2012 LONGHORN FIRE

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

ROSEBUD SIOUX INDIAN RESERVATION
BUREAU OF INDIAN AFFAIRS

VALENTINE, NEBRASKA
AUGUST 2012

INTERAGENCY
BAER TEAM

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

AGENCY/UNIT: Bureau of Indian Affairs
Rosebud Sioux Tribe

LOCATION: Valentine, Nebraska

DATE: August 9, 2012

PREPARED BY: Interagency Burned Area Emergency Response Team (Rhodenbaugh)

Iron Wood Lake

Submitted By: Eric Rhodenbaugh

Eric Rhodenbaugh, BAER Team Leader, BIA – Wind River, Fort Washakie, WY

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

REVIEW AND APPROVAL -- BUREAU OF INDIAN AFFAIRS

I. EMERGENCY STABLIZATION PLAN APPROVAL

☒ **Approve**

☐ **Approve with Revision**

☐ **Disapproved**

Explanation for Revision or Disapproval:

8/8/2012

Cleve Her Many Horses, Superintendent, Rosebud Agency, BIA **Date**

I. EMERGENCY STABLIZATION PLAN CONCURRANCE

☐ **Concur**

☐ **Concur with Revision**

☐ **Disapproved**

Explanation for Revision or Disapproval:

Timothy LaPointe, Acting Regional Director, Great Plains Region, BIA **Date**

II. EMERGENCY STABILIZATION PLAN CONCURRANCE

☐ **Concur**

☐ **Concur with Revision**

☐ **Disapproved**

Explanation for Revision or Disapproval:

Lyle Carlile, Director, Fire Management, BIA NIFC **Date**

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

REVIEW AND APPROVAL -- BUREAU OF INDIAN AFFAIRS

I. BURNED AREA REHABILITATION PLAN APPROVAL

☒ **Approve**

☐ **Approve with Revision**

☐ **Disapproved**

Explanation for Revision or Disapproval:

Cleve Her Many Horses, Superintendent, Rosebud Agency, BIA **Date** 8/8/2012

I. BURNED AREA REHABILITATION PLAN CONCURRANCE

☐ **Concur**

☐ **Concur with Revision**

☐ **Disapproved**

Explanation for Revision or Disapproval:

Timothy LaPointe, Acting Regional Director, Great Plains Region, BIA **Date**

II. BURNED AREA REHABILITATION PLAN CONCURRANCE

☐ **Concur**

☐ **Concur with Revision**

☐ **Disapproved**

Explanation for Revision or Disapproval:

Lyle Carlile, Director, Fire Management, BIA NIFC **Date**

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

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INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

PART A FIRE LOCATION AND BACKGROUND INFORMATION

Fire Name	LONGHORN	**Date Controlled**	UNKNOWN
Fire Number	SD_RBA_120895	**Jurisdiction**	**Acres**
Agency Unit	SD-ROSEBUD	**BIA_ROSEBUD**	46,599
Region	Great Plains		
State	South Dakota		
County	Todd		
Ignition Date/Manner	July19,2012/Lightning		
Zone			
Date Contained	July 29, 2012	**TOTAL ACRES**	**46,599**

PART B NATURE OF PLAN

I. Type of Plan (check one box below)

	Short-term Emergency Stabilization Plan
	Long-term Rehabilitation
√	**Both Long and Short-term Rehabilitation**

II. Type of Action (Check One box below)

√	**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

EMERGENCY STABILIZATION OBJECTIVES

- **Determine need for and to prescribe and implement emergency treatments**
- **Minimize Threats to Human Life, Safety, and Property**
- **Identify Threats to Critical Cultural & Natural Resources**
- **Promptly Stabilize and Prevent Unacceptable Degradation to Resources**

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

PART C - TEAM ORGANIZATION

BAER TEAM MEMBERS

POSITION	TEAM MEMBER / AFFILIATION
Team Leader	Eric Rhodenbaugh, BIA
Deputy Team Leader	Darryl Martinez, BIA
Hydrologist	TJ Clifford, BLM
Hydrologist	Jessica Gould, USFS
GIS	Mark Browing, BIA
Archeology	Dan Hall, BIA
Documentation	Wayne Waquiu, BIA
Wildlife Biologist	Emily Boyd, Rosebud Sioux Tribe
Technical Specialist	Ira Dean Wilson, BIA

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

Name	Affiliation	Specialty
Gerald Dillon	BIA	Realty Specialist
Doug Drake	BIA	Safety of Dams
Syed Huq	Mni Wiconi	Director
John Whiting	Mni Wiconi	Deputy Director
Ben Rhodd	Private Contractor	Archaeologist
Elton Menard	Rosebud Sioux Tribe	Safety of Dams Coordinator
Sam High Crane	Rosebud Sioux Tribe	Tribal Elder
Jennifer Golinda	Rosebud Sioux Tribe	Tribal Archaeologist

CONSULTATIONS

***** SEE INDIVIDUAL RESOURCE ASSESSMENTS APPENDIX I , SECTION V, CONSULTATIONS**

PART D

Part D LONGHORN FIRE

AGENCY	TREATMENT			TOTAL
BIA	**EMERGENCY STABLIZATION**			
1	Plan Preparation			$49,229
2	Implementation Leader			$24,000
3	Culvert Upsize			$9,880
4	Storm Patrol			$30,150
5	Cemetery Protection			$1,794
6	Invasive Weed Monitoring			$37,120
7	Invasive Weed Treatment			$8,825
8	Repair Exclusion Fence			$11,652
9	Hazard Tree Mitigation			$20,659
10	Flood Warning Signs			$5,038
11	Reservoir Patrol			$16,254
BIA TOTAL				**$214,601**
BIA	**BURNED AREA REHAB (BAR)**			
1	Reforestation			$208,399
2	Continuous Forest Inventory Plots			$3,630
BIA TOTAL				**$212,029**

2012 LONGHORN FIRE

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

PART E – SUMMARY OF ACTIVITIES – COST SUMMARY TABLE – BUREAU OF INDIAN AFFAIRS

TREATMENT SPECIFICATION	NFPORS CAT.	UNIT	UNIT COST	# OF UNITS	Fiscal Year				SPECIFICATION TOTAL
					2012	2013	2014	2015	
Rosebud Agency									
1. Plan Preparation	Planning – ES/BAER Plan	Plan			$49,229				$49,229
2. Implementation Leader	Administration				$6,000	$12,000	$6,000		$24,000
3. Culvert Upsize	Roads	Pipes	$4,940	2	$9,880				$9,880
4. Storm Patrol	Roads				$30,150				$30,150
5. Cemetery Protection	Facility and Infrastructure	Feet	$7.18		$1,794				$1,794
6. Invasive Species Monitoring	Monitoring	Acre				$12,373	$12,373	$12,373	$37,120
7. Invasive Species Treatment	Invasives					$2,941	$2,941	$2,943	$8,825
8. Repair Exclusion Fence	Facility & Infrastructure	Miles		5.8	$11,652				$11,652
9. Hazard Tree Mitigation	Roads	Trees	$45.73	512	$20,659				$20,659
10. Flood Warning Signs	Protection and Warning				$5,038				$5,038
11. Reservoir Patrol	Infrastructure				$16,254				$16,254
TOTAL									**$214,601**

2012 LONGHORN FIRE

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN
BURN AREA REHABILITATION (BAR) SPECIFICATION

PART E – SUMMARY OF ACTIVITIES – COST SUMMARY TABLE – BUREAU OF INDIAN AFFAIRS

TREATMENT SPECIFICATION	NFPORS CAT.	UNIT	UNIT COST	# OF UNITS	Fiscal Year			SPECIFICATION TOTAL
					2012	2013	2014	
Rosebud Agency								
1. Reforestation	Reforestation	Acres			$69,466	$69,466	$69,467	$208,399
2. Continuous Forest Inventory Plots	Assessment	Plots	$303	12		$3,630		$3,630
TOTAL								**$212,029**

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

PART F EMERGENCY AND B.A.R. STABLIZATION SPECIFICATIONS

BUREAU OF INDIAN AFFAIRS – ROSEBUD AGENCY

Southeast Perimeter of Fire

PART F - INDIVIDUAL SPECIFICATION

TREATMENT/ACTIVITY NAME	BIA Emergency Stabilization and Burned Area Rehabilitation (BAR) Plan Preparation	**Part E, BIA SPEC #**	ES-1
NFPORS TREATMENT CATEGORY*	Planning – ES/BAR BAER Plan	**FISCAL YEAR(S) (list each year):**	FY 2012
NFPORS TREATMENT TYPE *	Planning – Plan Preparation	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	Rosebud, SD	**IMPACTED T&E SPECIES**	N/A

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

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

Number and Describe Each Task:

A. General Description:
Preparation of the Emergency Stabilization Plan for lands impacted by the Longhorn Fire.

B. Location/(Suitable) Sites:
Bureau of Indian Affairs, Rosebud Agency lands impacted by the Longhorn Fire consisting of 46,599 acres.

C. Design/Construction Specifications:
1. Conduct a detailed assessment of post fire threats to life, property and critical cultural and natural resources and mitigate impacts to the extent possible.
2. Write Emergency Stabilization and Burned Area Rehabilitation treatment specifications based on ground reconnaissance, and consultations with local specialists. Treatments must meet objectives of approved land management plans.
3. Write resource assessments justifying treatments, identifying issues, observations, findings, and recommendations.
4. Prepare GIS maps for ESR planning, implementation and presentation.
5. Produce multiple hard copies of the plan for distribution, as well as digital copies.
6. Submit plan and documentation to the Agency Superintendent and Tribal Chairman.

D. Purpose of Treatment Specifications:
The purpose is to prepare a comprehensive ES and BAR plan to manage or mitigate the fire impacts in order to protect life and property and protect cultural and natural resources. Emergency stabilization actions will be based on a plan developed immediately post-fire.

E. Treatment Effectiveness Monitoring Proposed:
The plan details monitoring for treatment effectiveness as prescribed in each treatment specification. Accomplishment reports will be prepared to document the treatment monitoring.

LABOR, MATERIALS AND OTHER COSTS:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Administration:	$13,288
Cultural	$4,711
Watershed:	$5,860
Documentation:	$5,932
GIS:	$4,156
Agency Support:	$2,362
TOTAL PERSONNEL SERVICE COST	**$36,309**

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**
Conference room rental	$200
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$200**

MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	**COST / ITEM**
External Flash Drives	$200
TOTAL MATERIALS AND SUPPLY COST	**$200**

TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	**COST / ITEM**
Lodging and Per Diem:	$6,765
Rental Vehicle Costs	$1,405
Airline: Roundtrip flights (variable)	$3,530

TOTAL TRAVEL COST	**$11,700**

CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	**COST / ITEM**
GPO Plan Printing (15 plans)	$820
TOTAL CONTRACT COST	**$820**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISH MENTS	PLANNED COST
FY12	7-30-2012	8-09-2012	F, C	Plan			**$49,229**
						TOTAL	

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

SOURCE OF COST ESTIMATE

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

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

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

List Relevant Documentation and Cross-Reference Location within the Accomplishment Report..

See Plan Preparation Cost Accounting Table in Supporting Documents

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Implementation Leader	**PART E BIA Spec #**	ES-2
NFPORS TREATMENT CATEGORY*	Administration	**FISCAL YEAR(S) (list each year):**	2012, 2013, 2014
NFPORS TREATMENT TYPE *	Contract Administration	**WUI? Y / N**	
IMPACTED COMMUNITIES AT RISK		**IMPACTED T&E SPECIES**	

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

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

A. General Description: The Implementation Leader will coordinate and direct all aspects of the Emergency Stabilization plan.

B. Location/(Suitable) Sites: Bureau of Indian Affairs, Rosebud Sioux Reservation lands impacted by the Longhorn Complex .

C. Design/Construction Specifications:
1. Appoint, hire or contract a qualified Implementation Leader. Qualifications include adequate training and/or experience in engineering, forestry, or other natural resource related fields pertinent to the emergency stabilization work to be performed.
2. In accordance with ethical guidelines set forth in federal regulations, the Implementation Leader shall have no vested interest or relationship, perceived or actual, in any hiring, contracting or procurement associated with emergency stabilization work to be performed.
3. The Implementation Leader will coordinate and direct the completion of all activities specified in the Emergency Stabilization plan, including implementation of treatment specifications and activities, preparation of commercial and self determination contract packages, documentation of treatments installed, tracking of allocated funds and expenditures, preparation of annual and final accomplishment reports, development of supplemental requests for funding, ensuring the completion of all approved treatments, and coordination with the Rosebud Agency, Tribe, and other involved parties. A more detailed description of Implementation Leader responsibilities is included in the attached Implementation Leader Scope of Work.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): The Implementation Leader is necessary to ensure the work specified in the Emergency Stabilization plan is completed in a timely and professional manner, and adequate accountability of treatment effectiveness and funding expenditures is maintained and documented. Administrative support is necessary to provide procurement, contracting, and record keeping, and other administrative support to the Implementation Leader.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Not applicable

F. Treatment Effectiveness Monitoring Proposed: The Rosebud Sioux and Regional BAER Coordinator will monitor Implementation Leader performance to ensure specified projects are successfully completed on time and within budget, including any projects incorporated by approved plan amendments.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
FY12 Implementation Team Leader (GS-9 equiv. @ $300/day x 20 days)	$6,000
FY13 Implementation Team Leader (GS-9 equiv. @ $300/day x 40 days)	$12,000
FY14 Implementation Team Leader (GS-9 equiv. @ $300/day x 20 days)	$6,000

TOTAL PERSONNEL SERVICE COST	**$24,000**
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
Contractor will provide all labor material, supplies, equipment, transportation, and supervision to perform project implementation in accordance with the Project Implementation Leader scope of work.	
	$
	$
TOTAL CONTRACT COST	

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISH MENTS	PLANNED COST
FY 12	8/15/12	9/30/12	S	Implementation		1	$6,000
FY 13	10/1/12	9/30/13	S	Implementation		1	$12,000
FY 14	10/1/13	9/30/14	S	Implementation		1	$6,000
						TOTAL	**$24,000**

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

SOURCE OF COST ESTIMATE

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	
3.	Estimate supported by cost guides from independent sources or other federal agencies	E
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Implementation Leader Scope of Work (Attached).

The Implementation Leader is responsible for ensuring the work specified in the Emergency Stabilization plan is completed in a timely and professional manner, and tracking and documenting treatment effectiveness and funding expenditures. Qualifications include adequate training and/or experience in engineering, forestry, or other natural resource related fields pertinent to the emergency stabilization work to be performed. In accordance with ethical guidelines set forth in federal regulations, the Implementation Leader shall have no vested interest or relationship, perceived or actual, in any hiring, contracting or procurement associated with emergency stabilization work to be performed.

The Implementation Leader will coordinate all aspects of emergency stabilization and rehabilitation work approved in the Longhorn Complex Burned Area Emergency Response Plan including the implementation of treatment specifications and activities, preparation of commercial contract packages, documentation of treatments installed, maintaining financial tracking of costs, reporting rehabilitation progress, submitting supplemental requests for funding, ensuring the completion of all approved treatments, and coordinating with the Rosebud Agency, Rosebud Sioux, and other impacted parties.

The Implementation Leader will coordinate on-the-ground implementation of treatments including site orientation of contractors, developing daily/weekly work plans for contractors/crews, and assistance to the Agency in supervising work.

The Implementation Leader will monitor the work to ensure compliance with all relevant Federal laws and regulations. Such laws and regulations include but are not limited to NEPA, NHPA, and all OSHA regulations and safety standards.

The Implementation Leader will provide annual accomplishment reports due Sept 15th detailing percent accomplishment for each project specification, dates of completion, funds expended, quality control inspection reports, and treatment effectiveness monitoring reports.

At completion of the three-year funding period the Implementation Leader will prepare a final accomplishment report. The final report will summarize all data requested in the annual reports and provide a comprehensive and objective compendium of lessons learned of the treatment effectiveness of the prescribed treatment specifications based on the prescribed monitoring plans found in the Longhorn Burned Area Emergency Response Plan. The report will be provided in hard copy and electronic formats that will be distributed within the United States Government and will be made available to the public on United States Government administered websites. None of the reports will be considered proprietary to the contracted Implementation Leader or their associated firms.

The terms of the BIA Implementation Leader's contract will not exceed the three year term of the Longhorn Burned Area Emergency Response Plan and may be terminated at any time within the three year period for failure to achieve the prescribed emergency treatments within their specified time frames. To further clarify, all approved emergency stabilization treatments must be completed within one year of the date of control of the fire for the specific fire for which the treatment is prescribed. All approved rehabilitation treatments must be completed within three years of the control date of the fire for the treatment specification for which the fire was prescribed. Funding for implementing treatment specifications will only be provided on a cost reimbursement basis except for mutually agreed upon start up costs as pre-approved by a warranted contracting officer and for a case by case basis of supplies and materials as pre-approved by a warranted contracting officer.

The Implementation Leader will comply with all federal labor laws. Overtime must be approved in advance. Overtime will not exceed ten hours in a fourteen-day pay period. Payroll records must be submitted quarterly for documentation purposes.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Culvert Upsize	**PART E Spec-#**	ES - 3
NFPORS TREATMENT CATEGORY*	Roads	**FISCAL YEAR(S) (list each year):**	2012, 2013
NFPORS TREATMENT TYPE *	Culverts	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	Surrounding area of Rosebud	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description:
Roads downstream of the Longhorn Complex Fire contain drainage structures draining watersheds consisting of high to moderate burn severity. These streams now have the potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging drainage structures or exceeding their maximum flow capacity. If these flows plug drainage structures the result could be massive erosion and debris torrents further down the drainage due to the failure of fill slopes and road surfaces.

Also, there is an immediate and future threat to travelers along these roads within the burned area due to the increased potential for rolling and falling rock from burned slopes and increased potential for flash floods and mudflows. With the loss of vegetation normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of users at risk.

An evaluation of two culverts near Spring Creek determined that they are not adequately sized to process the increase in runoff and associated streamflow. These two culverts are on a gravel road and should be replaced with the next size larger.

B. Location/(Suitable) Sites: See Treatment map. These culverts are both located on the BIA30 road.

C. Design/Construction Specifications:
Culverts are to be replaced using approved, standard engineering methods. The design should include minimizing the disturbance to original channel bottom elevation. If necessary, the channel elevation should be surveyed to minimize any change to channel elevation. Any lower elevation will cause headcutting upstream and any higher elevation will cause erosion at the outlet.

1. Use at least the following Corrugated Metal Piping (CMP) (storm drain, 36" dia, 20'L, 12ga, CMP, bitum ctd). One of the culverts (CMP) is 18 inches and should be replaced with a 24 inch CMP. The other CMP is a 24 inches and should be replaced with a 36 inch CMP.
2. Alignment of culvert should be as perpendicular to the road prism as possible to provide full functional capacity.
3. Inlet of the replacement culvert should be cleared of debris and live vegetation for a distance of 6 feet. Outlet should be cleared of debris and within the original, established channel substrate.
4. All excess material and debris removed from the drainage shall be placed outside of the bank-full channel and floodplain where it cannot re-enter stream channels. Preferably the material will be moved off-site.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire):
The purpose of this treatment is to provide a culvert capacity that will effectively process the increase in runoff and associated streamflow due to burned hillslopes.

E. Treatment consistent with Agency Land Management Plan (identify which plan): This treatment is compatible with the Forest Management Plan, Rosebud Indian Reservation, South Dakota (August 1999) and is referenced on pages 24 and 25.

F. Treatment Effectiveness Monitoring Proposed:
The replacement should be inspected by a qualified engineer before, during, and after installation to ensure success and long-term function.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Engineer design and oversight: $390/day x 6 days	$2,340
TOTAL PERSONNEL SERVICE COST	**$2,340**
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.	
320C Excavator (incl. operator): $300/day x 3 days	$900
T800 Transport (incl. operator):: $200/day x 3 days	$600
140H Motor Grader (incl. operator):: $300/day x 1 days	$300
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$1,800**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Corrugated Metal Pipe: Piping, storm drain, 36" dia, 20'L, 12ga, CMP, bitum ctd ($94/linear foot x 2 pipes)	$3,760
TOTAL MATERIALS AND SUPPLY COST	**$3,760**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
4 X 4 pickup: 60 miles X $0.55/ mile x 10 patrols x 2 teams x 3 days (29.3 miles 1-way from Mission, SD)	$1,980
TOTAL TRAVEL COST	**$1,980**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	**$0**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (MM/DD/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISH MENTS	PLANNED COST
2012	08/15/2012	10/15/2012	F	pipes	$4,940	2	$9,880
						TOTAL	**$9,880**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, M, E, 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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix 1, Watershed Assessment and Treatments Map

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Storm Patrol (roads, culverts, bridges)	**PART E Spec-#**	ES - 4
NFPORS TREATMENT CATEGORY*	Roads	**FISCAL YEAR(S) (list each year):**	2012
NFPORS TREATMENT TYPE *	Hazard Removal	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	Surrounding area of Rosebud	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description:

Roads downstream of the Longhorn Complex Fire contain drainage structures draining watersheds consisting of high to moderate burn severity. These streams now have the potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging drainage structures or exceeding their maximum flow capacity. If these flows plug drainage structures the result could be massive erosion and debris torrents further down the drainage due to the failure of fill slopes and road surfaces.

Also, there is an immediate and future threat to travelers along these roads within and adjacent to the burned area due to the increased potential for rolling and falling rock from burned slopes and increased potential for flash floods and mudflows. With the loss of vegetation normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of users at risk.

