories.

BALD EAGLE: Bald eagles are periodically detected on Pueblo and DOE lands in the winter along the Rio Grande Corridor. Although eagles may migrate through the fire area, no wintering habitat occurs within the Cerro Grande Fire area. Potential wintering habitat, as defined by LANL's Threatened and Endangered Species Habitat Management Plan, includes 983 acres of core roosting and foraging habitat, and 2,356 acres of buffer habitat. The diet of bald eagles in this area is primarily fish and waterfowl, with some carrion and lagomorphs.

DIRECT EFFECTS: The Cerro Grande Fire occurred outside the wintering period for bald eagles. It is thought that no bald eagles were present within the fire area during this incident. Therefore there should be no direct effects to the bald eagles.

INDIRECT EFFECTS: The bald eagle core and buffer habitat on DOE lands was not burned, and no habitat-altering fire suppression activities took place within that designated bald eagle habitat

or suitable habitat on other agency lands. Therefore, there are minimal, if any, indirect effects to the bald eagle.

There may be some flash flooding in canyon bottoms within the bald eagle habitat during the rainy season and after snowmelt for a few years following the fire. However, within the bald eagle habitat the canyons are extremely deep (100 feet or more) with a great deal of bedrock exposed on the surface. Eagles are not expected to occupy the habitat during the periods of intense flash flooding (spring and summer).

POST-FIRE OBSERVATIONS: No bald eagles were observed throughout the fire area during post fire reconnaissance. No eagle observations were reported by suppression forces.

SOUTHWESTERN WILLOW FLYCATCHER: There is no suitable habitat for southwestern willow flycatcher in the fire area. Suitable habitat has been identified on DOE lands, in Pajarito Canyon below the fire area. Surveys conducted by LANL Biologists in previous years have detected willow flycatchers during the migration period. However, no southwestern willow flycatchers have been found breeding in this habitat. This habitat is located approximately 0.5 mile east of the fire perimeter.

DIRECT EFFECTS: The southwestern willow flycatcher habitat was not burned. The fire occurred primarily during the migration period for willow flycatchers, therefore it is assumed that individuals disturbed by smoke or suppression activities could have moved out of the area. Therefore there should be no direct effects to southwestern willow flycatcher.

INDIRECT EFFECTS: Because the fire did not affect the habitat, there are no indirect effects to the southwestern willow flycatcher However, because of burning in the Pajarito Canyon watershed, there is a possibility of sheet wash and flash runoff in stream channels within the burned area. Flooding is expected in the main channel below the fire area. Flash flooding could adversely impact any Southwestern willow flycatchers that chose to nest on DOE lands. Because the habitat is not extensive or of high quality, the probability of nesting willow flycatchers is not high. Changing hydrologic patterns could change the wetland vegetation in Pajarito Canyon in unpredictable, but not necessarily adverse ways.

POST-FIRE OBSERVATIONS: No attempt was made to survey for southwestern willow flycatcher during post fire reconnaissance. No willow flycatchers were observed The habitat was observed during aerial and ground reconnaissance.

SPECIES OF CULTURAL SIGNIFICANCE

ELK habitat within the fire area is important wintering habitat, but also supports year around resident elk. Elk present during the incident may have out run the fire. Calving is expected during June. Elk should benefit from the increased diversity of age and species composition of plants that will return to the burned area. Productivity may increase in the first few years following the fire due to the higher nutritional value of most young browse species. Elk calving is expected to begin the first week of June, and lasts for approximately two weeks.

STATEMENT FROM DOE: Management of elk in the Jemez Mountains has been a contentious issue in the past few years because of movement of elk into residential areas, a concern that elk are damaging cultural resources by trampling and contributing to erosion, a concern that elk are damaging natural resources by browsing heavily on aspen, and a desire by some people to see current numbers of elk maintained or increased. The La Mesa fire, in 1977, was associated with a large increase in the eastern Jemez Mountains elk herd. Habitat changes wrought by the Dome Fire and the current Cerro Grande Fire can be expected to have a large impact on the population dynamics and

distribution of elk in this area, and will undoubtedly intensify management concerns associated with this species in residential areas. Increased management efforts will probably be required for this species as a result of the fire.

POST FIRE OBSERVATIONS: Elk were observed on the Baca Ranch during post fire reconnaissance. Elk scat (post fire) were observed in the higher elevations of the fire area. One elk carcass was reported within the fire area but no location was provided. Reconnaissance of the 1998 Oso Fire indicated highly successful re-vegetation of grasses, forbs and shrubs, including gambel oak, New Mexico locust and mountain mahogany. Because the vegetation in the lower elevations of the Cerro Grande Fire is similar to that which occurs in the adjacent Oso Fire area, similar re-vegetation success is expected. Post fire vegetation plots were established in the Oso Fire area and monitoring data is on file at the Northern Pueblos Agency office. In the short term, forage, hiding and thermal cover are reduced. The emergency rehabilitation seeding should benefit elk as soon as the seeds germinate. During post fire reconnaissance, grasses throughout the fire area were observed to be sprouting. On June 1, a fire fighter reported seeing two newly born elk in the vicinity of Cerro Grande Mountain.