There are many places at risk of inundation, debris deposition, flood damage and other post-fire related impacts from elevated flows carrying sediment and debris. This post-storm assessment should identify culverts or bridges that are plugged or damaged. The patrols are used to identify those road problems such as plugged culverts and washed out roads and to clear, clean, and/or block those roads that are or have received damage. The storm patrollers shall have access to equipment that can be used when a drainage culvert is plugged or soon to be plugged and to repair any road receiving severe surface erosion. The sediment and debris should be removed immediately, especially from the inlet to avoid further damage to infrastructure. Work should be performed in the morning and early afternoon. Leave drainages when there is a chance of rain. Store equipment and materials out of flood plains and where chance of loss is low. Other values at risk (buildings, well heads, diversion structures, etc.) in the floodplain area may be assessed during storm patrol.

B. Location/(Suitable) Sites: There are stream crossing along roads BIA #3, #5, and #22 that will need to be patrolled. See treatment map for general areas. The total mileage for patrols is about 5.5 miles.

C. Design/Construction Specifications:

The Rosebud Sioux Tribe/BIA must clean the culverts within the treatment area identified on the treatment map. This treatment area includes 7 culverts that were evaluated during our assessment. This evaluation identified that 6 of 7 culverts were not currently at full functional capacity. The 6 culverts were plugged with debris and sand. One of the six culverts had a Cottonwood tree growing at its inlet. These six culverts must be cleaned to full functional capacity immediately to prepare for increased runoff. Following the initial cleaning, patrols will be responsible for the following tasks:

1. Immediately after receiving heavy rain (estimated to be > 0.5 inch in 20 minutes) the Rosebud Sioux Tribe/BIA will send out patrols to the roads identified above to evaluate hazard conditions. This evaluation must consider obstructions such as rocks, sediment, washouts and plugged culverts so that the problems can be corrected before they worsen or jeopardize motor vehicle users.
2. The primary purpose of the patrol will be to clean the inlet/outlet manually or with a hose from a fire engine.
    a. If the culvert cannot be cleaned to full functional capacity with the water pressure, then the road patrols mobilize the appropriate equipment to remove obstructions from the roads and culvert inlets after storm events.
3. All excess material and debris removed from the drainage system shall be placed outside of the bank-full channel and floodplain where it cannot re-enter stream channels. Preferably the material will be moved off-site.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire):

The storm patrol should identify and mitigate issues immediately after major rainfall events to avoid further damage during subsequent events. The purpose of the monitoring is to evaluate the condition of roads for motorized access and to identify and implement additional work needed to maintain and/or repair damage to road surfaces and flow conveyance structures across roads in order to provide safe access through the area. Qualified personnel will survey the roads within the fire perimeter after high-intensity storms and must inspect road surface condition, ditch erosion, and culverts/inlet basins for capacity to accommodate future runoff flows.

E. Treatment consistent with Agency Land Management Plan (identify which plan): This treatment is compatible with the Forest Management Plan, Rosebud Indian Reservation, South Dakota (August 1999) and is referenced on pages 24 and 25.

F. Treatment Effectiveness Monitoring Proposed:

The storm patrol will verify that the work has been completed and the infrastructure is ready for the next rain event. Storm patrollers

can also recommend changes to, or additional treatments, in the first year after the fire. Patrols and actions taken as a result of patrols should be documented for future reference. Documentation should include the estimated storm intensity and duration with a volume and a rate. (# of inches rainfall in # of minutes). It should also include photos of post-storm debris and the personnel or equipment needed for cleaning.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Storm Patrol Assessors (GS-9 equiv. @ $150/day x 2 teams of 2 people x 10 events) (split with Reservoir Patrol)	$6,000
TOTAL PERSONNEL SERVICE COST	**$6,000**
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
320C Excavator (incl. operator): $300/day x 3 days/event x 5 events	$4,500
T800 Transport (incl. operator):: $200/day x 3 days/event x 5 events x 3 pieces of equipment	$9,000
140H Motor Grader (incl. operator):: $300/day x 3 days/event x 5 events	$4,500
D6 Dozer (incl. operator):: $300/day x 3 days/event x 5 events	$4,500
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$22,500**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
TOTAL MATERIALS AND SUPPLY COST	**$**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
Patrols: 4 X 4 pickup: 60 miles X $0.55/ mile x 10 patrols x 2 teams (29.3 miles 1-way from Mission, SD)	$660
Road Clearing Access: 4 X 4 pickup: 60 miles X $0.55/mile x 5 events of 3 days each x 2 teams	$990
TOTAL TRAVEL COST	**$1,650**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	**$0**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (MM/DD/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISH MENTS	PLANNED COST
2012	08/15/2012	0729/2013	F	patrol	$660	10	$6,660
2012	08/15/2012	07/29/2013	F	Clean-out	$4,698	5	$23,490
						TOTAL	**$30,150**

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

SOURCE OF COST ESTIMATE

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

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

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix 1, Watershed Assessment.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Cemetery Protection	**PART E Spec-#**	ES - 5
NFPORS TREATMENT CATEGORY*	Facility and Infrastructure	**FISCAL YEAR(S) (list each year):**	2012
NFPORS TREATMENT TYPE *	Fence Replacement	**WUI? Y / N**	N
IMPACTED COMMUNITIES AT RISK	N/A	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description Wooden post elements of the fence enclosing the St. Mary's Cemetery on the Rosebud Indian Reservation were partly to mostly consumed by the approximately 44,000 acre Longhorn Fire Complex. Repair/replacement of the enclosure fence is critical to ensure that range cattle do not displace/damage headstones or disturb burial sites.

B. Location/(Suitable) Sites: The treatment location is St. Mary's Cemetery, which is located off of BIA Route 3203 in the northern portion of the area known as Iron Shell Flat. It is proposed that all wooden posts including corner braces that exhibit fire damage be replaced and the existing four strand barbed wire depending upon condition be re-strung or replaced. The gate providing ingress to the cemetery will be re-hung or replaced. It is estimated that the proposed treatment area is an exclosure comprised of approximately 250 linear feet of fencing.

C. Design/Construction Specifications: The treatment specification pertaining to fencing in designated areas shall be in accordance with Agency fencing standards. These standards include the following criteria: fence consists of four barbed wire strands; placement of a 5 ½ foot steel T-post every 12 feet and wooden braces at every corner.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): The St. Mary's Cemetery exclosure fence was severely compromised by the fire, putting gravesites and headstones at risk from trampling by livestock. The purpose of the specification treatment is to eliminate range cattle access to the cemetery, thereby protecting it from livestock related damage.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Forest Management Plan, Rosebud Indian Reservation and Rosebud Sioux Tribe Resolution No. 2006-216.

F. Treatment Effectiveness Monitoring Proposed: The treatment specification will be considered effective if livestock is excluded from the cemetery.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Range conservationist for contract administration: GS-09/5 @ $34.79/Hr. x 16 Hrs.	$557
Fencing crew: 2 GS-04/5 @ $20.63/Hr. x 16 Hrs.	$660
TOTAL PERSONNEL SERVICE COST	**$1,217**
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.	
1 Vehicle @ $100.00/day x 2 days	$200
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$200**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Barbed Wire: 1320 foot roll @ $54.99/roll x 1 roll	$55
Steel T-post (5 ½ foot): $4.28/post x 20	$86
Wooden Brace Posts: 8' x 6" @ 11.99/pst x 6 posts	$72
Metal Fence Stays: $42.40/bundle x .1 bundle	$5
T-Post Wire Clips 500/bundle: $76/bundle x .2 bundle	$16
Fencing Nails, 1 ½ inch by 0.080 inch Ring Shank .1 box @ $179/box	$18
Gate: 1 vintage garden gate @ $125	$125

TOTAL MATERIALS AND SUPPLY COST	**$377**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	**$1794**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2012	9/3/2012	9/5/2012	C	Feet	$7.18	250	**$1794**
						TOTAL	

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	M, E
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Treatments – See Appendix I, Longhorn Complex Cultural Resources Assessment

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Invasive Species Monitoring - NCA	**PART E Spec-#**	ES - 6
NFPORS TREATMENT CATEGORY*	Monitoring	**FISCAL YEAR(S) (list each year):**	2013
NFPORS TREATMENT TYPE *	Ecosystem Recovery Monitoring	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	N/A	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description: In the spring of 2013, assess for noxious weeds/non-native invasive plant species on reservation lands burned within the perimeters of the fires included within the Longhorn Fire Complex. Sites for detection will be previously known locations, roadways, hand lines, dozer lines, drop points, Incident Base Camp, Helibase, noxious weed wash station and other disturbed areas. Inventory for noxious weeds/non-native invasives in areas that have a high probability for invasion within the burned area and prescribe treatments to control the invasion and spread of the plants.

B. Location/(Suitable) Sites: Inventory areas that have a high potential for weed/invasive species invasion. Critical areas include roads, dozer lines, hand lines, drop points, helibase, Incident Base Camp, noxious weed wash station, and burned areas where suppression vehicles and equipment traveled through known noxious weed/non-native invasive plant species populations. Assess all visible noxious weed/non-native invasive plant species along road systems and drainages within the fire area.

C. Design/Construction Specifications:

1. Conduct detection monitoring of noxious weed/non-native invasive plant species populations within the burned area using protocol determined by the BIA Rosebud Agency and the Rosebud Sioux Tribe. Detection monitoring will be conducted in areas disturbed by the fire and fire suppression activities.
2. Native vegetative cover and density will be assessed in late spring of 2013 to determine whether there is sufficient recovery to preclude invasive species. Monitoring locations will be in areas representative that are not transitional from one vegetation monitoring stratum to another, using local Tribal and agency specified methods.
3. Inventory, photo document, and map new noxious weed/non-native invasive plant species infestations within disturbed lands using Global Positioning System (GPS) technology.
4. Sampling should determine species composition and density.
5. Cover sampling methodologies shall represent dominant plant community type, aspect, and slope variations within the fire area. Photos shall accompany data records as supporting documentation of findings.
6. Initiate tribally approved control measures where detection demonstrates the establishment or expansion of noxious weed/invasive species populations. Direct treatment will occur when there is a threat to natural regeneration and recovery of native vegetation, establishment of effective ground cover, or expansion within and outside the burn area from invasive species inside the burned area. Treatment will require submission for supplemental funding on sites that were not known before the fire.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): Purpose is to detect the invasion or spread of noxious weeds and non-native invasive plant species and to prescribe treatments that will control the invasion or spread. Assessment is necessary to determine whether vegetative treatments are necessary to meet management goals and objectives. The level of analysis required will be commensurate with the complexity of the project, level of concern, and the objectives of the plan. Using Integrated Pest Management (IPM) techniques will help to minimize the establishment of non-native invasive species within the burned area. If recovery has not been met then additional funding requests must be prepared and submitted.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Completion of Emergency Stabilization treatments are described in, and are consistent with the Rosebud Reservation 1999 Forest Management Plan. Protection of beneficiaries and Indian trust resources is consistent with the BIA's mission.

F. Treatment Effectiveness Monitoring Proposed: Control and detection of noxious weeds/non-native invasive plant species in burned areas will be monitored according to the strategy outlined in the specification. Control will be considered successful upon determination that all noxious weeds have been controlled and non-native invasive plants have not spread beyond their pre-fire locations. Monitoring is required to ascertain whether vegetative recovery of habitat has, as anticipated, occurred. Additional treatments may be proposed if monitoring concludes that the criteria for re-vegetation success are not achieved.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
Two Resource Specialists: GS-09/5 @ $2,535.00/Pay Period(80Hrs) x 2 Pay Periods x 3 years	$30,420
TOTAL PERSONNEL SERVICE COST	**$30,420**
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.	
Vehicle @ $500.00 / week x 4 weeks x 3 years	$6,000
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$6,000**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Miscellaneous field supplies	$500
Digital Camera	$200
TOTAL MATERIALS AND SUPPLY COST	**$700**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 13	5/1/2013	8/29/2013	C	Acre	$5.23	2,363	$12,373
FY 14	5/1/2014	8/29/2014	C	Acre	$5.23	2,363	$12,373
FY 15	5/1/2015	8/29/2015	C	Acre	$5.23	2,363	$12,373
						TOTAL	**$37,120**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	M
3. Estimate supported by cost guides from independent sources or other federal agencies	T
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix I, Vegetation Resource Assessment; See Appendix IV, Vegetation Treatment Map.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Invasive Species Treatment - NCA	**PART E Spec-#**	ES_7
NFPORS TREATMENT CATEGORY*	Invasives	**FISCAL YEAR(S) (list each year):**	2013, 2014, 2015
NFPORS TREATMENT TYPE *	Chemical Treatment	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	N/A	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description: In the spring of 2013, spray known noxious weed/invasive weed species sites burned within the perimeter of the Longhorn Fire Complex. Sites for treatment will be established through monitoring. Expected noxious weed species are:Spotted knapweed *(Centaurea biebersteinii)*, Russian knapweed *(Centaurea repens)*, White Top *(Cardaria draba)*, and Bull thistle *(Cirsium vulgare)*.

B. Location/(Suitable) Sites: Assess known locations of noxious weeds/non-native invasive plant species. See Vegetation Treatment Map, Appendix IV.

C. Design/Construction Specifications:

1. Apply Milestone herbicide to known noxious weed/non-native invasive plant species at a rate of 6 ounces per acre.
2. Map all treatments using Global Positioning System (GPS) technology. All treatments will be documented as to date, time of day, and current weather when treatment was being completed.
3. Use a colorant in the herbicide mix so treated areas are visually apparent.
4. Treatment should occur as soon in the spring as noxious weed/non-native invasive plant species are visible.
5. Electronic records of the treatments will be provided to the BIA, Rosebud Agency and the Great Plains Regional Office, Branch of Natural Resources.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): Purpose is to limit the spread of noxious weed/non-native invasive plant species into burned areas until native grasses recover. Purpose is also to ultimately control the plant species to manageable levels.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Completion of Emergency Stabilization treatments are described in, and are consistent with the Rosebud Reservation 1999 Forest Management Plan. Protection of Indian beneficiaries and Indian trust resources is consistent with the BIA's mission.

F. Treatment Effectiveness Monitoring Proposed: Control will be considered successful upon determination that all noxious weeds have been controlled and non-native invasive plants have not spread beyond their pre-fire locations. Monitoring is required to ascertain whether vegetative recovery of habitat has, as anticipated, occurred. Additional treatments may be proposed if monitoring concludes that the criteria for re-vegetation success are not achieved.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Range/Vegetation Specialist: GS-09/5 @ $2,783.00/Pay Period(80Hrs) x 1 Pay Period	$2,783
Range Technician: GS-04/5 @ $1,642.00/Pay Period(80Hrs) x 1 Pay Period	$1,642
TOTAL PERSONNEL SERVICE COST	**$4,425**
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.	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Milestone Herbicide @ $120.00/gallon X 25 gallons	$3,000
GPS Unit	$400

TOTAL MATERIALS AND SUPPLY COST	**$3,400**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
Vehicle @ $500.00/week x 2 weeks	$1,000
TOTAL TRAVEL COST	**$1,000**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 13	4/15/2013	9/30/2013	C	Acre			$2,941
FY 14	4/15/2014	9/30/2014	C	Acre			$2,941
FY 15	4/15/2015	9/30/2015	C	Acre			$2,943
						TOTAL	**$8,825**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	M
3. Estimate supported by cost guides from independent sources or other federal agencies	T
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix I, Ash Creek Fire Complex Vegetation Resource Assessment; See Appendix IV, Ash Creek Fire Complex Vegetation Treatment Map.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Repair Exclusion Fence	**PART E BIA Spec-#**	ES - 8
NFPORS TREATMENT CATEGORY*	Facility & Infrastructure	**FISCAL YEAR(S) (list each year):**	2012
NFPORS TREATMENT TYPE *	Fence Repair	**WUI? Y / N**	No
IMPACTED COMMUNITIES AT RISK		**IMPACTED T&E SPECIES**	N/A

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

A. General Description: Several miles of rangeland fence were burned in the Longhorn Fire Complex rendering it ineffective. Repair of approximately 5.8 miles of fence to exclude cattle from the Highway Rights of Way (BIA Road 27, 4.3 miles and BIA Road 5, 1.5 miles), and protect and ensure public safety.

B. Location/(Suitable) Sites: On location of original fence lines

C. Design/Construction Specifications: Fence construction will be in accordance with NRCS Specifications.

1. Existing and new fence materials will be used.
2. Repair 4-wire fence for existing Highway Right of Way consisting of 4 strands of 12 ½ gauge twisted barbed wire. Steel 6 foot T-posts will be driven 1 ½ feet in the ground and spaced at no more than 20 feet apart.
3. Wooden corner posts will be placed at all corners or at a maximum of 1/8 mile spacing or as necessary to compensate for topographical undulations. Posts are to be secured using 12 ½ gauge smooth twisted steel wire with a minimum breaking strength of 950 pounds of force.
4. Remove all burned fence materials from area, including wire, staples, and nails.

D. Purpose of Fencing Repair Specifications (relate to damage/change caused by fire): Protective/ boundary fences are to be repaired to protect domestic livestock from entering ROW.

E. Fencing consistent with Agency/Tribal grazing standards (identify which plan): Rosebud Forest Management Plan 1999.

F. Fencing Effectiveness Monitoring Proposed: The fencing will be considered successful if animals are excluded from the ROW.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
TOTAL PERSONNEL SERVICE COST	**$0**
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.	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$0**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Barbed Wire: 1320 foot roll @ $ 54.99 /roll x 10 rolls	$550
Fencing Nails, 1-1/2-Inch by 0.080-Inch Ring Shank 1box @ $179/box	$179
Wooden Brace Posts: 8' x 6" @ $ 15.00/post x 120 posts	$1,800
Metal Fence Stays: $ 42.40/bundle x 1 bundles	$43
T-Post Wire Clips 500/bundle: $76/bundle x 5 bundles	$380
TOTAL MATERIALS AND SUPPLY COST	$2,952
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
Fence Repair: $1,500 /mile x 5.8 miles	$8,700
TOTAL CONTRACT COST	$8,700

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 2012	09/01/2012	09/30/12	S	miles	$2,009	5.8 miles	$11,652
						TOTAL	$11,652

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Treatment Map.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Short-Term Tree Hazard Mitigation	**PART E Spec-#**	ES_9
NFPORS TREATMENT CATEGORY*	Roads	**FISCAL YEAR(S) (list each year):**	2012
NFPORS TREATMENT TYPE *	Hazard Removal	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	Little White River Housing	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description: Fell identified short-term tree hazards for the safety of the public within one tree length of and posing a threat to recreational use of developed sites and roads.

B. Location/(Suitable) Sites: Designated areas along BIA Roads; 27, 5, and 3, as identified on the Short-Term Tree Hazard Mitigation Map in Appendix IV.

C. Design/Construction Specifications:
1. Directionally fell remaining identified (with blue paint) tree hazards away from road.
2. Flush cut stumps as low as possible
3. Merchantable trees should be bucked to specifications set by the Rosebud Sioux Tribe. Non-merchantable trees should be bucked to firewood lengths for tribal removal.
4. Limbs should be chipped and dispersed.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): To ensure the safety of the public living along and using BIA Roads; 27, 5, and 3.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Rosebud Forest Management Plan 1999.

F. Treatment Effectiveness Monitoring Proposed: Final report of the number of trees felled and associated cost.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Crew Boss Sawyer 1 @ $34.44/Hr.* x 80 Hrs.	$2,755
Hand Crew Sawyer 2 @ $29.29 /Hr.* x 80 Hrs.	$4,686
Crew Boss Laborer 1 @ $29.79/Hr.* x 80 Hrs.	$2,383
Hand Crew Laborer 2 @ $24.64/Hr.* x 80 Hrs.	$3,942
* Adjusted to 2012 rates (1.093 x 2008 rates minus allowance for "associated vehicle costs.") Work to be done by BIA Forestry & Fire employees; limbing, bucking, skidding, loading, hauling treating slash all 512 identified tree hazards, included those previously felled. **TOTAL PERSONNEL SERVICE COST**	**$13,766**
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.	
Chainsaw-- Wear, Tear, and Replacement	$2,000
Rent Chipper @ $220.00/Day x 15 Days	$3,300
** Adjusted to 2012 rates (1.093 x 2008 rates). **TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST**	**$5,300**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Saw Fuel @ $4.00/Gal. x 10 Gals.	$40
2-Cycle Mix @ $31.99/Gal. x 1 Gal.	$32
Bar Oil @ $13.29/Gal. x 10 Gals.	$133
Saw Chain @ $42.00/Ea.. x 4 Ea.	$168
Wedges, Files, Etc.	$100
TOTAL MATERIALS AND SUPPLY COST	**$473**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
GSA 4WD Pickups 4 @ $28.00/Day x 10 Days	$1,120

TOTAL TRAVEL COST	**$1,120**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	**$0**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISH MENTS	PLANNED COST
2012	9/1/2012	9/30/2011	F	512 Trees	$40.34		**$20,659**
						TOTAL	**$20,659**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	E, M
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix I, Vegetation/Forestry Assessment. See Appendix IV, Short-Term Tree Hazard Surveillance/Mitigation Map.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Flood Warning Signs	**PART E Spec-#**	ES - 10
NFPORS TREATMENT CATEGORY*	Protection and Warning	**FISCAL YEAR(S) (list each year):**	2012, 2013
NFPORS TREATMENT TYPE *	Warning Signs	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	None	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description:
This treatment is for the installation of flood warning signs, burned area warning signs, and road closure signs. These signs will warn the public of dangers on the road that have changed as a result of the fire. Flood warning signs will warn the public when crossing drainages such as the Ironwood Creek, Beads Creek, Spring Creek, Crazy Horse Canyon and tributaries about the increased risk of floods. Burned area signs consist of a warning to the public identifying of the possible dangers associated with a burned area. It shall contain language specifying items to be aware of when entering a burn area such as falling trees and limbs, rolling rocks, and flash floods.