MULE DEER Primarily use the fire area as wintering habitat. Fire effects should be similar to those described above for elk.

POST FIRE OBSERVATIONS: Deer were observed in Guaje Canyon during post fire reconnaissance. Two carcasses were observed and at least one other carcass was reported, all in the southwestern portion of the fire area, on SFNF land.

BLACK BEAR Present in the fire area were most likely temporarily displaced during this incident. Bears should benefit from increased diversity of age and composition classes of plants growing after the fire.

POST FIRE OBSERVATIONS: No bears or bear sign were observed during post fire reconnaissance.

BOBCAT, MOUNTAIN LION Present in the fire area were most likely temporarily displaced during this event. These species may have benefited from increased prey availability as other species flee from the area. As prey species return to the fire area, bobcat and mountain lions will follow.

POST FIRE OBSERVATIONS: No bobcats or mountain lions were observed during post fire reconnaissance.

WILD TURKEY occur in the area year round and probably migrate from the higher elevations to the lower during winter months. Because of the dry conditions, it is likely that turkeys were at the higher elevations during the fire. Turkey prey items (primarily insects) should increase in abundance as the fire area re-vegetates.

POST FIRE OBSERVATIONS: No turkeys or turkey sign were observed during post fire reconnaissance.

GOLDEN EAGLEs have been observed in Santa Clara Canyon and throughout the fire area. It is possible they nest in the Canyon along the cliffs or in large trees. If eagles were present during the fire, they were probably temporarily displaced by the smoke and fire suppression actions. Because some of the canyons experienced low to moderate fire intensity, suitable nesting trees should remain. Prey species should have been minimally affected, and carrion should be more available in the short term.

POST FIRE OBSERVATIONS: No golden eagles were observed during post fire reconnaissance.

BARRED TIGER SALAMANDER'S are known to occur in Deer Pond on Santa Clara Pueblo lands. That pond is outside of the Cerro Grande Fire area. There should be no effect to this species.

RIO GRANDE CUTTHROAT TROUT AND RAINBOW TROUT occur in the Santa Clara drainage and ponds. There may have been some mortality if either trout species were scooped up in water buckets as a part of helicopter water drops. A post fire flush of ash and debris may occur, depending on the amount and duration of the first rains. Monitoring of water quality after the Oso Fire indicated no changes in water quality. Post Oso Fire monitoring of fish indicated no changes in species diversity or numbers. Flooding and debris flows are expected after the Cerro Grande fire. It is not known at this time whether or not such events would negatively affect these species. Post Oso Fire monitoring data is on file at the Santa Clara Pueblo office.

AGENCY SENSITIVE SPECIES

JEMEZ MOUNTAINS SALAMANDER this salamander is endemic to the Jemez Mountains of north central New Mexico where it occurs in the rocky soils of mixed conifer habitat above 7,000 feet elevation. Loss of habitat from unnatural stand replacing fire is considered the greatest threat to survival of the species (Interagency Agreement and Cooperative Management Plan; USFS, USFWS, NM Dept. Game & Fish; January, 2000). Charles Painter, NMGF Coordinator of the Endemic Salamander Team, provided the majority of this JMS information.

DIRECT EFFECTS OF FIRE: Jemez Mountains Salamanders are lungless salamanders of the family Plethodontidae. As such, they require high microhabitat humidity for cutaneous respiration. Because of the dry conditions of the forest at the time of the Cerro Grande Fire, Jemez Mountains salamander were not surface active, and therefore likely were not directly killed by the fire. However, there are numerous other direct effects of such a large, stand-replacing fire that include:

- loss of forest canopy resulting in decreased humidity of terrestrial and subterranean habitat
- loss of microhabitat including downed logs, leaf litter and duff, and the upper soil horizon
- loss of ability to recognize areas due to large scale habitat destruction
- dehydration of salamanders as they emerge from underground retreats and contact the abnormally xeric surface conditions
- siltation of interstitial spaces following precipitation
- decreased penetration of moisture into subterranean microenvironment
- stress to salamanders and resultant loss of population vigor and viability and reproductive potential
- loss of invertebrate prey and habitat

Cumulative effects of the above are expected to result in mortality of a significant portion of the Jemez Mountains salamander populations that occurred in the area of the Cerro Grande Fire.