B. Location/(Suitable) Sites: All locations are identified on treatment map. Suitable sites will be determined by local staff. There will be 3 Burned Area Warning signs (#2) installed on BIA 5 and 1 (#2) on BIA 3. There will be 1 Flash Flood sign (#1) on BIA 3, 2 on BIA 5, 1 on BIA 22, and 1 on entrance to Ghost Hawk Reservoir. Handouts (#3) will developed by Rosebud Indian Reservation.

C. Design/Construction Specifications:

1. Flood Warning Signs at stream or river crossings shall conform to the M.U.T.C.D. standards and shall be installed per Federal Highway Safety Standards. The signs shall read “FLASH FLOOD AREA”. Sign will be reflective yellow background, black border, and black lettering of at least a 4”.

2. Burned Area warning signs along the roads shall measure, at a minimum, 4 feet by 4 feet and consist of 0.08” aluminum, sheeted in high intensity orange with black letters. The signs shall read “ENTERING BURNED AREA STAY ON ROADS & TRAILS” Title lettering shall be a minimum of 5 inches in height and all remaining lettering shall be a minimum of 3.5 inches in height.

3. Develop brochures/handouts that describe the burned area and the ecosystem response. Describe the sensitivity of the area to impacts such as OHV and other activities that break the soil surface. Describe the processes of erosion and the loss of soil and soil productivity. Finally, describe the increase in runoff and expected flooding downstream of the burn. Distribute the handouts to hunters, operators, and visiting public.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire):
The purpose of the Flood Warning and Burned Area signs are to provide safety to the area visitors of possible dangers.

E. Treatment consistent with Agency Land Management Plan (identify which plan): This treatment is compatible with the Forest Management Plan, Rosebud Indian Reservation, South Dakota (August 1999) and is referenced on pages 24 and 25.

F. Treatment Effectiveness Monitoring Proposed:
Agency personnel while working in the areas of these signs shall monitor their effectiveness by observing if they are still installed while they are needed.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	COST / ITEM
GS 07 (Oversight for sign construction/installation) @ $170/day X 4 days =	$680
2 – GS 05 (sign installation) @ $130/day X 4 days =	$520
TOTAL PERSONNEL SERVICE COST	**$1,200**
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.	
Agency owned vehicle for sign crew to install sign at ($11.50/day (FOR rate) X 4 days) + ($0.42/mile (mileage) X 100 miles) =	$88
Fuel ($120/tank)	$120
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$208**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Flood Warning Signs 5 Each at $200 =	$1,000
Burned Area Signs (Roads) 3 Each at $310 =	$930
Burned Area Informational Handouts ($25/hour develop x 40 hours + production of $0.70/handout)	$1,700
TOTAL MATERIALS AND SUPPLY COST	**$3,630**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
TOTAL TRAVEL COST	**$0**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	**$0**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (MM/DD/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2012	09/15/2012	10/15/2013	F	ea	$4.99	1008	$5,038
						TOTAL	**$5,038**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix 1, Watershed Assessment and Treatments Map.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Reservoir Patrol (reservoirs)	**PART E Spec-#**	ES - 11
NFPORS TREATMENT CATEGORY*	Infrastructure	**FISCAL YEAR(S) (list each year):**	2012, 2013
NFPORS TREATMENT TYPE *	Hazard Removal	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	Surrounding area of Rosebud, SD	**IMPACTED T&E SPECIES**	N/A

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

A. General Description:
Reservoirs downstream from burned areas within the Longhorn Complex Fire contain drainage that may be at risk from increased flows. The streams now have the potential for increased runoff and debris flows. These increases in flows pose a threat to the existing inlet structures that may result in plugging or exceeding their maximum drain capacity. If these flows plug drainage structures the result could be massive erosion and debris torrents further down the drainage due to the failure of earthen dams and downstream road fill. Two of the dams, Ironwood and Beads, have a pre-existing risk due to gullying on the emergency spillway, saturation leaks, and tree growth within the earthen dam structure. There is an immediate and future threat to travelers along roads below the reservoirs due to a higher potential for increased flow following fires, but also in the event that the dam fails.

This post-storm assessment should identify inlets or spillway obstructions that are plugged or damaged. The patrols are used to identify problems such as debris piled up against the inlet, the emergency spillway, or any erosion channels within the dam. The storm patrollers shall have access to equipment that can be used when issues are observed and need to be repaired. The sediment and debris should be removed immediately from the inlet to avoid full dam failure. Leave drainages when there is a chance of rain. Store equipment and materials out of flood plains and where chance of loss is low.

B. Location/(Suitable) Sites: Ghost Hawk, Ironwood, and Beads reservoirs.

C. Design/Construction Specifications:
The Rosebud Sioux Tribe/BIA will send out patrols to the three dams immediately after receiving heavy rain (estimated to be > 0.5 inch in 20 minutes) to identify hazard conditions. Hazard conditions include obstructions such as debris and sediment that plugs the inlet or outlet. Other evidence of risk to failure must also be noted and would include evidence of new erosion on the earthen dam.

1. The primary task of the patrols will be to manually remove obstructions and smaller debris from the inlet cage. Patrols may need to mobilize other larger equipment to remove heavy obstructions from the inlets and/or earthen dam.
2. If equipment is necessary, then patrols must identify the equipment that appropriately addresses the issues observed.
3. Problems must be corrected immediately.
4. All excess material and debris removed from the reservoir shall be placed outside of the emergency spillway where it cannot re-enter stream channels. Preferably the material will be moved off-site.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire):
The storm patrol is intended to identify and mitigate issues immediately after a rainfall event to avoid further damage during subsequent events. The purpose of the monitoring is to evaluate the condition of reservoirs and to identify and implement additional work needed to maintain and/or repair damage to dam and flow conveyance structures (inlet or outlet from dam) in order to maintain dam stability. Qualified personnel will survey the dams after high-intensity storms. Survey will inspect the condition of the dam, the emergency spillway, and inlet/outlet structures for capacity to accommodate future runoff flows.

E. Treatment consistent with Agency Land Management Plan (identify which plan): This treatment is compatible with the Forest Management Plan, Rosebud Indian Reservation, South Dakota (August 1999) and is referenced on pages 24 and 25.

F. Treatment Effectiveness Monitoring Proposed:
The storm patrol will verify that the work has been completed and the infrastructure is ready for the next rain event. Storm patrollers can also recommend changes to, or additional treatments, in the first year after the fire. Patrols and actions taken as a result of patrols should be documented for future reference. Documentation should include the estimated storm intensity and duration with a volume and a rate. (# of inches rainfall in # of minutes). It should also include photos of post-storm debris within the reservoir and the personnel or equipment needed for cleaning.

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

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Storm Patrol Assessors (GS-9 equiv. @ $150/day x 2 teams of 2 people x 10 events) (split with Storm Patrol)	$6,000
TOTAL PERSONNEL SERVICE COST	**$6,000**
EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
320C Excavator (incl. operator): $30hour x 10 hours/day x 6 days/event x 3 events	$5,400
T800 Transport (incl. operator):: $20/hour x 10 hours/day x 6 days/event x 3 events	$3,600
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$9,000**
MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
TOTAL MATERIALS AND SUPPLY COST	**$**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
Patrols: 4 X 4 pickup: 60 miles X $0.55/ mile x 10 patrols x 2 teams (29.3 miles 1-way from Mission, SD)	$660
Clearing Access: 4 X 4 pickup: 60 miles X $0.55/ mile x 3 events of 3 days each x 2 teams	$594
TOTAL TRAVEL COST	**$1,254**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	**$0**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (MM/DD/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISH MENTS	PLANNED COST
2012/13	08/15/2012	07/29/2013	F	patrol	$666	10	$6,660
2012/13	08/15/2012	07/29/2013	F	Clean-out	$3,198	3	$9,594
						TOTAL	**$16,254**

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

SOURCE OF COST ESTIMATE

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

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

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix 1, Watershed Assessment.

LONGHORN FIRE

INTERAGENCY BURNED AREA EMERGENCY

RESPONSE PLAN

BURNED AREA REHABILITATION

(BAR)

PART E - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	Reforestation	**PART E Spec-#**	BAR_1
NFPORS TREATMENT CATEGORY*	Reforestation	**FISCAL YEAR(S) (list each year):**	2013, 2014, 2015
NFPORS TREATMENT TYPE *	Cone Collection, Planting	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	N/A	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description: Reforestation by hand planting ponderosa pine *(Pinus ponderosa)* seedlings on 528 acres of commercially designated forested Indian trust lands on the Rosebud Indian Reservation. This will include collection of ponderosa pine cones for seed extraction.

B. Location/(Suitable) Sites: See the treatment map for Burned Area Rehabilitation (BAR). Planting sites are located within the perimeters of the Longhorn Fire complex. There are a total of 528 acres in need of reforestation within the Longhorn Fire. All commercial forestlands were designated during a reservation wide forest cover typing project completed in 2001. North and east facing slopes with a slope of greater than 10% should be prioritized for planting. South and west facing slopes should only be considered for planting if other sites are unavailable.

C. Design/Construction Specifications:

1. Collect and process ponderosa pine cones to procure seed sufficient to grow the required seedlings to plant 528 acres of forestland.
2. Grow 159,456 containerized ponderosa pine seedlings. These will be grown to current height and caliper standards within established sized plugs. The Rosebud Agency has used Bessey nursery to extract seed and produce seedlings.
3. Hand plant 528 acres of commercial forestland at a rate of 302 trees per acre (12 foot by 12 foot spacing).
4. Trees will be hand planted according to established guidelines in the BIA Forest Development Handbook.
5. Trees will be stored in a frozen state or in a cooler before being taken to the field for planting. Trees will be kept in the shade at all times and when removed, will be planted in the ground as immediately as possible.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): The purpose of the treatment is to re-establish forest vegetation on commercially designated forestlands (areas which experienced almost total mortality and has no available natural seed source) for watershed stabilization, wildlife habitat, scenic and recreational values, and timber production.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Completion of Burned Area Rehabilitation (BAR) treatments are described in, and are consistent with the Rosebud Reservation 1999 Forest Management Plan. Protection of beneficiaries and Indian trust resources is consistent with the BIA's mission.

F. Treatment Effectiveness Monitoring Proposed: The Rocky Mountain Regional Office forester responsible for forest development will insure a representative sample of planted areas are inspected to insure conformance with the 53 IAM Forest Development Handbook 5-H and Regional reforestation standards.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
1 Forester for Contract Administration: GS-09/5 @ $6,030/month x 1months x 3 years	$18,090
2Forestry Technicians For Planting Inspections: GS-04/5 @ $3,560/month x 1 months x 3 years	$21,360
1 Forestry Technician For Treatment Effectiveness Monitoring: GS-05/5 @ $4,000/month x 1month x 3 years	$12,000
TOTAL PERSONNEL SERVICE COST	**$51,450**
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.	
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$0**

MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Nursery stock (ponderosa pine seedlings) : 158,400 seedlings @ $0.30 per seedling	$47,837
Delivery Costs	$2,000
TOTAL MATERIALS AND SUPPLY COST	**$49,837**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
3 Vehicle @ $1,000/ month x 1 month x 3 years	$9,000
TOTAL TRAVEL COST	**$9,000**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
Collect and process 58 bushels of ponderosa pine cones for seed @ $144.00 per bushel	$8,352
Hand plant ponderosa pine seedlings on 528 acres @ $170.00 per acre (includes tribal administration)	$89,760
TOTAL CONTRACT COST	**$98,112**

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 12	4/01/2013	6/15/2013	C	Acres	$394.69	176	$69,466
FY 13	4/01/2014	6/15/2014	C	Acres	$394.69	176	$69,466
FY 14	4/01/2015	6/15/2015	C	Acres	$394.70	176	$69,467
						TOTAL	**$208,399**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	M
3. Estimate supported by cost guides from independent sources or other federal agencies	T
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix I, Longhorn Fire Complex Vegetation Resource Assessment; See Appendix IV, Longhorn Fire Complex Vegetation Treatment Map.

PART F - INDIVIDUAL TREATMENT SPECIFICATION

TREATMENT/ACTIVITY NAME	CFI Plot Re-establishment	**PART E Spec-#**	BAR_2
NFPORS TREATMENT CATEGORY*	Assessment	**FISCAL YEAR(S) (list each year):**	2013
NFPORS TREATMENT TYPE *	Fire Damage Assessment	**WUI? Y / N**	Y
IMPACTED COMMUNITIES AT RISK	N/A	**IMPACTED T&E SPECIES**	N/A

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

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

A. General Description: Re-establish Continuous Forest Inventory (CFI) Plots within burned areas on the Longhorn and Ghost Hawk Fires. Eight (8) plots may have been impacted by the Longhorn Fire and four (4) plots within the Ghost HawkFire. These plot locations need to be inspected and re-established, if necessary. All plots are located on the Rosebud Reservation and were initially established in the 2000's. Plots were installed in 2008 and plots referenced using Geographic Positioning System technology.

B. Location/(Suitable) Sites: See the treatment map for the Burned Area Rehabilitation (BAR) Plan. There are 8 plots located on the Longhorn Fire and 4 plots located on the Ghost Hawk Fire.

C. Design/Construction Specifications:

1. Locate plots on the ground from existing maps or using Geographic Positioning System (GPS) coordinates. Reference plot data files to determine previous plot arrangement and condition of trees.
2. Assess damage to Reference Trees, Reference Points, Plot Center Stake and individual trees within the plot perimeter.
3. Establish new Reference Trees and Plot Center if necessary. Re-tag trees with numbered metal tags if previous tags are damaged or missing. If plot center is not found within high burn severity areas, re-establish plot center using reference tree plot center coordinates.
4. Refer to Agency guidelines listed in the Rosebud Field Manual.

D. Purpose of Treatment Specifications (relate to damage/change caused by fire): The purpose of the Continuous Forest Inventory system is to provide periodic data on the nature and extent of the forest accrual and depletion relative to the initial inventory to insure a sustainable level of timber harvest. The information gathered is essential in developing a forest management plan. The plots impacted within the burned area will provide useful data on pre-fire conditions and the re-established plots will provide post-fire data on plant succession.

E. Treatment consistent with Agency Land Management Plan (identify which plan): Completion of Emergency Stabilization treatments are described in, and are consistent with the Rosebud Reservation 1999 Forest Management Plan and the Wildfire Management Plan. Protection of beneficiaries and Indian trust resources is consistent with the BIA's mission.

F. Treatment Effectiveness Monitoring Proposed: The Rocky Mountain Regional Office forester responsible for inventory and planning will inspect a representative sample of re-established Continuous Forest Inventory Plots to insure the CFI guidelines in the Rosebud Field Manual are being followed.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).	**COST / ITEM**
Forester: GS-12/3 @ $47.50/Hour x 24 Hours	$1,140
Forestry Technicians: 2 GS-04/3 @ $18.00/Hour x 24 Hours	$864
TOTAL PERSONNEL SERVICE COST	**$2,004**
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.	
1 Vehicle @ $600.00 / week	$600
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$600**

MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):	
Miscellaneous field supplies	$150
TOTAL MATERIALS AND SUPPLY COST	**$150**
TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):	
Per diem for Forester: $123.00/day x 3 days	$369
Per diem for Technicians: $169.00/day x 3 days	$507
TOTAL TRAVEL COST	**$876**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY 13	6/01/2013	9/30/2013	F	Plots	$303	12	$3,630
						TOTAL	**$3,630**

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

SOURCE OF COST ESTIMATE

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	M
3. Estimate supported by cost guides from independent sources or other federal agencies	T
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, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Appendix I, Longhorn Fire Complex Vegetation Resource Assessment; See Appendix IV, Longhorn Fire Complex Vegetation Treatment Map.

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

APPENDIX I RESOURCE ASSESSMENTS

- **FOREST AND VEGETATION ASSESSMENT**
- **CULTURAL RESOURCE ASSESSMENT**
- **WILDLIFE RESOURCE ASSESSMENT**
- **WATERSHED ASSESSEMENT**

Erodible Soils

BURNED AREA EMERGENCY RESPONSE PLAN

Longhorn Fire Complex

VEGETATION AND FOREST RESOURCE ASSESSMENT
ROSEBUD RESERVATION

I. OBJECTIVES

- Evaluate and assess fire and suppression impacts to vegetative resources.
- Determine emergency stabilization and rehabilitation needs to aid in vegetative recovery and soil stabilization efforts and to mitigate impacts to sensitive plant species.
- Evaluate the potential for non-native invasive plant species encroachment into native plant communities and sensitive plant species habitat within the fire area and determine stabilization needs to mitigate encroachment.
- Assess forestland health and recovery.

II. ISSUES

- Identify range units and impacts to permittees.
- Potential for invasion of impacted lands by noxious weeds and non-native invasive plant species.
- Identify fire impacts to range unit, boundary fences.
- Identify reforestation needs.
- Identify areas needing grazing deferment.

III. OBSERVATIONS

This report addresses known and potential impacts to vegetation communities by the fires that make up the Longhorn Fire Complex. The total acres impacted by the Longhorn Fire Complex are 46,599 acres.

The burned area consists of approximately 62% forestland and 38% grassland. The majority of the timber stands were not damaged to the extent where reforestation will be necessary. Other vegetation species were minimally impacted and a full recovery is expected to occur when fall moisture arrives.

Twenty-two range units within the perimeter of the Complex were affected. The fire consumed the majority of the available grass on the rangeland. At this time, most livestock using the range units affected by the burns are concentrated in unburned areas or have been moved to other pastures. There have been no reports of livestock lost as the result of the fires. Permittees are concerned about forage loss for the remainder of the season, range areas impacted, and allotment fences.

A. Background

The Longhorn Fire Complex started from a series of lightning storms that occurred during the late nighttime hours on July 17, 2012. A total of 18 new starts emerged on Rosebud Reservation. The Longhorn Complex consisted of multiple fires; notable were the Longhorn, Beads Creek, Iron Shell, and the South Crazy Horse Fires.

On the afternoon of July 20, 2012 a risk analysis was done and it was determined that the incident should be managed by a Type II Team. Team C (Lowe) attended the Agency Administrator's In-Briefing by the Rosebud Agency at the St. Francis School at 22:00 hours on Friday July 20, 2012. The Team transitioned command with the Type III organization at 18:00 hous on July 21, 2012. The fire was contained on July 29, 2012.

Findings and recommendations discussed in this assessment are based upon information obtained from personal observations, interviews with Tribal and BIA natural resource managers, and other BAER team members.

B. Vegetation

A variety of vegetation communities occur within the boundaries of the fires included in this Complex. Although there was considerable mortality in forested stands, impacts to the shrub and grass component of the vegetation present on the fires were minimal and understory grasses had already started to re-sprout and were observed while conducting the field reconnaissance. Table 1 displays the existing vegetation type groups and component within the fire perimeters.

Table 1: Vegetation Types Impacted by the Ash Creek Fire Complex

Vegetation Community	Total Acres	Percent
Western Great Plains Sand Prarie	28,799	62
Black Hills Ponderosa Pine Woodland and Savanna	9,569	21
Western Great Plains Dry Bur Oak Forest and Woodland	3,686	8
Northwestern Great Plains Mixedgrass Prairie	1,754	4
WesternGreat Plains Wooded Draw and Ravine	1,019	2
Agriculture	449	1
Other	824	2
Grand Total	**46,100**	**100**

The LANDFIRE map layer of existing vegetation types showed 23 different types within the perimeter of the Longhorn Fire Complex. The map layer created for this assessment was derived from the LANDFIRE Biophysical Setting Model of December 2007. The seven vegetation types are described below.

WESTERN GREAT PLAINS SAND PRAIRIE

The largest expanse of sand prairies (approximately 5 million ha) can be found in the Sandhills of north-central Nebraska and southwestern South Dakota. Sand bluestem (*Andropogon hallii*) and prairie sandreed/sand reedgrass (*Calamovilfa longifolia*) are the most common species, but other grass and forb species such as needle and thread (*Hesperostipa comate*) and long-stolon sedge (*Carex inops ssp.*) may be present. Wind, fire and grazing constitute the major dynamic processes that can influence this system.

Black Hills Ponderosa Pine Woodland and Savanna

The Black Hills Ponderosa Pine Woodland and Savanna vegetation community occurs throughout the Great Plains Division along areas that border the Rocky Mountain Division and into the central Great Plains. The expansion of this system into the central Great Plains may be due to fire suppression.. This is the ponderosa pine (*Pinus ponderosa*) savanna that is not in the mountains of the Rockies. This type is dominated by interior ponderosa pine and is often the only tree present. Understory composition varies but Rocky Mountain juniper *(Juniperus scopulorum),* skunkbush sumac *(Rhus trilobata)*, mountain mahogany *(Cercocarpus montanus)*, snowberry *(Symphoracarpus albus)*, chokecherry *(Prunus virginiana)* and yucca *(Yucca glauca)* are common woody species. Herbaceous species include needlegrasses, grama grasses, little bluestem *(Schizachyrium scoparium),* western wheatgrass, sedges and bluebunch wheatgrass.

WESTERN GREAT PLAINS DRY BUR OAK FOREST AND WOODLAND

This system is dominated by Bur Oak (*Quercus macrocarpa*) and is found in upland areas in the northern part of the Western Great Plains. It often occurs as small to large patches on buttes, escarpments, and in foothill zones, usually on northerly-facing slopes. Other species, such as Quaking Aspen (*Populus tremuloides*), Eastern red cedar (*Juniperus virginiana*), and Green Ash (*Fraxinus pennsylvanica* spp.), may be present. The herbaceous layer can vary from sparsely to moderately vegetated and is composed of prairie grasses or woodland sedge (*Carex* spp.). Shrub associates can include *Prunus virginiana,* Beaked Hazel (*Corylus cornuta*)*,* Saskatoon serviceberry (*Amelanchier alnifolia*), or Snowberry (*Symphoricarpos* spp.). Historically, higher cover of grass species occurred as these stands were more open due to more frequent fires.

Northwestern Great Plains Mixedgrass Prairie

The Northwestern Great Plains Mixedgrass Prairie vegetation community extends from northern Nebraska into southern Canada and westward through the Dakotas to the Rocky Mountain Front in Montana The vegetation is dominated by cool and warm season perennial grasses, grama grasses, and rhizomatous grasses. Thickspike wheatgrass *(Elymus macrourus)* and western wheatgrass are also present. Idaho fescue *(Festuca idahoensis)* is a community dominant while bluebunch wheatgrass is more prevalent. Shrubs and sub-shrubs (fringed sagewort, and western snowberry) cover less than five percent of the ground. Most of the ground surface is covered and bare ground is less than 10% on more mesic sites and 20% on more xeric sites.

WESTERN GREAT PLAINSWOODED DRAW AND RAVINE

This ecological system is typically found associated with permanent or ephemeral streams and may occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding, although soil moisture and topography allow greater than normal moisture conditions compared to the surrounding areas. Occurrences can be either tree-dominated or predominantly shrubland. Green Ash (*Fraxinus pennsylvanica* spp.) with Slippery Elm (*Ulmus rubra*) or American elm (*Ulmus Americana*) typically dominate this system, although in some areas of the Western Great Plains steppe province, Rocky Mountain Juniper (*Juniperus scopulorum*) can dominate the canopy.

Agriculture

The Agriculture vegetation community consists of tame pasturelands and hay ground. These communities are composed of non-native domesticated grasses, alfalfa, and in some cases, the pastures are irrigated. These communities are often grazed by domesticated livestock.

Other

Seventeen (17) additional vegetative communities occur within the fire perimeter but each represents less than 1% of the burned area.

C. Management Direction

Management direction as outlined in the Forest Management Plan (FMP) for the Rosebud Reservation (1999 to Present) allows for the commercial sale of timber within the areas impacted by the fires.

Twenty-two Range Units (RU) lie partially or entirely within the perimeters of the two fires that make up the Longhorn Fire Complex. The Range Units and permittees impacted are listed in Table 2. Since the Rosebud Agency does not have a comprehensive range management plan, funds will not be available for range fence repair under a Burned Area Rehabilitation (BAR) Plan. Therefore, repair is up to the individual permittee or the Rosebud Sioux Tribe.

Table 2: Range Units and Range Unit Permittees Impacted

Fire	Range Unit	Range Unit Permittee
Longhorn Complex	6	NRD
	13	Ted Guerue
	17	Monica Rahn
	18	Ted Guerue
	20	NRD
	28	Eunice Jones
	33	Ted Guerue
	47	Scott Shelborne
	52	Dick Halligan
	57	Waln rodeo Co., Jeff Waln
	61	Joe Valandra
	62	William Lafferty
	63	Susan Guerue
	67	Neal Lapointe
	69	Stan Whipple
	73	Jeffery Waln
	74	Scott Shelborne
	77	Jeffery Waln
	80	Everette Crow Good Voice
	124	Hendricks Lapointe
	135	Sammy Waln
	137	Keith C. Whipple

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. If the fire occurred during hotter, drier weather, even moderate levels of crown scorch can be expected to have serious effects on tree vigor and mortality levels.

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 is estimated to be 35 percent of the pre-fire crown. The minimum post-fire survival criteria, for moderately vigorous trees, such as those growing on a poor site, 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 and Findings

The BAER Team in-briefed with local agency and tribal staff on Wednesday, August 1, 2012. Field reconnaissance was conducted on the 1st thru 5th of August. A flight was taken on August 3rd to get an overview of the fire area.

1. Tree Hazards

Three roads within the burned area were surveyed for hazard trees; BIA Roads 27, 5, and 3. Hazard trees were identified along these roads, and a hazard tree mitigation specification will be created.

2. Forest Mortality

The degree of fire-related mortality was determined by ground and aerial surveys on August 1st thru 5th, 2012. Mortality throughout the entire complex averaged sixty percent (60%). Stand mortality ranged from zero to 100% with the majority being a mosaic. Enough residual seed trees remain to ensure forest regeneration on all but approximately 800 acres. A reforestation specification will be created to treat this area.

3. Salvage of Timber Mortality

A potential timber salvage operation is being developed by Rosebud Agency and Rosebud Sioux Tribe. There are 29,031 acres classified as ponderosa pine forest within the Longhorn Fire Complex. Overstory mortality for the entire complex is estimated at 60%. The two main factors affecting salvage potential are accessibility and tree form. The best timber within the fire is located on steep, sandy slopes that are currently in a fragile condition. Operating equipment on these soils in the near future would cause long term loss of soil productivity. The majority of the trees within the fire are could be classified as open grown. These trees have a large number of limbs which could lead to board volume loss depending on desired products. If timber is to be used for house log material, the logs will remain viable "on the stump" for five to ten years. The table below represents the size and density of the ponderosa pine within the fire area.

Acres by Size and Density Class

	Stand Density 1 Canopy Cover less than 9%	Stand Density 2 Canopy Cover l 10% to 39%	Stand Density 3 Canopy Cover 40% to 69%	Stand Density 4 Canopy Cover 70% - 100%
Tree Size 1 Seedling/Sapling 1" – 4.9"	0	0	0	0
Tree Size 2 Pole Timber 5" – 10.9"	84	68	668	4,694
Tree Size 3 Small Sawlog 11" – 16.9"	3,134	11,0804	3,782	4,106
Tree Size 4 Large Sawlog 17"+	0	517	174	0

4. Continuous Forest Inventory (CFI) Plots

The CFI is used by forest management to monitor forest volume, growth data, insect and disease problems, tree condition and other data. Trees are tagged and re-measured approximately every 10 to 15 years. There are 12 known CFI plots that may have been affected by the fires. No plots were visited during the field reconnaissance, but all should be evaluated for damage. A specification will be created to survey the CFI plots and re-tag if necessary.

5. Threatened & Endangered (T & E) Plants

The United States Fish & Wildlife Service, South Dakota Field Office, was contacted for vegetative information for the Rosebud Reservation, and the presence or absence of T & E plant species. No T & E plant species reside within the perimeters of the fires that make up the Longhorn Fire Complex.

6. Spread of Noxious and Invasive Weeds Species

Rosebud Agency and Tribal resource staff personnel were contacted for vegetative information on the Rosebud Reservation. Known noxious and/or invasive weed species have not been mapped within the fire perimeter of the Longhorn Fire Complex. The volume of fire traffic on reservation roads, and the lack of vehicle wash stations early on

in the incident, would suggest some weeds were transported onto reservation lands. These locations will need to be monitored to determine if any noxious weed invasions occur after the fire. Monitoring should occur for at least three years after the fire. A specification will be created to survey for noxious weeds.

7. Fence Damage

Damaged fences from the wildfire and the suppression effort were noted during the field evaluations. Some damage occurred to wooden fence posts and braces. The fire was hot enough in some places to cause damage to the wire. Rehabilitation will be done under suppression funding in the few instances where damage occurred due to the suppression effort. Suppression personnel will repair these damages. Since a comprehensive range management plan does not exist, interior fence repair within the burn cannot be funded with BAER funds. The Natural Resource Conservation Service (NRCS) may also have cost share funds to assist permittees and the tribe in fence repairs. 5.8 miles of rights of way fence along BIA Rds 27 and 5 will be repaired. A specification for this treatment will be created.

8. Grass Seeding

Grass seeding will not be needed on any of the burned lands within the perimeters of the fires. Grass and forb recovery (sprouting) is already occurring. The fire was fast moving with short residence time resulting in minimal negative soil impacts.

V. RECOMMENDATIONS

A. Emergency Stabilization Specifications

Specification # ES 6-Invasive Species Monitoring

In the spring of 2013, assess for noxious weeds/non-native invasive plant species on reservation lands burned within the perimeter of the fires included in the Longhorn Fire Complex. Sites for detection will be roadways, hand lines, dozer lines and other disturbed areas. Inventory all known sites with high probability of an increase in invasive species populations. These high probability sites include those areas disturbed by hand or dozer line, increased road use, and other disturbed areas. Approximately 2,363 acres will be assessed on the Rosebud Reservation.

Specification # ES 7-Invasive Species Treatment

In the spring of 2013, treat the areas of infestation that were found during monitoring. Suspected invasives include: spotted knapweed *(Centaurea biebersteinii)*, Russian knapweed *(Centaurea repens),* white top *(Cardaria draba)* and Bull thistle *(Cirsium vulgare).* The application will use Milestone herbicide at a rate of 6 ounces per acre. All treatments will be documented using Global Positioning System (GPS) technology and will also be documented as to date of treatment, time of day and weather conditions during treatment. The applicator will use a colorant in the tank mix of herbicide. Treatment should occur as soon in the spring as noxious weed/non-native invasive plant species are visible. Electronic records of the treatments will be provided to the BIA Natural Resources Program.

Specification # ES 8-Rights of Way Fence Repair

Repair of approximately 5.8 miles of fence to exclude cattle from the Highway Right of Ways (BIA Road 27, 4.3 miles and BIA Road 5, 1.5 miles), and protect and ensure public safety.

Specification # ES 9 –Hazard Tee Mitigation

Fell identified (512 Trees) short-term tree hazards for the safety of the public within one tree length of and posing a threat to recreational use of developed sites and BIA Roads; 27, 5, and 3.

B. Burned Area Rehabilitation Specifications

Specification # BAR 1 – Reforestation of Commercially Designated Forest Acres

Reforest commercial forest acres that were heavily damaged and have no available seed source for natural regeneration. Approximately 528 commercial forest acres are eligible for reforestation under a Burned Area Rehabilitation (BAR) Plan. The priority acres should be north and east facing slopes with a slope of greater than 10%.

Specification # BAR 2 – Invasive Species Monitoring

In the spring of 2014 and 2015, assess for noxious weeds/non-native invasive plant species on reservation lands burned within the perimeter of the fires included in the Longhorn Fire Complex. Sites for detection will be roadways, hand lines, dozer lines and other disturbed areas. Inventory all known sites with high probability of an increase in invasive species populations. These high probability sites include those areas disturbed by hand or dozer line, increased road use, and other disturbed areas. Approximately 2,363 acres will be assessed on the Rosebud Reservation.

Specification # BAR 2 – CFI Plot Evaluation

CFI Plot Evaluation – Locate, survey, and where necessary, retag 12 Continuous Forest Inventory (CFI) plots that may have been impacted or damaged or destroyed by fire.

C. Management Recommendations, Non-Specific

Salvage of Commercial Timber – Salvage burned commercial timber within accessible timber stands. Avoid steep, sandy slopes until grass/forb recovery. Contact BIA timber sale forester from the Rocky Mountain Regional Office to schedule site visit and prepare salvage estimates.

Insect Population Monitoring – Monitor insect activity by way of aerial and ground surveys. Contact the U.S. Forest Service, Rapid City Service Center to schedule surveys.

Monitor Forest Regeneration – Monitor the burned area for natural regeneration. Contact BIA forest development forester from the Rocky Mountain Regional Office to schedule site visit and install monitoring plots.

Boundary and Range Fencing – Prepare a comprehensive Range Management Plan that will cover all Range Units on the Reservation. This will allow the permittees in the future to request Burned Area Rehabilitation (BAR) funding to assist with repair of fencing damaged by fire.

Immediate Removal of all Livestock – Remove all livestock that still reside within the fire perimeters.

Deferment - Recommend deferment of grazing of the burned area in the Longhorn Fire Complex for the remainder of the 2012 grazing season and into green-up and the establishment of seed heads for the 2013 grazing season. This deferment will be beneficial to the long term sustainability of the grazing lands by allowing the vegetation to regenerate to a healthy mature stand and the production of seeds before being subjected to the stress of grazing. If grazing is allowed too soon, forage availability and the production of seeds may be reduced adding to the already stressed environment as a result of the fires. Therefore, a deferment is recommended

VI. CONSULTATIONS

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INTERAGENCY BURNED AREA RESPONSE PLAN

Longhorn Fire Complex

CULTURAL RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess potential damage to cultural resources for the purpose of recommending treatments to stabilize archaeological sites, traditional cultural properties, and historic structures from adverse effects of wildland fire, suppression activities, post fire erosion, and emergency stabilization and rehabilitation actions.
- Conduct assessments necessary to meet Federal legal mandates.
- Consult with appropriate Native American tribes as necessary to meet Federal legal requirements, agency policies, and agreements.
- Prescribe possible measures to avoid or mitigate adverse effects to cultural resources that may result from emergency stabilization treatments.
- Assess effects to known historic and prehistoric cultural resources as the result of fire

II. ISSUES

- What effects has the fire had on Ceremonial Areas (and other Traditional Cultural Properties (TCPs)), what potential exists for post-fire effects to these resources, and are there proposed emergency stabilization treatments that could impact TCPs?
- How have known archaeological sites been impacted by the fire, are there expected to be post-fire effects to these resources, and are there proposed emergency stabilization treatments that could impact the integrity of archaeological sites?

III. OBSERVATIONS

A. **Background** - This report addresses potential and actual effects to cultural resources within the Longhorn Fire Complex. These fires originated on Thursday July 19, 2012 and burned an estimated 46,599 acres resultant from a series of eighteen separate lightning caused starts.

The Longhorn Fire Complex is located within the homeland of the Sicangu-Lakota Oyate people.

Cultural Chronology for the Northern Plains

Period	Phase	Date
Paleoindian	Clovis	10,000-8,000 B.C
	Folsom	ca. 8,000 B.P.
	Plano	6,000-4,000 B.C.
Plains Archaic	Early, Middle and Late	4,000-250 B.C.
Plains Woodland	Besant	A.D. 1-800

Plains Village Period		A.D. 900-1850
Historic Period		A.D. 1850-1960
Contemporary		A.D. 1960-Present

Culture History

The Paleoindian Period: This period represents the earliest well-defined occupation in North America. It is defined by lancolate projectile points occasionally found in association with the remains of extinct Pleistocene megafauna (Irwin and Wormington 1970).

The Archaic Period: This second sequence is distinguished from the Paleoindian Period by the presence of a wide variety of smaller, more crudely manufactured projectile points and an increase in the occurrence of stone tools (Jennings 1974). The tool technology reflects a shift in subsistence patterns towards smaller game and increased use of plant resources.

Plains Woodland Period: During this period horticulture is first practiced, and along with this technological shift came a semi-sedentary to sedentary lifestyle. While some villages were occupied on a permanent basis, most were occupied seasonally, as hunting and gathering were still important activities.

Plains Village Period: This period is typified by large scale sedentism based on maize agriculture with permanent villages of large earth covered lodges perched along major streams and rivers. Coincident with sedentary cultures were semi-nomadic peoples including the Lakota, and Cheyenne who followed the great bison herds, as well as relying on hunting of small game and gathering.

Historic Period: The encroachment of Euro-American settlers in the later part of the 19th century culminated in the Great Sioux Settlement of 1889. As a result, and with the near extinction of the bison herds, all Lakota peoples, including the Sicangu-Lakota Oyate people lost their ability to follow much of their traditional lifeway. Through various periods of turmoil with the federal government, tribes of the Northern Plains managed to restore much of their sovereignty and thereby maintain much of their cultural traditions.

Cultural Resources

Traditional Cultural Properties – This category includes ceremonial places and gathering/resource procurement areas of concern to the tribe. These places are sensitive, irreplaceable resources essential to the sustenance of traditional lifeways.

Archaeological Sites – This category is almost exclusively represented in this area by lithic landscapes. These resources are protected under historic preservation laws, regulations and executive orders. They are irreplaceable resources of tremendous scientific and cultural importance.

Historic Sites – This category includes administrative sites, mining structures, homesteads and outbuildings, and features associated with livestock production. Construction materials can be metal, masonry, wood or any combination of those and other materials.

Cemeteries - Crosscutting all time periods and cultures, cemeteries and other burial locations are places of extreme significance to cultures and their descendents. These are protected under state and federal law.

B. **Reconnaissance Methodology and Results** – A BAER Archeologist was dispatched to the incident on August 2, 2012. On August 3rd, the BAER coordinator and archeologist met with staff of the Rosebud Tribal Historic Preservation Office and the BIA Rosebud Agency Deputy Superintendent of Trust Services. The purpose of this meeting was to acquaint THPO and Bureau staff with the BAER process as it pertains to cultural resources. THPO staff expressed that their cultural resources information was extremely confidential and not generally shared with anyone from the outside. In order to perform the necessary cultural assessment for the BAER process, a compromise was reached whereby escorted by Rosebud Archaeologists, the BAER archaeologist would assess those most significant sites (or sites of concern), other cultural resources, and cemeteries reckoned to be within the burn area that may be at risk from post fire effects. Several sites and several cemeteries were identified as the subjects of the BAER cultural assessment.

C. **Findings** - The BAER cultural assessment took place between August 3-4 2012. The fire was contained on Sunday July 29th and there were no significant hazards to prohibit vehicular or foot travel within or surrounding the burned area. The August 3, assessment was conducted by BAER archaeologist Dan Hall, escorted by Tribal archaeologist, Jennifer Golinda, and Contract Archaeologist, Ben Rhodd. On August 4, the assessment was conducted by Dan Hall with Jennifer Golinda.

Four archaeological sites, four family cemeteries, and one TCP were assessed for risks from post-fire effects. None of the four archaeological sites was found to be at risk from post-fire effects. However, one site experienced impacts from the construction of a dozer line. One of the four cemeteries was found to have been subject to the effects of fire and is recommended for treatment. The TCP was totally consumed in the fire. The Rosebud contract archaeologist, indicated that any further discussion as to the disposition and treatment of this resource will occur between the cultural practitioner and the THPO.

Site SHC-74, the “Running Horse” site is a multicomponent site consisting of a historic dwelling and outbuilding that were totally consumed in the fire. There is a sparse scatter of historic material in association with this component. The prehistoric component to this site includes a dense lithic scatter of primarily petrified wood, and a light scatter of ceramics. A dozer line bisects this site and has impacted the prehistoric site constituents. Ironically, the dozer line held the burn, and in doing so, actually protected site constituents on the unburned side of the line from exposure. No post fire effects are expected, as this site is situated on level to gently sloping ground on the lip of a canyon and at the top of the burned area.

Site SHC-78, the “Sharpfish” site is a multicomponent site located within the burn, but on high ground. Currently the site exhibits little in the way of an artifact scatter, and is evidenced almost solely by the presence of depressions that may represent former dwelling foundations and root cellars. Given its location at the top of the burned area, and the paucity of exposed artifacts, this site is not assessed to be at risk from post-fire effects.

Site “RSTHPO” is a large multicomponent site that is reported to contain material dating from the Paleo-Indian period and subsequent culture periods. It is located just outside the burn above the lip of a canyon. The site is at no risk from post-fire effects of flooding or erosion. However, it has been reported that this site has in the recent past been subjected to extensive surface collection activities. Additionally, during this assessment it was noted that there is evidence of unauthorized excavation, presumably for the collection of subsurface artifacts. No less than ten shovel holes averaging approximately 30 cm in diameter were noted within a grass covered portion of this site. Finally, the site has also been compromised by the presence of livestock which congregate around a developed water source and has produced deflation areas that expose artifacts.

Site SHC-76 is a small lithic scatter located in a canyon bottom below the “Running Horse” site. The site as assessed exhibited less than ten flakes along an abandoned road bed and in rodent back dirt piles. Although it is located within and below the burn, it is in an area that water transported materials will be diverted around and is not likely to be subject to erosion. No treatments are recommended.

IV. RECOMMENDATIONS

A. Emergency Stabilization

Specification #5 Cemetery Protection. This specification is designed to repair/replace the exclosure fence around the St. Mary's Cemetery, located on Iron Shell Flat. The fire has severely damaged fence components and the cemetery burial plots and headstones are at risk from trampling by livestock. Successful implementation of this specification will assure the protection of the cemetery.

B. Management Recommendations – Non-Specification Related

Describe the recommendation and reasons.

1. Conduct archaeological survey of dozer lines throughout the Longhorn Fire Complex. Dozer lines are known to have impacted at least one archaeological site.
2. Secure outside source(s) of funding to conduct intensive archaeological surveys within the fire perimeter before vegetation is re-established.
3. Conduct cultural resource surveys prior to any rehabilitation treatments, salvage logging or other ground disturbing actions. This is in accordance with Section106 of the National Historic Preservation Act.
4. Re-vegetate dozer line where it bisects the "Running Horse" site to protect exposed artifact assemblage.
5. Regularly monitor site "RSTHPO" for unauthorized collection and excavations. Exclude cattle from deflation areas until vegetation can become re-established.

V. CONSULTATIONS

Rosebud Tribal Historic Preservation Office.	Russell EagleBear, THPO
BIA, Great Plains Regional Office.	Carson Murdy, Regional Archeologist

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University of Manitoba
http://www.umanitoba.ca/faculties/arts/anthropology/manarchet/chronology/woodland/besant.html

INTERAGENCY BURNED AREA RESPONSE PLAN

Longhorn Fire Complex

WILDLIFE RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess the effects the fire, suppression activity and any prescribed treatments for emergency stabilization (ES) and burn area rehabilitation (BAR) could have on federally listed Threatened & Endangered species and their habitat.

- If necessary, conduct a Section 7 Emergency Consultation with the United States Fish & Wildlife Service

- Determine, recommend, and prescribe treatments that benefit affected wildlife, fish and their habitat, including T&E and culturally sensitive species.

II. ISSUES

- Four (4) federally listed endangered species occur in Todd County, SD – a county of the Rosebud Sioux Indian Reservation, and some may inhabit locations within the burn area.