INDIRECT EFFECTS OF FIRE SUPPRESSION: Jemez Mountains salamanders require a specific set of subterranean and terrestrial microhabitat conditions for activity. The microhabitat must be moist enough for cutaneous respiration. The soils and the rock structure must be friable enough to allow for movement deep into the soil column to escape high surface temperatures and low humidity. The habitat must be variable enough to support an abundant invertebrate prey base. Impacts of the following fire suppression activities may negatively affect the microhabitat suitability:

- potential release of contaminants from fire retardant
- development of hand lines and bulldozer lines for fire containment

- mop up of smoldering logs and stumps that may be potential post-fire habitat for salamanders and their prey
- burn out operations that further eliminate vegetation and degrade habitat

The Essential Zone was designated on the SFNF to include the total known habitat crucial for the long term maintenance of viable populations of the Jemez Mountains salamander. Of the total 30,510 acre Essential Zone, 8,407 acres (28%) are within the fire perimeter. 4,226 acres experienced moderate to high burn severity. This is 14% of the designated Essential Zone. Due to severe habitat degradation resulting from the Cerro Grande Fire, Jemez Mountains salamanders may not survive in these areas. The areas of high fire intensity and vegetation mortality will likely be unsuitable salamander habitat for many decades.

EFFECTS OF REHABILATION ACTIONS: Certain actions that may be taken to restore the habitat to pre-fire conditions and prevent the loss to life and property may have adverse effects on Jemez Mountains salamander populations and their ability to re-colonize impacted areas. Such actions may include:

- reseeding of fibrous-rooted, non-native grasses
- use of heavy equipment to restore fire lines and roads
- road construction and culvert installation to prevent flooding
- extensive use of matting to control erosion

While these actions may be necessary in select areas, they should be limited to areas where life and property are at risk if such actions are not taken.

POST FIRE OBSERVATIONS: JMS habitat was observed throughout post fire reconnaissance. The JMS Team visited the study plots near the top of Quemazon Canyon, and habitat along the Pipeline and Camp May Roads on May 26, 2000. Much of the essential habitat within the fire was affected by high intensity fire, resulting in moderate and high burn severity.

PEREGRINE FALCON: The Regional Forester of the Southwestern Region has agreed to cooperate with the FWS, other Federal and State agencies, and researchers to conduct monitoring to evaluate effects of agency actions. Monitoring results will be part of the information analyzed during the species status review to determine if this species will remain off the federal list (reference Letter from Southwestern Regional Forester to Forest Supervisors, 9/16/1999). As such, it is important to discuss potential effects of the Cerro Grande Fire to this species. One known aerie occurs within the Cerro Grande Fire area, and two occur outside the Fire perimeter. Current nesting status is unknown. Site specific information about this species is extremely sensitive. Therefore, no specific data are recorded in this assessment.

DIRECT EFFECTS: If peregrines were present during the fire, it is possible they were flushed from the aerie and temporarily or permanently displaced. In addition, aircraft used during suppression activities probably caused additional disturbance to the birds within the fire area and to those outside the fire perimeter. Nesting status at the time of the Cerro Grande fire would probably include egg incubation and hatching of young. During the Dome Fire, nesting peregrines were observed leaving the area. Post fire monitoring results indicate reproductive failure of pairs disturbed during that incident.

INDIRECT EFFECTS: It is unlikely cliff nest locations were damaged by the fire or suppression activities. Smoke could coat rock walls, but this effect should be negligible due to wind patterns (strong, turbulent, mostly unstable conditions) dispersing smoke from the fire area quickly. No inversions during the most active burn periods are noted in the various fire narratives and field observations. Foraging habitat found within the fire area was affected to varying degrees. Prey species include a variety of birds. These prey species have probably been affected in two ways: Direct mortality or displacement due to the fire and suppression action disturbance, and habitat loss. These effects, although significant, should not greatly reduce the ability of the peregrines to

successfully forage within a reasonable range of their territories. Because the fire burned in a mosaic pattern, leaving some unburned and minimally effected areas, and because there is suitable foraging habitat adjacent to the fire area, prey species should still be available. Habitat for prey species will return in time, depending on post fire re-vegetation rates. Avifaunal studies conducted after the 1977 La Mesa Fire found many bird species benefited from tree mortality, as indicated by increased species richness and diversity within the fire area.