- Other wildlife, including those with cultural importance, may have been affected, directly or indirectly, by the fire. The Tribe understands this may be beyond the scope of the BAER, but would like it noted in the final report that some habitat of non-protected species was burned but understands that this does not warrant any specific rehabilitation, other than maybe monitoring. Possible wildlife habitat loss due to erosion could be magnified by hunting and other ground contact activities.

III. OBSERVATIONS

On July 19, 2012, several wildfires started from multiple independent dry lightning strikes within timber cover on the Rosebud Sioux Tribe Indian Reservation. The fire, known now as the Longhorn Complex, had a fire perimeter of 46,599 acres of timber and rangeland. The fire was contained on July 29, 2012.

The purpose of this wildlife assessment is to determine the effects the fire and suppression activities may have had on any listed wildlife and their habitat. A determination also needs to be made as to what effects the proposed stabilization method may have on the species of concern, as well. The species in question will be identified and discussed in more detail, under the “findings” section below. The information in this report was written based on data gathered from routine field surveys performed by the BAER team, in collaboration with the biologist for the Rosebud Sioux Tribe’s Department of Natural Resources

(RSTDNR), and consultation with Scott Larson from the USFWS-Pierre, SD office.

- Burn Severity and Vegetation Mortality data results summary and how this impacts wildlife:
    - Burn intensity refers to the effects of fire on vegetation resources, whereas burn severity refers to the effects of fire on soils and hydrologic function. These two terms get easily confused, and as such, the burn intensity data is referred to as vegetation or plant mortality. The *burn severity* data shows that of the overall 46,599 acres, about 8,177 acres, or 18% of the total, went unburned (or had a very low degree of burn severity). Another 29,100 acres, or 62% of the total area, was classified as having LOW burn severity. This shows that the majority of the fire, although encompassing a large area, actually caused minimal damage to the soils and their hydrologic function. The fire may actually prove to be more of a benefit to the habitat that was burned, rather than damaging. Similar to the percentage of unburned acres, was the MODERATE burn level area. It was 8,952 acres, making up 19% of the total burn area. The remainder of the burn acreage is made up of the HIGH burn severity. At 370 acres, the most severe damage to the soil was minimal compared to total acres affected by the fire. Although the acreage is low, it should not be overlooked by any means. Minimal ground contact activities, if any, should be allowed in this specific acreage for at least 1 year or more. *Vegetation mortality data* is broken down into two main categories for this fire, grass/forb cover and the timber overstory. One thing to mention is that when grasses, especially the local bunch grasses, burn at low to moderate burn intensities, the grasses my be lost temporarily, but will have natural regeneration. Whereas timber that is lost, is gone for good. Natural regeneration for timber is a varying factor, depending on several environmental factors. The majority of the rangeland grasses, within the fire perimeter, were consumed by the fire complex. Around 60% of the timber within the fire burn area was lost, with some areas having higher mortality concentration than others. For example, there is an 800 acre area that had 100% mortality of vegetation. This area, which coincides with some of the HIGH burn intensity areas, will be recommended for 500 acres of reforestation planting. This data shows how fortunate the Tribe is, in that although it was the largest fire on Rosebud Sioux Tribal lands in recorded history, the natural resources will see more of a benefit from the fire than long-term damage.
    - Data for the following table of Threatened & Endangered (T&E) Species was provided through correspondence with Mr. Scott Larson, field supervisor USFWS.

County	Group	Species Scientific Name	Species Common Name	Certainty of Occurrence	Status
Todd	Bird	*Grus americana*	Whooping Crane	Possible	Endangered
Todd	Mammal	*Mustela nigripes*	Black-footed Ferret (4)	Known	Experimental/Non-Essential
Todd	Plant	*Platanthera praeclara*	Western Praire Fringed Orchid (1)	Possible	Threatened
Todd	Insect	*Nicrophorus americanus*	American Burying Beetle (2)	Known	Endangered

It is important to note:
1 The counties indicated for the Western Prairie Fringed Orchid are counties with potential habitat. Currently, there are no known populations of this species in South Dakota. Status surveys have been completed for the orchid in South Dakota. However, because of the ecology of this species, there is a possibility that plants may be overlooked.
2 The American Burying Beetle is presently known for only Gregory, Todd and Tripp counties. One specimen was recently trapped in southern Bennett County. Historic specimens have been recorded from
Haakon and Brookings Counties. A comprehensive status survey has never been completed for the American burying beetle in South Dakota. Until status surveys have been completed, the beetle could and may occur in any county with suitable habitat. Suitable habitat is considered to be any site with significant humus or topsoil suitable for burying carrion.
4 Black-footed ferrets have been reintroduced in the Badlands National Park, Buffalo Gap National Grasslands,
Cheyenne River Sioux Tribe Reservation, Lower Brule Sioux Reservation, Rosebud Sioux Reservation and Wind
Cave National Park .

- Findings
    - The routine surveys, paired with information from the Tribal biologist and the local USFW consultant, resulted in the following findings:
        1. The endangered Whooping Crane is a migratory bird that can usually be seen in the area during October and April. It is unknown if any cranes used any of the effected dams/reservoirs as stop over roosts. So, they are not expected to be an issue with any of the prescribed treatments.
        2. The history of the Black-Footed Ferret population on the Rosebud.

Black Footed Ferrets (*Mustela* nigripes):
Black footed ferrets are both an endangered and culturally significant species. Their existence was known by Native American populations, including our ancestors, long before they were known by the non-Native community. According to the Black-footed Ferret (BFF) website, Black-footed ferrets first showed up in history in the fur trading records in the early to mid-1800s. In 1851, they were officially described near the Platte River. Because of their elusive nature, a controversy arose about their actual existence and by the 1950's, Black-footed Ferrets were thought to be an extinct mammal. Then, in 1964, a small wild population was discovered in Mellette

County, SD, which is located within the external boundaries of the Rosebud Indian Reservation. Biologists came in and tried to start a captive breeding program, but it went unsuccessful and by 1974, all those wild ferrets were gone. However, in 1981, near Meeteetse, WY, another small wild population was discovered and from this population came the National captive breeding program that is still reintroducing BFFs nationwide. It is also important to note the relationship between black-footed ferrets and prairie dogs. The ferrets rely heavily on the existence of prairie dogs. The prairie dogs make up more than 90% of their diet, and once a ferret kills a prairie dog, it takes over its burrow as its own living space. In 2003, the Rosebud Sioux Tribe, with the assistance of a Tribal Wildlife Grant funded through the USFWS, began a ferret reintroduction program that was very successful. That program ended in 2006, but an unknown amount of wild ferrets remain on Tribal lands. Verified sightings of black-footed ferrets have been reported as recently as July of 2012, and the farthest sighting was more than 40 miles from the original reintroduction site. There have been no confirmed sightings within the burn area for several years, but because of the close proximity to other sightings (a few miles) and the live prairie dogs within the burn area, it is possible that ferrets could be in the burn area. One thing to note is that the federal government designated the reintroduction site (Todd County, SD) as a "nonessential experimental population in accordance with section 10(j) of the Endangered Species Act of 1973." Even though the Tribe no longer actively reintroduces ferrets, the wild population in existence still falls under this designation of an experimental population. Because the fire did not permanently damage the vegetation on the prairie dog towns, it is listed as having no adverse effects on the habitat area of the black-footed ferrets. The fire may actually encourage the germination of the native seed bank, and have a positive effect on the habitat vegetation.

3. According to the USFWS, Western prairie fringed orchids haven't been found in SD in over a century and were not known to have been in Todd County even though some populations may exist in Nebraska's Sand Hills country. BAER activities should not be problematic for this species.
4. Although the American Burying Beetle is documented as existing in Todd County, they are very rare and only of few of these sightings exist. No reports were ever made as to their existence within the burn area, even after some surveys in the west took place. We cannot foresee a situation in which BAER activities would conflict with this species.

- The RSTDNR was pleased that the condition of the riparian channels were still in good condition, post fire. Despite the soils being prone to high erosion, this buffer of intact vegetation will act as a natural filter to keep any ash or other contaminant located in the watershed from reaching the water sources. This

vegetation buffer will ensure that the water quality will not be degraded at a level that could negatively affect the fish and other aquatic species.

- On other areas that did have 100% mortality rates on the vegetation, erosion is going to be an issue that could possibly degrade the environmental health of that particular location. It is important to limit and/or restrict hunting activity, especially vehicle traffic, in these areas as they could greatly magnify the erosion issue.
- From the field survey data and information gained through correspondence with the local US Fish & Wildlife field supervisor, it was revealed that there would not be any adverse effects to wildlife or their habitat. In fact, the resulting burn effects will be beneficial to the wildlife habitat. Because of this, the Section 7 Emergency Consultation was not needed.

IV. RECOMMENDATIONS

- In the case of the four listed threatened & endangered species, it was determined that BAER activities would have no adverse effects on these or any wildlife species in the area. The only recommendation is regarding the possible presence of Whooping Crane in the burn rehabilitation area. If any Whooping Cranes are sighted during any of the BAER or BAR activities, it would be our recommendation that all activities in that area cease (stop immediately) until the bird is no longer seen. These birds are usually in the area for 1-3 days.
- Another recommendation, that is covered under the soils assessment but effects this wildlife assessment, would be to monitor the wildlife habitat for increased erosion activity. Fire trails and other access roads are an area of high concern for such monitoring activities, along with the high severity burn areas identified on the Burn Severity Map.

V. CONSULTANTS

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- BAER Team members
- Scott Larson, Field Supervisor, U.S. Fish & Wildlife Service
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VI. REFERENCES

- http://www.fws.gov/southdakotafieldoffice/SpeciesByCounty.pdf
- http://blackfootedferret.org

BURNED AREA EMERGENCY STABILIZATION PLAN

Longhorn Complex Fire

WATERSHED RESOURCE ASSESSMENT

I. OBJECTIVES

- Assess overall soil and watershed changes caused by the fire, particularly those that pose substantial threats to human life and property, and critical natural and cultural resources. This includes evaluating changes to soil conditions, hydrologic function, and watershed response to precipitation events;
- Identify potential flood and erosion source areas and sediment deposition areas;
- Identify potential threats to life, property, and critical natural and cultural resources in relation to flooding, debris flows, erosion, sediment deposition;
- Develop soil burn severity map, watershed response maps, and watershed treatment maps;
- Develop treatment recommendations, if necessary;
- Identify future assessment or analysis needs;
- Identify future monitoring needs, if necessary;

II. ISSUES

Issues identified as possible post-fire watershed conditions that threaten life, property, and significant cultural and natural resources include:

- Risk to life and property from flooding along main roads that parallel the Little White River in Little Crazy Horse Canyon, Beads Creek, and Ironwood Creek;
- Risk to transportation infrastructure downstream from burned hillsides;
- Increased erosion and sedimentation;
- Loss of soil productivity;
- Threats to water quality from sedimentation and contaminants;
- Threats to reservoirs downstream from the burned area due to increased streamflow (Ghost Hawk, Ironwood, Beads).

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III. OBSERVATIONS

A. Background –

The purpose of the burned area assessment is to determine if the fire caused emergency watershed conditions and to identify potential values at risk from these conditions. Identification of values at risk occurs through consultation with individuals, state, tribal, federal agencies as well as through field investigations. Not all values initially identified are determined to be at risk. If emergency watershed conditions are found and values at risk are identified and confirmed, then the magnitude and scope of the emergency is mapped and described, values at risk to be protected are analyzed, and treatment prescriptions are developed to protect these values.

The most significant factor leading to emergency watershed conditions is loss of ground cover, which leads to erosion and changes in hydrologic function in the form of decreased infiltration and increased runoff. Such conditions lead to increased flooding, debris flows, sedimentation and deterioration of soil conditions. Values at risk are human life and property and significant cultural and natural resources located within or downstream of the fire that may be subject to damage from flooding, debris flows, and hillslope erosion.

Geology/Physiography

The Longhorn Complex Fire is located in the un-glaciated portion of the Missouri Plateau subdivision of the Great Plains physiographic province of the United States. The Great Plains

province is underlain by Cretaceous age rock that is mantled in many areas with Tertiary rock formations that range from Paleocene to Pliocene in age. These tertiary formations presumably represent depositions from multiple erosional cycles and mostly consist of clastic sediments derived from the Rocky Mountain region to the west and laid down on the plains as continental deposits. The area within the burned area includes Quaternary alluvium and the Arikaree/Rosebud Formation that unconformably overlies the Brule and Chadron Formations of the White River Group, which unconformably overlies the Cretaceous Pierre Shale.

Alluvial deposits include undifferentiated Pleistocene and Holocene alluvium terracing along the sides of the valleys. The terrace deposits generally parallel stream channels and occur as isolated, nearly flat to gently sloping benches about 150 to 350 feet above the adjacent stream base levels. The streams incised into the Tertiary strata are generally filled with 10 – 30 feet of alluvium across the valley floor. This alluvium usually consists of moderately permeable coarse-grained soils with varying lesser amounts of non-plastic to plastic fines. The Rosebud formation has been described as an "immature" rock of fluvial origin that consists of silicified claystone, mudstone, siltstone, and poorly indurated, tuffaceous sandstone.

The area is part of a regional aquifer that consists mainly of deposits of Quaternary and Tertiary age. They are hydraulically connected between South Dakota and Texas. The primary aquifer is the Ogallala, but the Arikaree and Brule may also be included. The Brule Formation is the upper unit of the White River Group, and the Chadron Formation is the lower unit. The Rosebud Formation is part of Arikaree while the Ash Hollow and Valentine Formations are also part of the High Plains hydrologic unit.

The burned area is located on the Rosebud Indian Reservation and encompasses tributary streams of the Little White River including Beads, Ironwood, Running Enemy, Coffee, and Ghost Hawk Creeks that drain into the Little White River. Many other unnamed tributaries also drain from the burned area. The Little White River runs through what is locally named Little Crazy Horse Canyon. These streams make up a dendritic system of shallow stream valleys incised into the gently undulating Great Plains. The floodplain of the Little White River is about 600 feet wide near the downstream edge of the burned area.

Climate

The weather and climate of the Longhorn Complex area mimics that of the overall west central South Dakota region. It is considered a continental climate, with hot summers, cold winters, and extreme variability in both precipitation and temperature. Precipitation and temperature are greatly influenced by topography and elevation. Temperatures range from near 100^{o}F during the summer months to well below 0^{o}F in winter. Summer days are usually quite warm, but nights are typically cool. This summertime temperature pattern and the predominant regional updraft often cause convective storms to form, starting in late spring and continuing throughout the summer.

Average annual precipitation ranges from 18 to 20 inches for the Longhorn Complex fire area (HPRCC, 2012). Approximately 50% of the annual precipitation occurs during May, June, and July, and almost 75% during the 5-month period between April and August, in the form of rain associated with high-intensity, short-duration thunderstorms. The smallest amounts of precipitation typically occur during the winter months, November through February, as snow. Most of the total annual snow fall occurs in the late spring months of April and March, in which heavy and wet snowfall often causes tree damage.

The Longhorn Complex has several weather stations monitored through the High Plains Regional Climate Center (HPRCC) nearby. Two of the closest stations include Wood, SD (Station #399442) and Mission, SD (Station #395620). Table 1 displays a summary of average monthly and annual precipitation amounts for these climate stations. The average annual snowfall for Wood, SD is 32 inches and 38 inches for Mission, SD (HPRCC, 2012).

Table 1 -Average Monthly and Annual Precipitation (inches) for Climate Stations near the Longhorn Complex

Climate Station	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual

Wood, SD 1913-2012 Elevation 2,180 ft	0.48	0.61	1.21	2.19	3.13	3.38	2.46	1.90	1.52	1.34	0.70	0.47	19.39
Mission, SD 1966-2012 Elevation 2,590 ft	0.38	0.50	1.17	2.26	3.25	3.49	2.75	1.85	1.65	1.57	0.64	0.47	20.00

Soil

Soils are formed over time from weathered or deposited materials. The type of deposition and/or weathering of the parent geology influences many of the physical, chemical, and hydrologic characteristics of a soil. Among these properties are soil texture, which is the proportions of sand, silt, and clay; chemical content; bulk density; structure; and the kinds and amounts of rock fragments. Soil texture is given in the standard terms used by the U.S. Department of Agriculture, as defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. An appropriate modifier is added when the content of particles coarser than sand is 15 percent or more – for example, "gravelly."

Thirteen soil map units comprise 90% of the Longhorn Complex. Soil map units are a grouping of different soil types that may be individually too small to map separately or differentiate from other surrounding soils. The remaining 10% of the burned area is comprised of forty different soil map units, that each individually cover 1% or less of the burned area. The soils within the Longhorn Complex burned area are relatively young and weakly developed, having formed from material weathered from eolian (wind-deposited) sands as well as Quaternary and Tertiary aged alluvial deposits. Thus, the O horizons are thin and contain very little organic material.

Soils textures within the burned area are split between two different general texture groups – sands on the eastern half of the fire and loams on the western half. McKelvie soils in combination with Peji and/or Peji and Blula soils dominate the eastern portion of the fire in the Crazy Horse Canyon contributing drainages. These soils comprise 44% of the total fire area. Soil textures for this portion of the fire are sands, fine sands, and loamy fine sands weathered primarily from the Ogallala sandstone.

These same soils are rated as severe to very severe for susceptibility to erosion due to the lack of cohesive soil particles such as silts and clays in these sandy soils, as well as their location on steep hill slopes. The erosion hazard ratings are based on slope and on the soil erosion factor (K). Soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. "Severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical. McKelvie soils are highly susceptible to off-site transport due to both wind and water erosion due to their very small particle size, as well as their sandy texture. The erosion factor (T) for these soils, the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting productivity over a sustained period, is 3-5 tons/acre.

The McKelvie and Peji soils are highly susceptible to damage by fire due to their fine sandy texture, low amount of rock content, and location of steep hill slopes. Blula soils are moderately susceptible to fire damage for the same reasons, with the exception of their location. These ratings indicate the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer and cause fire-induced damage.

The remaining soils on the western half of the fire are comprised of Anselmo, Longpine, Ronson, and Vetal fine sandy loams; Richfield-Tuthill silt loams; and Valentine sands. These same soils are rated as slight to moderate for susceptibility to erosion. Soils rated moderate have higher sand content and are located on steeper slopes. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; whereas "moderate" indicates that some erosion is likely and that erosion-control measures may be needed. The erosion factor (T) for these soils ranges from 2-5 tons/acre, with most soils and most of the area having a T factor of 5 tons/acre. This means that soils on the western portion of the fire are resistant to erosion compared to those on the eastern side, and thus can maintain productivity despite higher soil erosion.

With the exception of the Valentine sands, soils on the western side of the fire are rated low to

moderately susceptible to damage by fire. Valentine sands are rated as highly susceptible to fire damage for the same reasons as the McKelvie sandy soils on the east. Soils that are rated moderately susceptible to damage by fire have finer textures.

Watershed Response

Stream flow in the area is influenced by the amount and timing of precipitation. Snow thaw is common from the middle to the end of March. By the end of March, flows start to increase in the streams. In April, a sharp increase in flow is attributed to the combination of precipitation and melting of accumulated snow. Flows reach their maximum during May or June. Although precipitation is highest in June, streamflow does not increase proportionally due to the increased evapotranspiration of the forested stands.

The drainages in the Longhorn Complex fire area are in a stream flow regime dominated by runoff resulting from both snowmelt and intense summer thunderstorms (Sando, 1998). Runoff from rapid snowmelt or rain-on-snowmelt can occasionally occur in the late spring months, especially after heavy, wet snows associated with April and May blizzards. Peak flows result from both rainfall and snowmelt but no studies have been conducted to determine the proportion or relative magnitude of peak flows resulting from snowmelt (Sando, 1998). Peak stream flows resulting from rainfall runoff account for roughly 85% of the annual peaks observed in the area (Sando, 1998). Peak flows generally occur during the months of April, May, or June, but can occur any month from March to September if significant thunderstorm activity occurs. Since these thunderstorms generally occur between May and September, flash floods can and do often occur during these months as well.

The potential for sediment deposition in post-fire floods will vary depending 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 Longhorn Complex.

One common geomorphic response of burned slopes is the generation of sediment and ash-laden flows or mudflows which can be much more erosive and destructive than typical floods. Given the severity of the fire, the availability of unconsolidated materials on hill slopes, location in low order basins and the steep, dissected terrain, it is possible that mud flows could be produced after the fire given a very intense rainfall event. Unfortunately, threshold rainfall conditions for such an event are not documented for this setting. However, field observations suggest that under unburned conditions, mud flows are not a significant process in the burned area. No recent mud or debris flow deposits were observed in fans or along channels or floodplains.

B. Reconnaissance Methodology and Results

The scope of this assessment focuses on the infrastructure within or immediately downstream from the burned area, especially on the northeast half of the fire. The entire analysis area lies within trust lands and the Rosebud Indian Reservation are affected by having lands immediately adjacent or downstream of the fire. The responsibility of the team was to conduct a burned area assessment across the entire fire area.

The purpose of a burned area assessment is to determine if the fire caused emergency watershed conditions and if there are potential values at risk from these conditions. Identification of values at risk occurs through consultation with the individuals, tribe, State and federal agencies, and through field investigation. Not all values initially identified are determined to be at risk. (Refer to Supporting Documents Appendix V.) When emergency watershed conditions are found, and the values at risk are confirmed, then the magnitude and scope of the emergency is mapped and described. Values at risk and resources to be protected are analyzed and treatment prescriptions are developed to protect those values at risk. The most significant factor leading to

emergency watershed conditions is loss of ground cover, which leads to erosion and changes in hillslope hydrologic function in the form of decreased infiltration and increased runoff. Such conditions lead to increased flooding, sedimentation and deterioration of soil condition.

Burned area evaluations included:

- Identifying fire-caused changes in soil properties and hydrologic function;
- Determining spatial extent and strength of hydrophobic soil conditions;
- Determining post-fire infiltration rates;
- Verifying and modifying the Burned Area Reflectance Classification (BARC) image to create a soil burn severity map, and if appropriate a runoff potential map;
- Identifying sediment source areas and erosion potential;
- Determining current channel and culvert capacities;
- Identifying potential flood zones; and
- Identifying potential threats to human life, property, and critical natural and cultural resources (values at risk).

The Interagency BAER Team hydrologists conducted aerial reconnaissance flights and field visits to review resource conditions after the fires. The main objectives of the field visits were to 1) evaluate soil burn severity and watershed response in order to identify potential flood and erosion source areas; 2) identify and inventory values at risk, 3) identify the physical and biological mechanisms that are creating risks; 4) review channel morphology and riparian conditions; 5) inspect hillslope conditions; and 6) determine needs for emergency stabilization. Values at risk are human life and property, and critical natural and cultural resources located within or downstream of the fire that may be subject to damage from flooding, ash, mud and debris deposition, and hillslope erosion.

Soil Burn Severity

Soil burn severity mapping is intended to reflect the degree of effects caused by the fire to soil characteristics that affect soil health and hydrologic function, hence erosion rate, and runoff potential. It is not a map of vegetation consumption. In mapping soil burn severity, the team evaluated field-observable parameters such as the amount and condition of surface litter and duff remaining, soil aggregate stability, amount and condition of fine and very fine roots remaining, and surface infiltration rate (water repellency) (Table 1). Water repellency was evaluated by observing the length of time a water drop remained beaded on the soil. If water repellency was present, the depth and thickness of this water repellant layer was also measured. Ash and soil color may also indicate how intense the heat was and how long it remained at a given place (residence time). These parameters are compared to similar soils under unburned conditions to estimate the degree of change caused by the fire.

Table 2 -General Characteristics of the soil burn severity classes

Soil Burn Severity	Characteristics
Unburned to Very Low	Unburned islands within the fire perimeter, and areas where very low severity ground fire occurred. Vegetation canopy, ground cover, and soil characteristics are not altered significantly from pre-fire conditions.
Low	Shrub canopy and grasses may be scorched or consumed. Unburned and charred grass root crowns, grass thatch, and ponderosa pine needle litter are present at the surface. A moderate, thin water repellent layer, generally less than 0.25 inches, may be present at the ash-soil interface. The water repellent layer is discontinuous and may not be entirely fire-induced due to pre-fire drought conditions. In forested areas, light ground fire may have occurred but litter and duff remain largely intact and forest canopy is generally unaffected.
Moderate	In shrub and riparian areas, shrub canopy is consumed, with stobs and stems remaining. A moderate, thin water repellent layer may be present at the ash-soil interface, but is discontinuous. In forest areas, leaf litter and fine surface fuels may be consumed; conifer or hardwood canopy is scorched but not consumed and will soon become soil cover/mulch.

	Unburned patches between shrubs and trees are smaller but still present.
High	Generally areas where conifer or hardwood canopy cover was dense and pre-fire litter layers were deeper and more continuous (i.e. riparian areas). Some charred, but recognizable organic material may be present in or beneath a thick ash layer. Water repellency may be present in thicker layers starting at the ash-soil interface, but water infiltrates into the soil below this 0.25-0.50 inch layer.

While soil burn severity is not based primarily on fire effects to vegetation, the team used post-fire vegetative condition as one of the visual indicators in assessing soil burn severity. In some cases there may be complete consumption of vegetation by fire, with little effect on soil properties, such as in a shrub ecosystem. Denser vegetation, with a deeper litter and duff layer, results in longer heat residence time, hence more severe effects on soil properties. For example, deep ash after a fire usually indicates a deeper litter and duff layer prior to the fire, which generally supports longer residence times. This promotes loss of soil organic cover and organic matter which are important for erosion resistance, and the formation or exacerbation of water repellent layers at or near the soil surface. The results are increased potential for runoff and soil particle detachment and transport by water, wind, and gravity. This would be mapped as high soil burn severity.

Conversely, sparse or light pre-fire vegetation such as grasses or sparse shrubs usually have negligible litter layer and surface fuels and experience extremely rapid consumption and spread rates, with very little heat residence time at the soil surface. The result is very little alteration of soil organic matter and little or no change in soil structural stability. Water repellency may or may not be entirely fire-induced due to pre-fire drought conditions.

In between these extremes, the moderate class of soil burn severity is far more diverse in observed soil conditions and can include various vegetation types, ranging from forests to shrub communities. In the case of a forest, the litter layer may be largely consumed, but scorched needles and leaves remain in the canopy and will rapidly become mulch. This is important in re-establishing protective ground cover and soil organic matter. This factor can result in the classification of the area as moderate, rather than high. Generally, however, there will also be less destruction of soil organic matter, roots, and structure in an area mapped as moderate. In a shrub ecosystem, even where pre-fire canopy density was high, litter layer is generally thin, and while the shrub canopy may have been completely consumed by the fire, the soil structure, roots, and litter layer may remain intact beneath a thin ash layer. Above ground indicators such as size of unconsumed twigs remaining to help the team determine how long the heat may have persisted on the site. If only root staubs and large diameter twigs remain, it was likely a more intense fire with longer heat residence time, and combined with other observations of soil conditions may result in a call of high soil burn severity.

Satellite image-derived maps called Burned Area Reflectance Classification (BARC) helps to map soil burn severity classes throughout the burned landscape. A BARC is a map of degree of post-fire changes in spectral reflectance. The BARC is created by comparing near infrared and shortwave infrared reflectance values and measuring the difference between pre-fire and post-fire satellite images (see http://www.fs.fed.us/eng/rsac/baer/barc.html for more information). Since vegetation condition is the primary factor affecting post-fire spectral response in remotely sensed images, the BARC must be adjusted to fit ground observations before it can accurately be referred to as a soil burn severity map. Field and aerial observations provided the data necessary to make adjustments to the BARC to create the map of soil burn severity classes. The pre-fire image was a 30m Landsat 5 scene acquired August 22, 2011, and the post-fire image was a 30m Landsat 7 image on July 31, 2012.

Soil Erosion

Soil erosion potential following a fire is generally increased over pre-fire potential. This is largely due to loss of soil cover (forb, grass, leaf, and needle litter), surface horizon soil organic matter responsible for structural stability, and in some cases, increased water repellency at or near the soil surface. The amount of increase over pre-fire condition is related to the degree of soil changes.

Important factors in any erosion model that are most affected by fire are the same; the amount of effective soil cover, the inherent susceptibility to soil particle detachment by wind, water, or gravity (a function of soil texture and structural stability), and the surface infiltration rate. As discussed above, these characteristics vary by degree of soil burn severity, and an area of high

soil burn severity can be expected to show a larger increase in sediment production than an area of low soil burn severity. It is important to understand pre-fire erosion behavior when assessing post-fire erosion, since some areas have water repellant surfaces and inherently high erosion potential even before the fire.

The Erosion Risk Management Tool (ERMiT, 2006) was used to estimate erosion under both pre-fire and post-fire conditions for the Longhorn Complex. The ERMiT tool is an interface developed specifically for post-fire rapid assessments, and uses the Water Erosion Prediction Project (WEPP, 2006) erosion model, which considers soil burn severity.

Soils information from the NRCS Soil Data Mart and Soil Data Viewer were used to determine input parameters for the ERMiT erosion modeling. These parameters for the dominant soil types in the watershed of concern were utilized to compare pre-fire (unburned) and post-fire (burned at various severities) erosion rates. This information was also utilized to compare the effectiveness of treatments on reducing potential erosion rates after the fire.

Watershed Response

The primary watershed responses from the effects of the Longhorn Complex are expected to include: 1) initial flush of ash with normal precipitation; 2) gully and rill erosion on steep slopes in drainages with moderate and high burn severity with normal precipitation; 3) localized flash flooding in narrow, steep drainages with larger portions of moderate and high burn severity in response to high intensity precipitation (i.e. summer thunderstorms) with sediment deposition where stream gradients flatten and/or at tributary mouths; and 4) increased runoff from typical thunderstorm events occasionally seen in spring and fall. Elevated soil erosion, sedimentation, runoff, and stream flows are expected to decrease rapidly after the first year and return to the natural hydrological watershed function within three to five years after the fire when vegetative ground cover has sufficiently recovered to restore the surface soil-hydrologic function and processes within the watersheds that burned at moderate and high severity. It should also be noted that there may be an increase in localized hill slope failures on McKelvie sandy soils found in the northeast portion of the fire due to the decay of roots of the fire killed trees as long as 8 to 12 years after the wildfire. This root decay (peaks from 8 to 12 years following tree fatality) and leads to a loss of soil strength and an increase in shallow subsurface slope failures and/or headward advancement of existing headcuts.

Overland flow occurs as a result of rainfall that exceeds soil infiltration capacity and the storage capacity of depressions. On the unburned forest floor, overland flow often doesn't occur at all and when it does it follows a myriad of interlinking flow paths that constantly change as organic material (litter and duff layers) and inorganic material (rock) are encountered (Huggins and Burney, 1982). Consumption of the forest floor by fire alters the path of overland flow by reducing the overall length of the flow path, resulting in the concentration of flow into a shorter flow path. This concentration of overland flow increases the hydraulic energy of the flow and can result in rill erosion. At the watershed scale, the reduction of hillslope flow path lengths and the formation of rills that have a high water conveyance capacity reduce the times of concentration or the amount of time for overland flow to reach a defined point within the watershed.

Overland flow is also increased if there is an increase in water repellency (hydrophobicity) of the soils because of the fire. This can reduce infiltration and increase overland flow (runoff) (DeBano et al., 1967). Infiltration curves for water repellent soils reflect increasing wettability over time once the soil is placed in contact with water. Water repellency decreases (hence infiltration increases) with time as the substances responsible for hydrophobicity begin to break down, thereby increasing wettability. In general, fire-induced hydrophobicity is broken up or is sufficiently washed away within one to two years after a fire (Robichaud, 2000). The thicker and deeper the water repellant layer, the longer it will take to dissipate. Also, as noted above, many of the soils in these vegetation communities are water repellant prior to the fire (i.e.: not fire-induced), and in these cases the water repellency will likely persist. However, once soil cover and vegetative canopy begin to recover, this persistent water repellency becomes less significant to the runoff response since the litter and canopy quickly restore protection of soil and obstruction of overland flow, thus enhancing infiltration and reducing energy for runoff and erosion.

Raindrops striking exposed mineral soil with sufficient force can dislodge soil particles. This is known as splash erosion. These dislodged particles can fill in and seal pores in the soil thereby reducing infiltration. Further, once soil particles are detached by splash erosion they are more easily transported in overland flow. Surface erosion is defined as the movement of individual soil

particles by a force (wind, water, or gravity), and is initiated by the planar removal of material from the soil surface (sheet erosion) or by concentrated removal of material in a downslope direction (rill erosion). Surface erosion is a function of four factors: 1) susceptibility of the soil to detachment, 2) magnitude of external forces (raindrop impact or overland flow), 3) the amount of protection available by material that reduces the magnitude of the external force (soil cover), and 4) management practices that can reduce erosion (Foster, 1982; Megahan, 1986).

On-the-ground field observations and aerial reconnaissance within and downstream of the burned area were conducted to determine potential watershed response. Channel morphology related to transport and deposition processes were noted, along with channel crossings and stream outlets. Observations included condition of riparian vegetation and the volume of sediment stored in channels and on slopes that could be mobilized. In addition, the team used the USGS StreamStats peak flow model to compare pre-fire and post-fire watershed response.

Peak Flow Modeling

The USGS StreamStats model was used to predict peak flows generated in key watersheds identified with potential downstream values-at-risk. StreamStats peak flow values are based on regression equations developed from gage station data as described in the USGS Paper "Techniques for Estimating Peak-Flow magnitude and Frequency Relations for South Dakota Streams" (Sando, 1998) was used to estimate pre-fire peak flows for the watersheds shown in Appendix IV, Evaluated Watersheds Map. South Dakota is divided into hydrologic regions with regression equations for estimating peak discharges having recurrence intervals that range from 2 to 500 years. The Longhorn Complex is located primarily within the Great Plains flood region (Region C), but portions of the Little White River are also located within the Sand Hills flood region (Region E). The StreamStats model does not attempt to route runoff along channels.

The basin variables used in the regression equations are contributing drainage area (A), in square miles for both flood region C and E. The results using the USGS StreamStrats regression equations from the evaluated watersheds can be found in Appendix V, Support Documentation. The absolute numbers may not be close to actual observed results, due to assumptions made in the model, and on the actual storm events. However, the regression equation method is useful in making general comparisons of expected magnitude of flows for pre-fire levels.

C. Findings –

Soil Burn Severity

The general characteristics of the soil burn severity classes were described in Table 2. The soil burn severity for the Longhorn Complex Fire consists of the following:

Table 3 -Summary of Soil Burn Severity within Fire Perimeter

Burn Severity Classification	Area (acres)	Area (% of total burned)
Unburned/Very Low	8,177	18%
Low	29,100	62%
Moderate	8,952	19%
High	370	1%
Total	**46,599**	

Soil burn severity varied widely by watershed (Table 4). The watersheds of concern within the Longhorn Complex have predominantly low and moderate mosaic of burn severity (Table 4).

Table 4 -Acres of Soil Burn Severity Class by Watershed

Watershed	Soil Burn Severity	Area (acres)	Percent of Watershed
Ghost Hawk Total Watershed Area (2,657 ac) Area Burned (58%)	Unburned/very low	409	15%
	Low	800	30%
	Moderate	320	12%
	High	1	0%
Beads Total Watershed Area (10,650 ac) Area Burned (81%)	Unburned/very low	1,101	10%
	Low	4,452	42%
	Moderate	2,897	27%
	High	161	2%
Ironwood Total Watershed Area (3,143 ac) Area Burned (60%)	Unburned/very low	299	10%
	Low	991	32%
	Moderate	584	19%
	High	26	1%
Little White River Total Watershed Area (589,250 ac) Area Burned (7%)	Unburned/very low	7,321	1%
	Low	24,315	4%
	Moderate	7,684	1%
	High	342	0%

During field work to validate and correct the BARC image it was noted that much of the area was in the low to moderate soil burn severity class. As such much of the area mapped as moderate soil burn severity may appear on the surface to have been burned at high severity due to the tree mortality. It is also important to note that fire-induced water repellency, also known as hydrophobicity, was highly variable even in areas burned at high soil burn severity. Water repellency was found at depths of no more than ½ to 1 inch below the soil surface in any burn severity class.

It was difficult to adequately classify the BARC to match the burn severity mapped during field reconnaissance due to the mix of rangeland grass vegetation types on the tops of ridges and valley bottoms. Thorough field reconnaissance identified that there was a consistent break in soil burn severity at a certain gradient slope. Through GIS analysis, it was determined that the areas that consistently burned at a low severity coincided with 0-4% slopes. Therefore, the BARC was reclassified to represent all slopes between 0 and 4% as a low soil burn severity class and that all slopes greater than 4% slope would represent the field modified burn severity received with the BARC. This map was reviewed by several team members and the final map was approved on August 5, 2012.

Soil Erosion

Potential erosion has increased in the burned areas as a result of the fire. The most significant increases occurred in areas where soil burn severity was moderate or high and where slopes are steep (greater than 35 percent). A high percentage of the burned area is underlain by fine to very fine sandy soils derived from the Ogallala Formation. These soils have low cohesion and high inherent erodibility to both wind and water, especially on slopes over 35 percent, and after removal of protective vegetation, litter, and tree and shrub canopy by fire.

This is especially significant on the steep slopes found in the narrow, face drainages to the Little White River between the Iron Shell Bridge and the Beads Creek Road on the north east part of the main fire area. The steep slopes and channels in several of small watersheds contain large amounts of loose soil and stored sediment with high potential for mobilization of surface erosion and debris flows if significant precipitation occurs over a short period of time.

A comparison of overall pre-fire surface erosion rates with post-fire surface rates was made using the ERMiT erosion modeling tool by watershed (Table 5). The fire is a complex mix of various combinations of soil type, burn severity, slope, and pre-fire vegetation type. The fire-caused changes in the dominant combinations were modeled, and the results are displayed in Appendix V, Support Documentation. The absolute numbers may not be close to actual observed results, due to assumptions made in the model, and on the actual storm events that occur in the first year or two following the fire. However, it is useful in making general comparisons of expected magnitude of change following the fire.

Table 5 -Comparison of pre- and post-fire modeled erosion rates by dominant soil type

Representative Hill Slope and Soil Type	Pre-fire erosion (ton/ac/yr)	Untreated MODERATE Post-fire erosion (ton/ac/yr)	Untreated HIGH Post-fire erosion (ton/ac/yr)	Change pre-fire to post-fire	Post-fire with natural pine needle mulch (ton/ac/yr)	Change pre-fire to post-fire with mulch
Ironwood Area: McKelvie sands	0.44	4.75	8.7	1000-2000% (10-20 fold increase)	1.13 – 3.40	150-700% (1.5 - 7 fold increase)
Ironshell Area: sandy loams	0.24	2.46	2.95	900-1100% (10-13 fold increase)	0.82 – 0.99	240-315% (2.4 – 3 fold increase)

Soil burn severity was overestimated to account for expected hydrologic runoff due to the density of the pre-fire grass component within these watersheds. Prior to the fire, the predicted erosion rates ranged from 0.2 to 0.4 tons per acre in a given year. One ton/acre of soil loss can be thought of as the thickness of a dime spread across one acre of land. After the fire, the predicted erosion rates for representative slopes ranged from 2.5 to 4.8 tons per acre for moderate; and 3.0 to 8.7 tons per acre for high burn severity. This is a 900 – 2000% increase over pre-fire conditions. This percent increase in erosion potential can also be thought of as being 10-20 times higher than unburned conditions. Although the modeled post-fire erosion is higher than pre-fire conditions, post-fire erosion rates drop significantly in the third year due to natural vegetative recovery and development of effective soil cover (i.e. litter and duff).

Currently, scorched ponderosa pine throughout the fire area, have already begun to drop pine needles to create a natural protective mulch layer. This has resulted in up to 40% effective soil cover already and much of the scorched canopies have yet to drop. As more pine needles continue to drop, the effective soil cover will continue to increase, decreasing the amount of exposed bare soil. This will also decrease the amount of erosion and sediment yield from these hill slopes. Straw mulch was considered as a potential treatment for steep slopes that experienced moderate to high burn severity. Post-fire erosion rates with the natural pine-needle mulch treatment are not significantly different from untreated areas at the 30% exceedence probability (Table 5). This means that there is a 70% chance that post-fire erosion will not exceed 0.8 to 3.4 tons/acre for moderate and high severity hill slopes (i.e. about 1-3 thicknesses of a dime across an acre). With the ponderosa pine needle mulch, the post-fire erosion potential drops to a 150 – 700% increase or only 1½ to 7 times more than unburned conditions. The presence of the natural mulch is a significant decrease when compared to the untreated erosion potential.

Watershed Response

Peak Flow

The BAER Team used the USGS StreamStats model based on streamflow regression equations to estimate pre-fire peak flows for various flood recurrence intervals (Table 6). A more detailed discussion of the models and the results is found in Appendix V, Supporting Documentation: Watershed Modeling and Response. All values are cubic feet per second (cfs) and represent pre-fire streamflow. An estimation of percent increase has been calculated using the USGS Regression Method for estimating post-fire streamflow (Foltz, 2009).

Table 6 - Flood recurrence intervals and associated risk of occurring in any given year.

Flood Event	Chance of occurring	Beads Reservoir (cfs)	Ironwood Reservoir (cfs)	Ghost Hawk Reservoir (cfs)	Little White River* (cfs)
Post-fire Increase to streamflow		26%	17%	11%	1%
2 year	50%	110	62	27	703
5 year	20%	327	182	45	1,460
10 year	10%	566	314	57	2,240
25 year	4%	922	515	73	3,660
50 year	2%	1,260	708	87	5,110
100 year	1%	1,660	933	100	6,990
500 year	0.2%	2,830	1,610	137	13,700

**Flood recurrence data for the Little White River is based on USGS observed measurements at the gage station.*

The absolute numbers from the model may not be very close to actual observed results, due to assumptions made in the model, and on the actual storm events that occur in the first year or two following the fire. However, they are within reason and the overall magnitude of change between the pre-fire and post-fire peak flow is estimated in Table 6, but overall average increase to streamflow is estimated to be 18%. Even though this is estimation, it is useful in making general comparisons of expected magnitude of change following the fire. An storm was observed on august 2nd that was recorded as about ½" in 20 minutes. This storm resulted in a bankfull flow in small headwater drainages and carried very little debris and sediment. The Ghost Hawk drainage carried the bankfull flow to the wide valley just above the reservoir and deposited its entire sediment load in the upper portion, never reaching the reservoir with sediments.

Post-fire flows are not anticipated to significantly higher than pre-fire flows due to:

1. the patchy mosaic of burn severity found throughout the fire;
2. predominantly low and moderate burn severity throughout the fire;
3. pine needle mulch layer already forming to protect soils and minimize runoff;
4. re-sprouting of grasses and forbs;
5. presence of storage reservoirs such as Ironwood and Beads Reservoirs; and/or
6. healthy floodplain and riparian function found in the Little White River valley.