POST FIRE OBSERVATIONS: No peregrines were observed during post fire reconnaissance

HABITAT IMPROVEMENTS WITHIN THE FIRE AREA

No habitat improvements occurred within the portion of the fire area on Santa Clara Pueblo, San Ildefonso Pueblo, BAND or DOE lands. The SFNF portion included several vegetative treatment units, several spring developments and a big game guzzler on the eastern edge of Guaje Mesa. The vegetative treatments were primarily prescribed fire and thinning. The fire has expanded these treatment areas beyond the desired range of variability. The spring developments appear to be unaffected by the fire. Water flow amounts should increase in areas where the fire killed most of the vegetation. The big game guzzler was severely damaged by the fire. This guzzler is an extremely important water source for a wide variety of species. The closest water is approximately 6 miles to the northwest in Garcia Canyon. Because water is the limiting factor for most species in this ecosystem, this guzzler should be repaired before the next monsoon season. Parts that should be replaced include the water collection apron, pipe from apron to storage tank, fence around the apron and storage tank, and the fence around valve box.

Cerro Grande Fire Complex Species List

The current U. S. Fish and Wildlife species list was obtained on May 19, 2000, from Mary Orr, accessed on the U. S. Fish and Wildlife Service web site of protected species. The following federally listed species occur, or have habitat within, the fire area:

SPECIES	LISTING STATUS
Mexican spotted owl, *Strix occidentalis lucida*	T
Bald eagle, *Haliaeetus leucocephalus*	T
Southwestern willow flycatcher, *Empidonax traillii extimus*	E

The Santa Clara Pueblo Tribal Council policy is to recognize Traditional Species of Special concern. The following species were identified in the Oso Fire BAER Wildlife Report, and during BAER reconnaissance for the Cerro Grande Fire as occurring within the fire area, having habitat within the fire area, or may be affected because their habitat occurs down stream from the watersheds affected by the fire. No additional species were identified by the San Ildefonso Tribal Council.

Elk, *Cervus elaphus*	CS
Mule deer, *Odocoileus hemionus*	CS
Black Bear, *Ursus americanus*	CS
Bobcat, *Lynx rufus*	CS
Mountain lion, *Felix concolor*	CS
Golden eagle, *Aquila chrysaetus*	CS
Wild turkey, *Meleagris gallopavo*	CS
Barred tiger salamander, *Ambystoma tigrinum mavortium*	CS
Rio Grande cutthroat trout, *Salmo clarkii virginalis*	CS
Rainbow trout, *Salmo gairdneri*	CS
and others identified by the Pueblos	

LANL-UC Biologists requested elk, Jemez Mountains salamander and other species, be addressed as part of this BAER assessment because of their status as species of concern or because of important issues associated with management of these species to the agencies, Tribes, and residents of the eastern Jemez Mountains. National Park Service (NPS) Management Policies prescribe management of endangered, threatened, and candidate species in conformance with the Endangered Species Act. Management Policies states: "The National Park Service will identify and promote the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats...The NPS also will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats...(4:11)" (Natural Resources Management Guideline Chapter 2, pg 270, NPS-77). The Forest Service (FS) is expected to comply with de-listing requirements for the peregrine falcon, including assessing effects to this species and conducting monitoring. The FS, FWS and New Mexico Department of Game and Fish have agreed to protect the known and potential range of the Jemez Mountains salamander in a manner consistent with the Conservation Agreement signed in January, 2000. Therefore the following species are included in this assessment from LANL-UC, NPS, NMGF and the Southwest Regional Forester's Sensitive Species List (7/21/99 as corrected 2/23/00):

Peregrine falcon, *Falco peregrinus anatum*	S
Jemez Mountains Salamander, *Plethodon neomexicanus*	S

The following species were identified by U. S. Fish and Wildlife Service as occurring within the four counties affected by the fire (Los Alamos, Santa Fe, Sandoval, Rio Arriba). This list was reviewed because these species have some potential to exist within, adjacent to, or downstream from the fire area. Through post fire reconnaissance and consultation with local experts, it was determined that these species were not affected by the fire because they have no habitat within or adjacent to the fire area, inventories prior to the fire determined absence, or they are not expected to be affected by potential post-fire flooding:

Whooping crane, *Grus americana* (no habitat within fire area)	E
Interior least tern, *Sterna antillarum* (no habitat within fire area)	E
Mountain plover, *Charadrius montanus* (no habitat within fire area	P/T
Black-footed ferret, *Mustela nigripes* (fire outside of species range)	E
Boreal western toad, *Bufo boreas boreas* (no habitat within fire area)	C
Colorado pikeminnow, *Ptychocheilus lucius* (no habitat within or downstream of fire area)	E
Rio Grand silvery minnow, *Hybognathus amarus* (no habitat within fire area; no effects to habitat which is downstream from the fire area)	E

KEY TO LISTING STATUS:

E	ENDANGERED
T	THREATENED
C	CANDIDATE
P	PROPOSED
CS	CULTURALLY SIGNIFICANT
S	FOREST SERVICE SENSITIVE

Determinations for each species, by jurisdiction. Reference Emergency Consultation #2-22-00-E-288.

MEXICAN SPOTTED OWL

SANTA CLARA PUEBLO: No MSO present, therefore the determination for fire, suppression action and emergency rehabilitation actions is ***no effect.***

SANTA FE NATIONAL FOREST:

Fire effects: It was determined the fire had significant effect to any owls present in the fire area during the incident. Probably only on resident single owl was present. Some 5,979 acres (95%) of MSO habitat was removed by the wildfire. Because of potential disturbance, displacement and documented habitat loss, the determination of fire effects to Mexican spotted owl is **adverse effect.**

Suppression action effects: The only suppression actions that occurred in or adjacent to the two MSO Protected Activity Centers were either helicopter water drops, air attack reconnaissance (fixed wing), and/or fixed wing retardant drops. Because any owls that were present before the fire would probably have been flushed or overcome by the fire itself, and because it is unlikely that the owls would attempt to return to the degraded habitat while the fire was still burning, it is thought that suppression actions had no further effect to the owls. Therefore, the determination of suppression effects to Mexican spotted owl is **no effect.**

Proposed emergency rehabilitation action effects: Emergency rehabilitation measures recommended in this report (see Part F – Specifications, for details) should have beneficial effects to MSO because they include actions to prevent soil loss and to revegetate the fire area. Therefore the determination of the effects of emergency rehabilitation measures is **may affect, not likely to adversely affect.**

DEPARTMENT OF ENERGY:

Fire effects: It was determined that the fire had significant effect on any owls that may have been present in the fire area during the incident. Some 948 acres of MSO habitat was removed by the wildfire. Because of potential disturbance and documented habitat loss, the determination of fire effects to Mexican spotted owl is **adverse effect.**

Suppression action effects: Suppression effects included backfiring of 289 acres of MSO core habitat. Therefore, the determination of fire suppression effects to MSO is **may affect, not likely to adversely affect.**

Proposed emergency rehabilitation action effects: Emergency rehabilitation measures recommended in this report (see Part F – Specifications, for details) should have beneficial effects to MSO because they include actions to prevent soil loss and to revegetate the fire area. Therefore the determination of the effects of emergency rehabilitation measures is **may affect, not likely to adversely affect. Note that additional emergency rehabilitation measures are currently being developed for DOE lands. Effects of these additional measures should be assessed for effects. This determination may change and the need for consultation should be addressed.**

BANDELIER NATIONAL MONUMENT: Because less that 2 acres were affected, and no MSO were present within that portion of the habitat, the determination of effects from the fire, suppression actions and proposed emergency rehabilitation is **no effect.**

BALD EAGLE

ALL LAND OWNERSHIP:

Fire effects: It was determined that no bald eagles were present in the fire area during the incident, and no nesting or winter roosting habitat was affected. Therefore, the determination of fire effects to bald eagles is **no effect.**

Suppression action effects: No eagles were present during the fire, therefore the determination of suppression actions to bald eagle is **no effect.**

Proposed emergency rehabilitation action effects: Emergency rehabilitation measures recommended in this report (see Part F – Specifications, for details) should have no negative effects to bald eagles. Eagles and other species should benefit from any action that stabilizes soils and mitigates the potential for post fire flooding. Therefore, the determination of the effects of emergency rehabilitation measures is **no effect.**

SOUTHWESTERN WILLOW FLYCATCHER

ALL LAND OWNERSHIP:

Fire effects: It was determined that no southwestern willow flycatchers were present in the fire area during the incident, and no nesting or migratory habitat was affected. Therefore, the determination of fire effects to southwestern willow flycatcher is **no effect.**

Suppression action effects: No southwestern willow flycatchers were present during the fire, therefore the determination of suppression actions is **no effect.**

Proposed emergency rehabilitation action effects: Because there is no habitat on Pueblo Reservation lands and SFNF lands, the determination for those jurisdictions is **no effect.** Emergency rehabilitation measures recommended in this report (see Part F – Specifications, for details) should have beneficial effects to southwestern willow flycatcher because they include actions to prevent soil loss and potential downstream loss of vegetation from post fire flooding. Therefore the determination of the effects of emergency rehabilitation measures is **may affect, not likely to adversely affect. Note that additional emergency rehabilitation measures are currently being developed for DOE lands. Effects of these additional measures should be assessed for effects. This determination may change and the need for consultation should be addressed.**

IV RECOMENDATIONS

A. Management

1. Section 7 Emergency Consultation documentation for the fire, suppression actions and proposed emergency rehabilitation actions should be concluded with FWS by transmittal of a letter requesting concurrence with determinations on SFNF and DOE lands.

2. Any determinations documented in this assessment should be reevaluated, and Section 7 Consultation reopened, if additional rehabilitation measures or vegetation management activities are proposed after May 31, 2000. If non-emergency vegetation management activities are proposed, such as salvage logging, another Biological Assessment should be prepared.