"Prescribed fires with low to moderate burn severity rarely produce adverse hydrologic effects that land managers need to be concerned about" (Neary et. al 2005). Because so much of the Longhorn Complex was a mosaic of low (62%) to moderate burn severity, much like a prescribed fire would produce; post-fire flooding is not expected to be significantly increased over pre-fire conditions. Post wildfire floods from high burn severity areas can be a concern, particularly the timing of storm flows (response time) and magnitudes of flood peaks. Because intensely burned watersheds respond to rainfall faster, producing more "flash floods," they also may increase the number of runoff events. However, for the Longhorn Complex the areas of high severity are small patches interspersed among areas of moderate and low burn severity. No watershed was identified that had a large portion of high burn severity. Thus areas that may generate some runoff will have to flow through adjacent areas of moderate and low burn severity, which essentially act as a buffer – filtering ash and sediment as well as slowing runoff and preventing rapid concentration of flow.

Throughout the fire area, vegetation recovery is largely dependent on climatic cycles. If normal winter precipitation occurs, vegetation recovery could be rapid, with forbs and grasses providing ground cover similar to that observed in unburned areas throughout the fire. Once sprouting vegetation begins to produce brushy crowns and a duff/litter layer, watershed response will be reduced further. By the second winter season, forbs, grasses, and re-established shrubs should provide sufficient cover to reduce any increase in watershed response to near pre-fire levels.

However, if winters are dry, vegetation recovery will be slow, and thus the establishment of

ground cover and shrub communities will be slow, and watershed response will remain slightly elevated over pre-fire conditions. The recovery of some areas may be slowed than what past experience suggests, due to the extended drought and extensive wildfires in recent years.

The effect of wildfires on storm runoff is well documented. Wildfires typically cause an increase in watershed responsiveness to precipitation events. Burned watersheds can quickly yield runoff due to the removal of protective tree and shrub canopies and litter and duff layers, thus producing flash floods. Burned areas often respond to the local storm events in a much flashier way. The amount of water yield increase is variable and it is often orders of magnitude larger than pre-fire events. These negative impacts are predominantly true in watersheds that experienced significant consumption of the shrub community and moderate to high soil burn severity effects. Fire may increase the number of runoff events as well since it generally takes a smaller storm to trigger runoff until vegetation begins to recover. Peak flow increases from the fire may also be augmented by flows of floatable debris and transportable material within the active channel areas and steep, incised drainages.

A consequence of significant runoff, erosion, sediment and debris delivery is a short-term degradation of water quality as ash, sediment, and burned organic debris are delivered to streams and reservoirs within and downstream of burned areas. The impacts of this effect depend largely on the vegetative recovery times in combination with storm characteristics in the same time period. If a significant storm event were to occur yet this summer and produce runoff, the Ironwood, Beads, and Ghost Hawk Reservoirs would attenuate, or store, peak flood flows, releasing stream flows in a controlled manner through their individual overflow outlets. Thus post-fire flood flows are not anticipated to be a threat for typical rain events that may occur in the interim period while vegetation is recovering.

Values at Risk

BAER assessments evaluate the effects of a range of storms, from the “typical” storms (2-year thunderstorm events in this area) up to larger storm events such as the 10 to 25-year storms. The ability for BAER to prescribe temporary treatments that withstand storm events greater than a 25-year magnitude becomes problematic. The nature of BAER activities allows for rapid assessment and rapid implementation of treatments to protect human lives, property, and critical natural and cultural resources. Design of treatments and implementation beyond 25-year storm events usually requires complex engineering and implementation that exceeds the rapid implementation of such treatments.

Aerial reconnaissance and field evaluations were conducted throughout the fire area to determine if threats to life, property, or critical cultural or natural resources were present on trust lands in close proximity or downstream of the fire area. Bridge, roads, culverts, outbuildings, residence buildings, cultural sites, and dam structures were evaluated for risk from increased erosion, flooding or debris flows. The following table summarizes the identified values at risk (Table 7).

Table 7 - Values-at-risk Identified for the Longhorn Complex Post-fire Assessment

Value at Risk	Potential Threat	Level of Risk	Treatment
Ghost Hawk Reservoir	Flooding/Debris/Sediment	Low	Reservoir Patrols
Beads Reservoir	Flooding/Debris/Sediment	Moderate	Reservoir Patrols
Roads, Bridge, Culverts	Flooding/Debris/Sediment	Very High	Storm Patrols, Culvert Uupsize
Ironwood Reservoir	Flooding/Debris/Sediment	Moderate	Reservoir Patrols
Visitors along	Flash Flooding/Falling	Moderately	Warning

Value at Risk	Potential Threat	Level of Risk	Treatment
major roads	Trees	High	Signs, Storm Patrols, Reservoir Patrols
Soil Productivity within northeast half of burned area	Loss of protective soil crust and soil loss	Very High	Natural needle cast from pine trees, rest grazing, Limit vehicle use off trails and roads

IV. RECOMMENDATIONS

Based on the results of the above observations:

A. Emergency Stabilization – Fire Suppression Rehabilitation

No recommendation under this category.

B. Emergency Stabilization

Warning Signs

This treatment is for the installation of flood warning signs, burned area warning signs, and road closure signs. These signs will warn the public of dangers on the road that have changed as a result of the fire. Flood warning signs will warn the public when crossing drainages such as the Ironwood Creek, Beads Creek, Spring Creek, Crazy Horse Canyon and tributaries about the increased risk of floods. Burned area signs consist of a warning to the public identifying of the possible dangers associated with a burned area. It shall contain language specifying items to be aware of when entering a burn area such as falling trees and limbs, rolling rocks, and flash floods.

BAER Education

This treatment will provide the funding and direction for the local agency and tribe to develop brochures that describe the sensitivity of the area to impacts such as OHV and other activities that break the soil surface. Describe the processes of erosion and the loss of soil and soil productivity. Finally, describe the increase in runoff and expected flooding downstream of the burn. Distribute the handouts to hunters, operators, and visiting public.

Storm Patrols

There are many places at risk of inundation, debris deposition, flood damage and other post-fire related impacts from elevated flows carrying sediment and debris. This post-storm assessment should identify culverts or bridges that are plugged or damaged. The patrols are used to identify those road problems such as plugged culverts and washed out roads and to clear, clean, and/or block those roads that are or have received damage. The storm patrollers shall have access to equipment that can be used when a drainage culvert is plugged or soon to be plugged and to repair any road receiving severe surface erosion. The sediment and debris should be removed immediately, especially from the inlet to avoid further damage to infrastructure. Work should be performed in the morning and early afternoon. Leave drainages when there is a chance of rain. Store equipment and materials out of flood plains and where chance of loss is low. Other values at risk (buildings, well heads, diversion structures, etc.) in the floodplain area may be assessed during storm patrol.

Aerial Straw Mulch & Seed (Considered but eliminated as a treatment)

The application of agricultural straw mulch and/or seed to the ground surface within areas that were classified as high burn severity was considered for the Longhorn Complex Fire. Much of the burned area consists of a Silt/sand soil type that has developed a crust that ranges between a 2 and 8 inch depth above deep silty sand. Through observations of past burned areas, dozer lines, old scarps, and newly created OHV trails, it was determined that the loss of this crust would result in extreme soil movement by wind and water erosional processes. This crust is stabilized by grass root masses and is currently in good, stable condition. An evaluation of the risk of soil loss and associated consequences did not warrant treatment due to the following factors: high burn severity was located in small, localized areas (< 5 acres each); surrounding burn is low to moderate with significant needle cast (natural mulch); downstream values were either non-existant or so far downstream that they were not threatened; expected that there is still a viable seed source within and near these areas.

Culvert Replacements
Replace culverts at two stream crossings where culverts are not adequately sized for expected increase to streamflow.

Prepare and Deliver Final BARC Map
The mapping that is done from the air and using vantage points has limited spatial accuracy, so it is recommended that an additional BARC image be procured from the Remote Sensing Application Center in Salt Lake City, Utah. This additional soil burn severity information may help with future planning to address post-fire rehabilitation needs on all of the effected Pueblos and adjacent federal land.

B. Management Recommendation – Rehabilitation – (Non Specification)

Ghost Hawk Emergency Outflow
Re-evaluate the emergency outflow pipe on the Ghost Hawk Dam to make sure that the capacity can adequately process normal high flows. Comparison between the original photos and photos from August 2, 2012 indicate an increase in the size of the caving.

Protection of Sensitive Soils
Monitor the recovery of the grasses within the burn, even in the low to moderate burn severity classes to ensure that the crust has stabilized. Manage the area to minimize Off-Highway Vehicle use until it is determined that the soils have re-established pre-fire stability. Any activities that potentially break through the soil crust may cause irreversible damage and loss of a productive soil resource for many years.

V. CONSULTATIONS

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INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

APPENDIX II COMPLIANCE

BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN COMPLEX

APPENDIX II. ENVIRONMENTAL COMPLIANCE DOCUMENTATION

- Environmental Compliance Considerations and Documentation
- Environmental Compliance and Consultation Documentation and Decision
- Exception Checklist for BIA Categorical Exclusion

BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN COMPLEX

Environmental Compliance Considerations and Documentation

A. FEDERAL, STATE, AND PRIVATE LANDS ENVIRONMENTAL COMPLIANCE RESPONSIBILITIES

All projects proposed in the 2012 Longhorn Fire Burned Area Rehabilitation (BAR) and Emergency Stabilization (ES) Plan that are prescribed, funded, or implemented by Federal agencies on the Rosebud Sioux Reservation are subject to compliance with the *National Environmental Policy Act* (NEPA) in accordance with the guidelines provided by the *Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508)*. This Appendix documents the Interagency Burned Area Emergency Response (BAER) Team considerations of NEPA compliance requirements for prescribed emergency stabilization and monitoring actions described in this plan for areas affected by the Longhorn Fire. This plan identifies specific emergency stabilization and monitoring actions designed to address damages to resources as a result of the Longhorn Fire. The Bureau of Indian Affairs (BIA) must complete separate NEPA analyses and compliance for any proposed activities not addressed in this plan.

This plan has been developed by a BIA BAER Team, comprised of representatives from the BIA Rosebud Agency, the Rosebud Sioux Tribe (MAT) and the National Park Service.

Agency Specific Guidance: This NEPA documentation has been developed in accordance with the following agency specific guidelines.

- **Bureau of Indian Affairs:** Burned area emergency stabilization and monitoring actions proposed on Tribal Trust lands will comply with NEPA compliance guidelines contained in the Bureau of Indian Affairs (30BIAM) regulations and guidelines.

B. RELATED PLANS AND CUMULATIVE IMPACTS ANALYSIS

Forest Management Plan (FMP) for the Rosebud Agency (1999): The BAER Team reviewed the Fire Management Plan and determined that actions proposed in the Longhorn BAER Plan are consistent with the management objectives established in the FMP for Emergency Stabilization projects.

Cumulative Impact Analysis*:* Cumulative effects are the environmental impacts resulting from the incremental impacts of a proposed action, when added to other past, present, and reasonably foreseeable future actions, both Federal and non-federal. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The emergency stabilization treatments for the areas affected by the Longhorn Fire, as proposed in the Longhorn BAER Plan; do not result in an intensity of impact (i.e. major ground disturbance, etc.) that would cumulatively constitute a significant impact on the quality of the environment. The treatments are consistent with the above jurisdictional management plans and associated environmental compliance documents of the BIA, Rosebud Agency, Rosebud Sioux Tribe and the attached categorical exclusion.

No direct or indirect unavoidable adverse impacts to the biological or physical environment would result from the implementation of the Longhorn BAER Plan. The implementation of BAER and monitoring treatment actions proposed in the plan would not result in any adverse effect on the burned area or areas downstream. Conversely, implementation of the plan would be expected to result in a cumulatively beneficial response based on BAER recovery efforts.

C. APPLICABLE LAWS AND EXECUTIVE ORDERS

This section documents consideration given to the requirements of specific environmental laws in the development of the Longhorn Fire BAER Plan. Specific consultations initiated or completed during development and implementation of this plan are also documented. The following executive orders and legislative acts have been reviewed as they apply to the Longhorn Fire BAER Plan.

1. **National Historic Preservation Act (NHPA).** All proposed treatments are in compliance with this order.
2. **Executive Order 11988, Floodplain Management.** All proposed treatments are in compliance with this order.
3. **Executive Order 11990,** Protection of Wetlands. All proposed treatments are in compliance with this order.
4. **Executive Order 12372,** Intergovernmental Review. Coordination and consultation is ongoing with affected Tribes, Federal, and local agencies. A copy of the BAER plan will be disseminated to all affected parties.
5. **Executive Order 12892, Federal actions to address Environmental Justice in Minority and Low-Income Populations.** All Federal actions must address and identify, as appropriate, disproportionately high and adverse human health or low-income populations, and Indian Tribes in the United States, The BAER Team has determined that the actions proposed in this plan will result in no adverse human health or environmental effects for minority or low-income populations and Indian Tribes.
6. **Endangered Species Act.** The BAER Team Leader has consulted with the Rosebud Agency Wildlife Biologist regarding actions proposed in this plan and potential effects on federally listed species and has determined that there is no effect.
7. **Clean Water Act.** All proposed treatments are in compliance with this Act. Restoration and emergency stabilization measures proposed are necessary to maintain clean water within the burn and adjacent areas. Long-term impacts are considered beneficial to water quality.
8. **Clean Air Act.** Federal Ambient Air Quality Primary and Secondary Standards are provided by the National Ambient Air Quality Standards, as established by the U.S. Environmental Protection agency (EPA) (Clean Air Act, 42 U.S.C. 7470, et seq., as amended). The BAER Team has determined that treatments prescribed on the Longhorn Fire will have short-term minor impacts to air quality that would not differ significantly from routine land use practices for the area.

D. APPLICABLE AND RELEVANT CATEGORICAL EXCLUSIONS

The individual actions proposed in this plan are Categorically Excluded from further environmental analysis as provided for in the Department of Interior Manual Part 516. All applicable and relevant Department and Agency Categorical Exclusions are listed below. Categorical Exclusion decisions were made with consideration given to the results of required emergency consultations completed by the BAER Team and documented in Section E below.

Applicable Department of the Interior Categorical Exclusions

Part 516 DM 2, App. 1.6	Non-destructive data collection, inventory (including field, aerial and satellite surveying and mapping), study, research and monitoring activities.
Part 516 DM 2, App. 1.7	Routine and continuing government business, including such things as supervision, administration, operations, maintenance and replacement activities having limited context and intensity; e.g. limited size and magnitude or short-term effects.
Part 516 DM 2, App. 1.10	Policies, directives, regulations and guidelines of an administrative, financial, legal, technical or procedural nature; or the environmental effects of which are too broad, speculative or conjectural to lend themselves to meaningful analysis and will be

subject later to the NEPA process, either collectively or case-by-case.

Applicable Bureau of Indian Affairs Categorical Exclusions

Part 516 DM 6 App. 4.4 H (5) Approval of Fire Management Planning Analysis detailing emergency fire suppression activities.

Part 516 DM 6 App. 4.4 H (6) Approval of emergency and range rehabilitation plans when limited to environmental stabilization on less than 10,000 acres and not including approval of salvage sales of damaged timber.

Part 516 DM 6 App. 4.4 L (4) Installation of fencing, signs, pavement markings, small passenger, shelters, traffic signals, and railroad warning devices where no substantial land acquisition or traffic disruption will occur.

Part 516 DM 6 App. 4.4 L (5) Emergency repairs under 23 U.S.C. 125.

Part 516 DM 6 App. 4.4 M (1) Data gathering activities such as inventories, soil and range surveys, timber cruising, geological, geophysical, archaeological, paleontological and cadastral surveys.

Part 516 DM 6 App. 4.4 M (2) Establishment of non-disturbance environmental quality monitoring programs and field monitoring stations including testing services.

E. STATEMENT OF COMPLIANCE FOR THE LONGHORN FIRE BURNED AREA EMERGENCY RESPONSE PLAN

This section documents considerations given in development of the Longhorn Fire BAER Plan to the requirements of specific environmental laws. Specific consultations initiated or completed during development and implementation of this plan are also documented. The above mentioned executive orders and legislative acts have been reviewed as they apply to the Longhorn BAER Plan.

F. CONSULTATIONS

Bureau of Indian Affairs
- Elton HawkWing, Dep. Supt.(Trust), Rosebud Agency
- Dana Cook, FMO, Rosebud Agency
- Cleve Her Many Horses, Superintendent, Rosebud Agency
- Ira Dean Wilson, Realty Officer, Rosebud Agency

Rosebud Sioux Tribe
- Emily Boyd, Biologist, Dept. of Game & Fish, RST

EXCEPTION CHECKLIST FOR BIA CATEGORICAL EXCLUSIONS

Project: Longhorn Fire Burned Area Emergency Response (BAER) Plan Date: 8/8/2012

Nature of Proposed Action:

Longhorn BAER Plan for the treatments within the burn area.

516 DM 10.5 Categorical Exclusions
Exclusion category H. Forestry; number: 6

Approval of emergency forest and range rehabilitation plans when limited to environmental stabilization on less than 10,000 acres and not including approval of salvage sales of damaged timber.

Evaluation of Exception to use of Categorical Exclusion

1.	This action would have significant adverse effects on public health or safety.	No ☒	Yes ☐
2.	This action would have an adverse effect on unique geographical features, such as wetland, wild or scenic rivers, refuges, floodplains, rivers placed on nationwide river inventory, or prime or unique farmlands.	No ☒	Yes ☐
3.	The action will have highly controversial environmental effects.	No ☒	Yes ☐
4.	The action will have highly uncertain environmental effects or involve unique or unknown environmental risks.	No ☒	Yes ☐
5.	This action will establish a precedent for future actions.	No ☒	Yes ☐
6.	This action is related to other actions with individually insignificant, but cumulatively significant environmental effects.	No ☒	Yes ☐
7.	This action will affect properties listed or eligible for listing in the National Register of Historic Places.	No ☒	Yes ☐
8.	This action will affect a species listed, or proposed to be listed as endangered or threatened.	No ☒	Yes ☐
9.	This action threatens to violate federal, state, local, or tribal law or requirements imposed for protection of the environment.	No ☒	Yes ☐
10.	This action will have a disproportionately high and adverse effect on low income or minority populations.	No ☒	Yes ☐
11.	This action will limit access to, and ceremonial use of	No ☒	Yes ☐

Indian sacred sites on federal lands by Indian religious practitioners, or significantly adversely affect the physical integrity of such sacred sites.

12. This action will contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or may promote the introduction growth, or expansion of the range of such species. No ☒ Yes ☐

A "yes" to any of the above exceptions will require that an EA be prepared.

NEPA Action - - - CE X EA ____

Preparer's Name and Title: Darryl Martinez

Regional Archeologist Concurrence with Item 7 _____

Concur: _____ Date: 8/8/2012
Regional Director/Superintendent

Concur: _____ Date: _____
Regional Office/Agency Environmental Coordinator

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

APPENDIX III PHOTO DOCUMENTATION

- **FORESTRY / VEGETATION**
- **CULTURAL RESOURCES**
- **WATERSHED / SOIL ISSUES**

BEADS RESERVOIR

Forestry_Vegetation Issues / Concerns

Needle Cast

Mortality

Cone Crop

Mosiac Burn

Cultural_ Issues / Concerns

Dozer Line Bisecting Site

Unauthorized Excavation at Looted Site

Burn Above Clearwater Cemetery

Burned Over Site

Large Depression at site

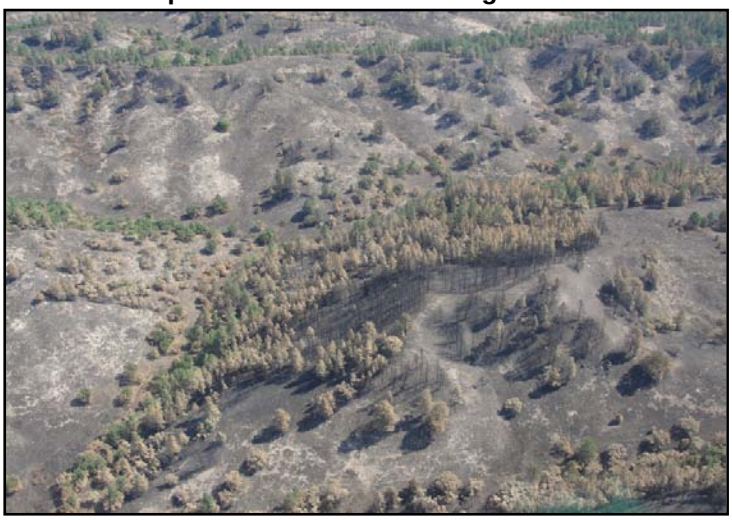
Burnt Posts at St. Mary's Cemetery

Watershed_ Issues / Concerns

Beads Creek Bridge_Clearance is above bankfull levels.

Mix of severity drainages into Beads reservoir. Note unburned riparian areas found throughout burn.

Ghost Hawk Reservoir: Intact riparian vegetation and Mosaic burn severity.



Mosaic burn consisting of High severity centered Surrounded by mix of Low and Moderate severity.

Channel above Ghost Hawk Reservoir illustrating bankfull flow after the Aug. 2, 12 event (~0.5” in 20 mins)

Note silt-sand soils and crust held together by root system of grasses. Yucca significant in re-stabilizing soils.