3. Consult with the Santa Clara Pueblo and San Ildefonso Tribal Councils regarding any proposed emergency or other post-fire activities that may affect Pueblo lands or any Species of Cultural Significance which occur on ancestral lands.

4. Implement Jemez Mountains salamander emergency habitat rehabilitation: Create down logs for emergency restoration of habitat prior to the rainy season. In areas of mixed conifer forest burned at moderate or high vegetation mortality and with a slope of <60%, large, fire-killed Douglas-fir logs should be felled to achieve approximately five down logs per acre where possible. These logs can serve as potential refugia for salamanders and their invertebrate prey. These logs should be felled perpendicular to the slope of the habitat to promote more rapid decomposition. Logs felled this way catch more debris and thus also prevent loss of soil and surface debris to erosion, (BAER Spec #17 N-1a, Salamander Habitat Rehabilitation

5. Road closures for protection of species and habitats should include:
   - Guaje Canyon from the intersection of 442 at the junction with 416 to its terminus at Guaje Pines Cemetery. (BAER Spec #37, S-3c, Road Closures).
   - Forest Road 416 should be gated west of the Co-par Pumice Mine on a seasonal basis, based on resource needs due to high fire danger or wet weather conditions.
   - Los Alamos Canyon Road should be closed for public safety.
   - Reclose Canada Bonito Trail (reopened for suppression effort).

6. Replace Wildlife Water Development located on the mesa south of Chupaderos Canyon. Although this cannot be funded with Emergency Rehabilitation Funds, this water source should be replaced because it is the only water within approximately 6 miles. Water is a limiting factor for most of the species discussed in this report. The cumulative effect of no water and little to no forage for the next several months may cause significant effects to any species using the northeastern portion of the fire area. (BAER Spec #18, N-1b, Wildlife Water Development).

B. **Monitoring (specifications included in Section F of this BAER report)**

1. Monitor Mexican Spotted Owl to determine effects of the fire, suppression, and emergency rehabilitation measures on DOE lands. (BAER Spec #32, N-1e, Monitor Threatened Mexican Spotted Owl).

2. Monitor Jemez Mountains salamander to determine effects of the fire, suppression and emergency rehabilitation measures on SFNF. Carefully designed surveys should be conducted to determine the persistence at all previously known Jemez Mountains salamander localities within the area impacted by the Cerro Grande Fire. These sites should be investigated during optimal environmental conditions for maximum terrestrial activity by salamanders. If possible, each site should be surveyed at least two times each year during a minimum of three years post-fire. If salamanders are located at select sites, these sites should also be monitored for a minimum of three years post-fire. Morphometric data (e.g., body size and weight) to allow the interpretation of size class distribution and individual salamander vigor should be collected. Morphometric information provides evidence of reproduction and recruitment into the population. To investigate the possibility of the long-term persistence of Jemez Mountains salamanders, the invertebrate prey base should be monitored through the use of specially designed pit-fall traps. Monitoring of the prey base should continue for a minimum of three years post-fire. (BAER Spec #30, N-1c, Jemez Mountains Salamander – Monitoring).

3. Monitor peregrine falcon to determine effects of the fire, suppression and emergency rehabilitation measures on SFNF. This monitoring data is essential for the Regional Forester to provide to FWS as a part of the five year monitoring period identified in the de-listing package for this species. (BAER Spec #31, N-1d, Peregrine Falcon Monitoring).

4. Elk pellet transects – establish pellet group sampling plots if it is determined that there were negative effects to elk. This will provide additional information needed to determine where the elk are and what might be needed to mitigate effects. No specification provided at this time.

5. Vegetation transects – establish vegetation monitoring plots, similar to those established after the OSO fire, to determine the extent and composition of species

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that return to the fire area. This should be done in key locations across the fire area, regardless of jurisdictional boundaries, and the data shared with all land managers. Specification is discussed in the BAER Vegetation Report.

V. CONSULTATIONS

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*People who reviewed the draft BAER Wildlife Resource Assessment.

VI. REFERENCES

Department of the Interior, Dome Fire BAER Report. 1996.

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New Mexico Department of Game and Fish, write up on effects of the Cerro Grande Fire to the Jemez Mountains Salamander. 5/27/2000.

New Mexico Department of Game and Fish, USFWS, USGS, USDA FS. Cooperative Management Plan for the Jemez Mountains Salamander on Lands Administered by the Forest Service. 2000

San Ildefonso Pueblo Forest Management Plan. 1997

USDA FS, Valle Fuels Management Project EA, Los Alamos County, New Mexico unpublished draft, 2000.

USDA FS, R-36 Site Plan. 1994

USDA FS, Santa Fe National Forest land and Resource Management Plan. 1987.

USDA FS, Fire Effects in Southwestern Forests Proceeding of the Second La Mesa Fire Symposium. 1994.

US Fish and Wildlife Service, Recovery Plan for the Mexican Spotted Owl (*Strix occidentalis lucida*. 1995.

THE FOLLOWING SUPPORTING DOCUMENTATION CAN BE FOUND IN THIS BAER REPORT UNDER APPENDIX IV:

U. S. Fish and Wildlife Service Species list dated 5/19/2000
FS memo "De-listing of Species Under the Endangered Species Act" dated 9/16/99
Conservation Agreement for the Jemez Mountains Salamander signed January, 2000
TES species map
Specifications (Part F)

Other supporting documentation not included in this BAER report is filed in the Cerro Grande BAER file, including:

ICS 214 Unit logs
Wildlife Guidelines for Forest fire Mop-up and restoration, including State species lists (NMGF) 5/2000
SW Region USFS Sensitive Species List (7/21/99 as corrected 2/23/00)
Documentation on Emergency Consultation with FWS
Summary of Weather Information on Cerro Grande Prescribed Fire
Memo and attachments from NMGF on JMS concerns dated 5/27/2000
Species map

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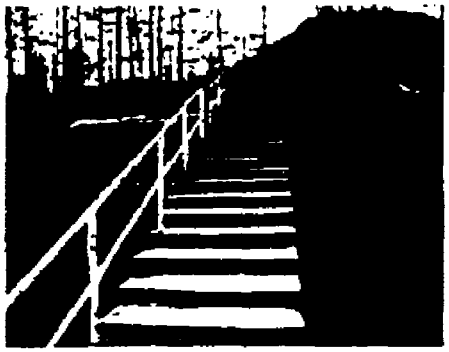
AFFECTED PEOPLE & HELPING HANDS

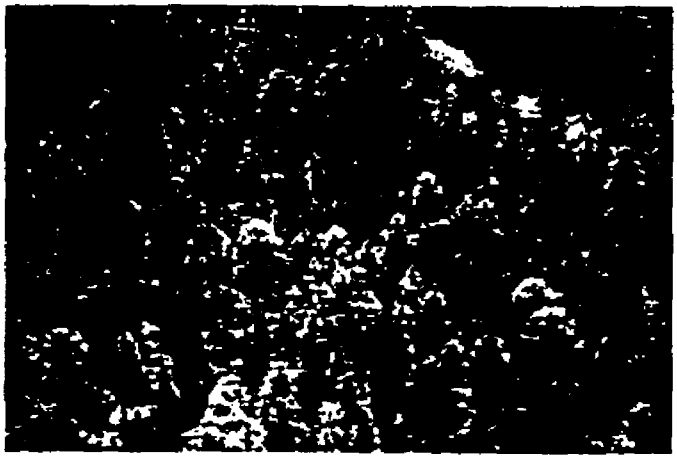
THE FIRE AND DESTRUCTION



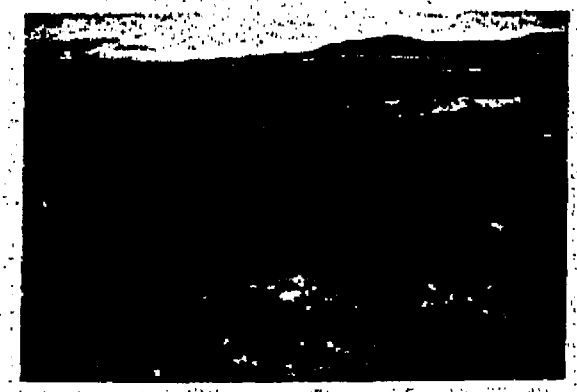
BURN SEVERITY

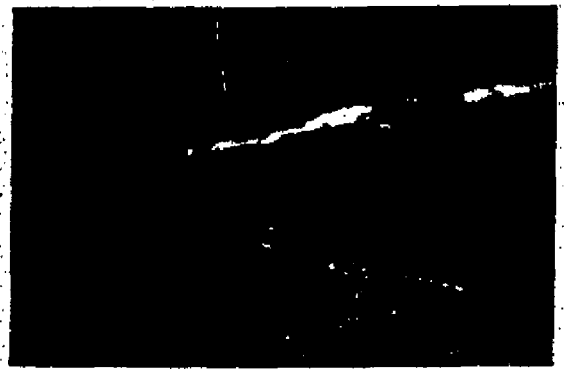
High Severity

Moderate Severity



FIRE SEVERITY





Light Severity

AFFECTED WILDLIFE RESOURCES

REHABILITATION EFFORTS

Volunteer Contour Raking

Volunteer Straw Mulching

Fire Crew Mulching

REHABILITATION EFFORTS

Dozer Line Rehabilitation

Log Erosion Barrier Construction

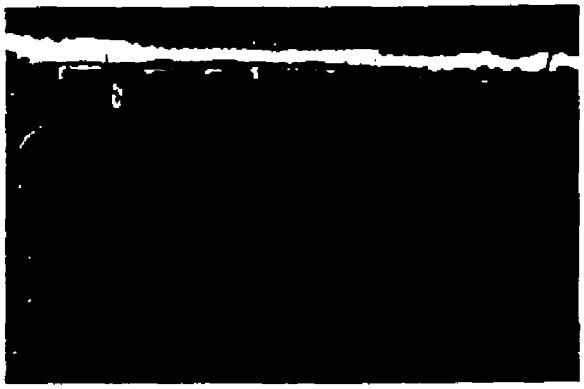
Contour Tree Felling

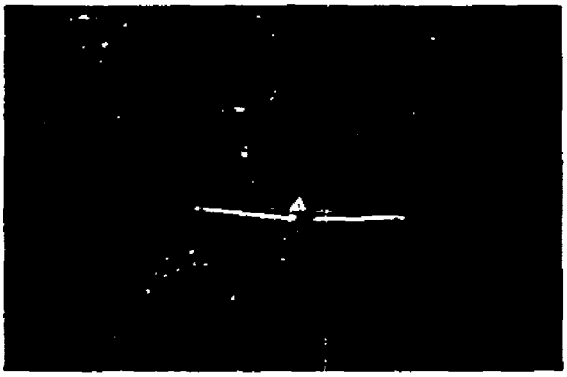
PEOPLE

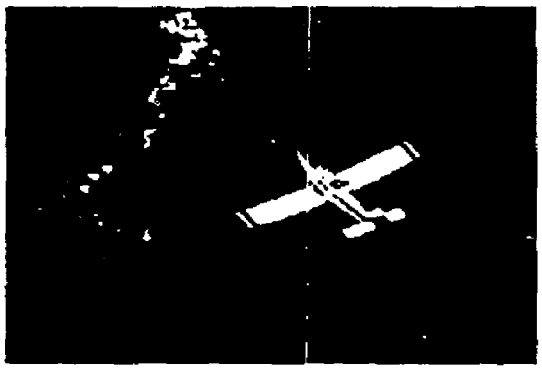
A1

REGROWTH

SEEDING OPERATIONS







REHABILITATION TREATMENTS

Log Check Dam

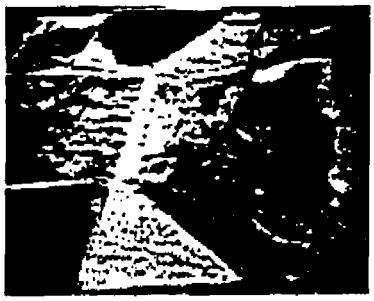
Rock Check Dam

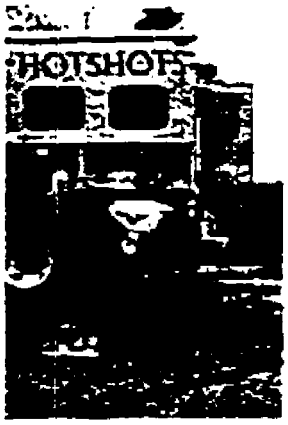
Straw Mulching

Rock Check Dam

Straw Wattle & Mulching

Straw Wattles

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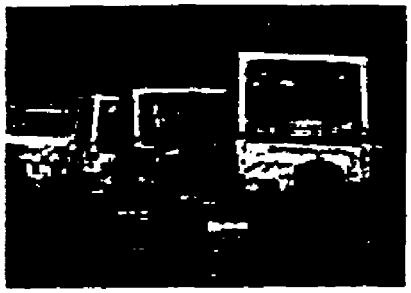

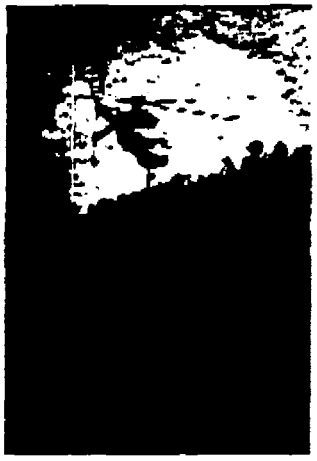

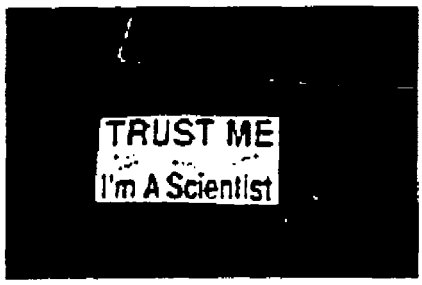
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