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

APPENDIX IV MAPS

#1 Burn Severity_ BARC Map
#2 Treatments
#3 Reforestation / CFI
#4 Watershed Map

Re-sprouting of grasses above Ghost Hawk Lake

INSERT 11” X 17”

LONGHORN BURN SEVERITY MAP

INSERT 11” X 17”

LONGHORN TREATMENTS MAP

INSERT 11” X 17”

LONGHORN REFORESTATION MAP

INSERT 11” X 17”

LONGHORN WATERSHED MAP

INTERAGENCY BURNED AREA EMERGENCY RESPONSE PLAN

2012 LONGHORN FIRE

APPENDIX V SUPPORTING DOCUMENTATION

1. Delegation of Authority
2. BAER JHA
3. BAER_Roster 2012
4. Organizational Chart
5. Cultural Cost Risk
6. Forestry Cost Risk Hazard Tree
7. Rights of Way Fencing Cost Risk
8. Watershed Cost Risk
9. Boyd_mtg notes 8/1/12
10. Boyd_mgt notes 8/2/12
11. BAER Closeout 8/8/12
12. Climate Summaries
13. ERMit Modeling results
14. USGS StreamStats results

Buffalo Herd

UNITED STATES GOVERNMENT

memorandum

DATE: August 1, 2012

REPLY TO
ATTN OF: acting Superintendent

SUBJECT: Longhorn BAER Team Delegation of Authority

TO: Elton Hawk Wing, Deputy Superintendent-Trust Services

You are hereby delegated authority and responsibility to assess post fire effects and produce a Burned Area Emergency Response (BAER) Plan outlining measures and standards necessary to mitigate fire damage resulting from the Longhorn Fire. All BAER activities will be conducted within the framework of provisions contained within Part 620: Department of Interior Manual Chapter 3; Bureau of Indian Affairs policy and sound resource management practices. A National Environmental Policy Act (NEPA) document will be prepared as part of the BAER Pan.

Your primary responsibility is to organize and direct your assigned resources to establish cost effective measures to protect the resources of the Rosebud Sioux Reservation from further damage and start the process of recovery. You are to work in cooperation with the Rosebud Sioux Tribe.

As a team leader, you are accountable to me and to the Great Plains Regional Director. On any occasion that I am not immediately available, Elton Hawk Wing has full authority to represent me.

Lee Brenda

National Interagency Burned Area Emergency Response	1. WORK PROJECT/ACTIVITY BAER Assessments	2. LOCATION 2012 Longhorn Fire	3. UNIT BAER Team
JOB HAZARD ANALYSIS (JHA)	4. NAME OF ANALYST	5. JOB TITLE	6. DATE PREPARED 08/01/2012

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS Engineering Controls * Substitution * Administrative Controls * PPE
General Field work, monitoring	General personal safety	Bring your radio with charged battery Sign out;
		If going to a remote area alone let someone know specifically where you will be; Be sure someone knows you have returned.
	Sun and hyperthermia	Cover areas of exposed skin with proper personal protective clothing.
		Use sunscreen to prevent sunburn.
		Drink enough water to keep hydrated and prevent heat exhaustion or heat stroke (at least 2 quarts in summer).
		Pace yourself when climbing steep, open slopes.
	Hypothermia and cold	Carry extra clothes; wear layers to prevent sweating and subsequent cooling.
		Bring rain gear, hat, warm gloves with you everyday.
		Use extra caution in stream bottoms to prevent falling in water and hypothermia.
	Giardia / insects	Don't drink unfiltered or untreated water from creeks.
		Check yourself daily for ticks, especially hair.
		Tuck pants into boots, shirt into pants, wear long sleeves.
	Fatigue, carelessness	Get plenty of sleep at night; Be careful and do job right the first time, safely.
	Trip and fall, eye poking	Watch for down trees and debris on forest floor. Wear goggles when walking in thick, shrubby areas.
	Crossing creeks	Watch where you walk in stream, expect rocks to be slippery, don't cross if you feel unsafe.
		Cross facing upstream so knees don't buckle, use a stick for extra balance.
Field surveys, monitoring	Steep slopes, Remote worksites	Wear vibram soled shoes, with good ankle support. Carry a radio, leave itinerary.
Mapping/Inventory Within Fire Perimeter	Working within fire perimeter.	Wear PPE (Hard Hat, leather boots, NOMEX, fire shelter, goggles, and gloves) at all times. Recognize fires are not controlled. Know your 10 standard fire orders and "watch out" situations.
	Stump/root holes	Keep your eyes on path of travel. Stop your travel and complete task if your attention is diverted.

	Snags/Hazard trees	Size up your surroundings. Avoid work in areas where hazards exist. Be aware of expected conditions. Post a lookouts if the wind picks up.
	Slippery footings	Be aware in areas of wet ash, loose rocks, and unstable slopes.
	Rattle snakes	Be aware at all times.
Communication/Coordination with Team Leaders and Suppression Personnel	Personal Health and Safety	Take care of cuts, bruises, and blisters immediately. Report accident to Team Leader and complete accident report.
	Lightning	Check weather report, stay off ridge tops and open slopes during lightning storms
		If stuck in open keep radio and metallic objects away from you, squat down with only feet on ground using insulate pad if possible, keep as much of your body off the ground as possible.
	Falling rocks	Wear hardhat if in area with loose rocks; don't work directly above another person; be wary of rocks.
	Heavy brush	Wear long sleeve shirt; goggles
	Insect bites	Wear long sleeve shirt and hat; use repellent at your discretion.
		Carry anti-histamine and asthma-inhaler for bee stings. If known allergic carry proper medication and instruct coworkers in administration.
		Report your next day's work area to Team Leader by 1800 the previous day In order to be included in next day's shift plan.
		Be sure to check in with Division Sup.Group before entering and leaving fire perimeter.
Driving	Vehicle accidents and associated injury	Always wear safety belts and make sure everyone is buckled up! Drive carefully on heavily travelled roadways. Driving defensively means anticipating the other drivers actions before it happens. Back your vehicle in when parking and use a ground guide when available.
		Drive carefully in snow and mud, chain up BEFORE you get stuck. Don't attempt accessing remote areas in poor conditions
		Roads are narrow, drive defensively, giving yourself enough time/space to react to other drivers. Maintain stopping distance of half the distance you can see. Drive with headlights on.
		Stop and take a break if you feel sleepy while driving, or let someone else drive.
		If possible, remove hazards from roadbed rather than try to drive over or around them.

10. SIGNATURE	11. TITLE	12. DATE

2012 INTERAGENCY BURNED AREA EMERGENCY RESPONSE TEAM (BAER) TEAM

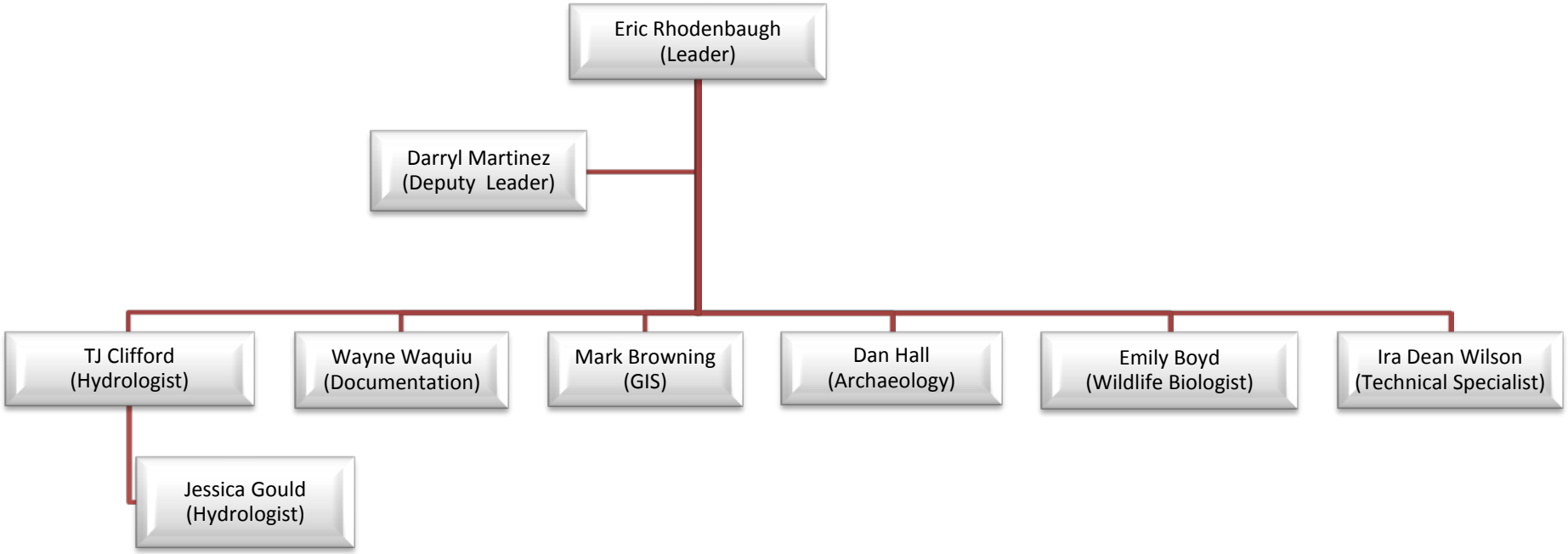
LONGHORN FIRE, ROSEBUD AGENCY

POSITION	NAME/ORGANAIZATION/ADDRESS (Unit Identifier) (GACC)	WORK PHONE	FAX	CELL/PAGE/ EMAIL
Team Leader BAEL	***Eric Rhodenbaugh***/BIA Wind River Agency (WYWRA) PO Box 158, Fort Washakie, WY 82514 (RM)	307-332-3719	307-332-7317	307-349-2300c Eric.rhodenbaugh@bia.gov
Deputy Team Leader BAEL	***Darryl Martinez*** /BIA NIFC (NMSWC) 1001 IndianSchoolRd.NW,Albuquerque, NM 87104 (SW)	505-563-3369	505-563-3052	505-331-3514c darryl.martinez@bia.gov
Hydrologist BAHY	***TJ Clifford***/ BLM (IDBOD) 1287 Development Way, Boise, ID 83705 (EGB)	208-384-3459	208-384-3326	208-866-3204c tclifford@blm.gov
BAES	***Jessica Gould***/USFS Black Hills NF (SDBKF) 8221 S Hwy 16, Rapid City, SD 57702 (RM)	605-716-2039	605-343-7134	605-545-5485c
Cultural Resouces BACS	***Dan Hall*** /BIA Pacific Region (CASAA) 2800 Cottage Way, Sacramento, CA 95825 (NO)	916-978-6041 916-803-3840c	916-978-6055	530-613-0404 persc dan.hall@bia.gov
Computer/Doc. Specialist BADO	***Wayne Waquiu*** /BIA Albuquerque AO (NMABA) PO Box 26567, Albuquerque, NM 87125-6567 (SW)	505-563-3380	505-563-3052	505-259-6483c wayne.waquiu@bia.gov
Geo. Info Specialist GISS	***Mark Browning***/BIA Great Plains Region 115 4th Avenue SE, Aberdeen, SD 82514 (GP)			605-380-0598 c mark.browning@bia.gov
Technical Specialist THSP	***Ira Dean Wilson*/BIA Rosebud Agency** 1004 Omaha Street, Mission SD 57555 (GP)			605-828-2488 c Ira.wilson@bia.gov
Wildlife Biologist BABI	***Emily Boyd*/Rosebud Sioux Tribe** P.O. Box 430, Rosebud, SD 57570 (GP)	605-747-2289	605-747-2434	605-828-6197 c

INTERAGENCY BURNED AREA EMERGENCY RESPONSE TEAM (BAER)

LONGHORN FIRE

ROSEBUD AGENCY (BIA)



2012 Longhorn Fire Complex
Cost/Risk Analysis – Cultural Resources

Part 1. Treatment Cost

Treatments	Cost
#5 Cemetery Protection	$1794.
Total	**$1794.**

Part 2. Probability of Rehabilitation Treatments Successfully Meeting ESR Objectives

Treatments	Units	%
#5 Cemetery Protection	1	100

Risk of Resource Value Loss or Damage

No Action-Treatment Not Implemented (check one)

Resource Value	None	Low	Mid	High
Lives	X			
Residential & Commercial Property	X			
Water Quality & Soil Productivity	X			
Cultural Resources				X
Roads	X			

Proposed Action ☐ Treatments Successfully Implemented (check one)

Resource Value	None	Low	Mid	High
Lives	X			
Residential & Commercial Property	X			
Water Quality & Soil Productivity	X			
Cultural Resources		X		
Roads	X			

PART 3. SUMMARY

1. Are the risks to natural resources and private property **acceptable** as a result of the fire if the following actions are taken?

Proposed Action Yes [X] No [ ] Rationale for Answer:

#5 Cemetery Protection: The repair/replacement of the St. Mary's Cemetery exclosure fence has no potential to place natural resources and private property at risk.

No Action Yes [X] No [ ] Rational for answer:

#5 Cemetery Protection: Selection of the No Action Alternative, the decision to not implement the Proposed Action has no potential to place natural resources or private property at risk. The subject of the Proposed Alternative, a cemetery is not a natural resource or private property.

Alternative(s) Yes [X] No [ ] Rationale for answer:

#5 Cemetery Protection: There is no viable alternative to the proposed action.

2. Is the probability of success of the proposed action, alternatives or no action acceptable given their costs?

Proposed Action Yes [X] No [ ] Rational for answer:

#5 Cemetery Protection: Cemeteries are important cultural resources that provide the Tribal community a link to their past and a venue for honoring elders who have passed on. The modest costs associated with this treatment are acceptable given the probability of success.

No Action Yes [ ] No [X] Rational for answer:

#5 Cemetery Protection: Selection of the No Action Alternative could result in unacceptable consequences to the St. Mary's Cemetery. The potential costs to this cultural resource that may occur if the Proposed Action is not selected is incalculable when compared with the modest cost that would be incurred by implementing this treatment.

3. Which approach will most cost-effectively and successfully attain the Emergency Stabilization and Rehabilitation objectives and therefore is recommended for implementation from a Cost/Risk Analysis standpoint?

Proposed Action Yes [X] No [ ] Rational for answer:

#5 Cemetery Protection: The Proposed Action will best meet the objective of ensuring that the St. Mary's Cemetery will be protected from livestock impacts. While no costs would be incurred by not implementing this treatment, the certainty of livestock impacts to the cemetery is unacceptable.

2012 Longhorn Fire Complex
Cost/Risk Analysis – Forestry

Part 1. Treatment Cost

Treatments	Cost
Short-Term Tree Hazard Mitigation	$34084.
Total	**$34084.**

Part 2. Probability of Rehabilitation Treatments Successfully Meeting ESR Objectives

Treatments	Units	%
Short-Term Hazard Tree Mitigation	512	90

Risk of Resource Value Loss or Damage

No Action-Treatment Not Implemented (check one)

Resource Value	None	Low	Mid	High
Lives			x	
Residential & Commercial Property		x		
Water Quality & Soil Productivity	x			
Cultural Resources		x		
Roads	x			

Proposed Action ☐ Treatments Successfully Implemented (check one)

Resource Value	None	Low	Mid	High
Lives	x			
Residential & Commercial Property	x			
Water Quality & Soil Productivity	x			
Cultural Resources		x		
Roads	x			

PART 3. SUMMARY

1. Are the risks to natural resources and private property **acceptable** as a result of the fire if the following actions are taken?

Proposed Action Yes [X] No [ ] Rationale for Answer:

Short-Term Tree Mitigation: Implementation of the proposed action poses no risks to natural resources or private property. Short-Term Tree Hazards have been identified that put Public Safety at risk. Felling these trees will alleviate the threat to recreational use of developed sites and roads.

No Action Yes [ ] No [X] Rational for answer:

Short-Term Tree Hazard Mitigation: Failure to remove short-term hazard trees will result in unacceptable risks to Public Safety, thereby rendering certain recreational sites and roads unsafe.

Alternative(s) Yes [X] No [ ] Rationale for answer:

Short-Term Tree Hazard Mitigation: There is no alternative other than to remove tree hazards (proposed action), or leave hazard trees standing (no action alternative).

2. Is the probability of success of the proposed action, alternatives or no action acceptable given their costs?

Proposed Action Yes [X] No [ ] Rational for answer:

Short-Term Tree Hazard Mitigation: Given the high probability of success and resulting removal of the threat to Public Safety on recreational sites and roads by felling short-term hazard trees, the modest cost for treatment implementation is acceptable.

No Action Yes [ ] No [X] Rational for answer:

Short-Term Tree Hazard Mitigation: The No Action Alternative will not address the risks to Public Safety from short-term hazard trees located within recreational sites and roads. The costs to Public Safety are unacceptable.

3. Which approach will most cost-effectively and successfully attain the Emergency Stabilization and Rehabilitation objectives and therefore is recommended for implementation from a Cost/Risk Analysis standpoint?

Proposed Action Yes [X] No [ ] Rational for answer:

Short-Term Tree Hazard Mitigation: Only through implementation of the proposed action can the threat to Public Safety from short-term tree hazards on recreational sites and roads be addressed. Costs to implement the proposed action are nominal given the importance of ensuring Public Safety.

2012 Longhorn Fire Complex
Cost/Risk Analysis – Facility and Infrastructure

Part 1. Treatment Cost

Treatments	Cost
Repair Exclusion Fence	$11652.
Total	**$11,652**

Part 2. Probability of Rehabilitation Treatments Successfully Meeting ESR Objectives

Treatments	Units	%
Repair Exclusion Fence	5.8	90

Risk of Resource Value Loss or Damage

No Action-Treatment Not Implemented (check one)

Resource Value	None	Low	Mid	High
Lives				x
Residential & Commercial Property			x	
Water Quality & Soil Productivity	x			
Cultural Resources	x			
Roads			x	

Proposed Action ☐ Treatments Successfully Implemented (check one)

Resource Value	None	Low	Mid	High
Lives		x		
Residential & Commercial Property		x		
Water Quality & Soil Productivity	x			
Cultural Resources		x		
Roads		x		

PART 3. SUMMARY

1. Are the risks to natural resources and private property **acceptable** as a result of the fire if the following actions are taken?

Proposed Action Yes [X] No [ ] Rationale for Answer:

Repair Exclusion Fence: There expected to be no risks to natural resources or private property resultant from implementation of the proposed action. The repair of several miles of rangeland fencing along several highways' Rights-of-Way (ROW) will serve to exclude livestock and in doing so protect and ensure Public Safety.

No Action Yes [ ] No [X] Rational for answer:

Repair Exclusion Fence: Failure to implement this treatment may result in unacceptable risks to Public Safety and concomitant risks to natural resources and private property. Under the No Action Alternative livestock would pose a risk to vehicular traffic along several highways' ROWs.

Alternative(s) Yes [X] No [ ] Rationale for answer:

Repair Exclusion Fence: No viable alternative exists that would address this issue.

2. Is the probability of success of the proposed action, alternatives or no action acceptable given their costs?

Proposed Action Yes [X] No [ ] Rational for answer:

Repair Exclusion Fence: There is a high probability of success if the proposed action is implemented. For a modest and acceptable cost, Public Safety would be significantly improved by the exclusion of livestock from several highways' ROWs.

No Action Yes [ ] No [X] Rational for answer:

Repair Exclusion Fence: Failure to exclude livestock from several highway ROWs will result in unacceptable risks to Public Safety.

3. Which approach will most cost-effectively and successfully attain the Emergency Stabilization and Rehabilitation objectives and therefore is recommended for implementation from a Cost/Risk Analysis standpoint?

Proposed Action Yes [X] No [ ] Rational for answer:

Repair Exclusion Fence: There exists no other reasonable approach to the exclusion of livestock from several highways' ROWs. Furthermore, the proposed action is both cost-effective and has a high probability for success.

2012 Longhorn Fire Complex
Cost/Risk Analysis – Watershed

Part 1. Treatment Cost

Treatments	Cost
Storm Patrol	$30,150.
Reservoir Patrol	$16,254.
Culvert Upsize	$ 9880.
Flood Warning Signs	$ 5038.
Total	**$61322.**

Part 2. Probability of Rehabilitation Treatments Successfully Meeting ESR Objectives

Treatments	Units	%
Storm Patrol	2	80
Reservoir Patrol	2	80
Culvert Upsize	2	90
Flood Warning Signs	1	80

Risk of Resource Value Loss or Damage

No Action-Treatment Not Implemented (check one)

Resource Value	None	Low	Mid	High
Lives				x
Residential & Commercial Property				x
Water Quality & Soil Productivity				x
Cultural Resources			x	
Roads				x

Proposed Action ☐ Treatments Successfully Implemented (check one)

Resource Value	None	Low	Mid	High
Lives		x		
Residential & Commercial Property		x		
Water Quality & Soil Productivity		x		
Cultural Resources		x		
Roads		x		

PART 3. SUMMARY

1. Are the risks to natural resources and private property **acceptable** as a result of the fire if the following actions are taken?

Proposed Action Yes [X] No [ ] Rationale for Answer:

Storm Patrol: There are no anticipated risks to natural resources and private property as the result of implementing the proposed action. Ensuring that culverts are kept free of debris will significantly reduce the probability of inundation, debris deposition, flood damage, and other post-fire impacts resultant from elevated flow events.

Reservoir Patrol: There are no anticipated risks to natural resources and private property as the result of implementing the proposed action. Ensuring that reservoir spillways and inlets are kept free of debris will significantly reduce the risk of earthen dam failure and the concomitant risk to travelers along roads below the reservoirs.

Culvert Upsize: There are no risks to natural resources and private property expected as the result of implementing the proposed action. Two culverts were identified as inadequate to accommodate elevated flows and associated debris expected from post-fire watershed events. The upsize of these two culverts will significantly reduce downstream risks resultant from high runoff.

Flood Warning Signs: There are no risks to natural resources and private property that would result from implementation of the proposed action. Warnings as to the dangers of flooding associated with stream crossings and within a burn area where hazards include falling trees and limbs, rolling debris, and flash floods will serve to increase awareness of these significant public health and safety issues.

No Action Yes [ ] No [X] Rational for answer:

Storm Patrol: Risks to natural resources and private property are certain to be elevated should the proposed action not be implemented. Culverts that are plugged or otherwise compromised will result in unconstrained transport of sediment and debris that may pose significant and unacceptable risks.

Reservoir Patrol: Risks to natural resources and private property are certain to be elevated should the proposed action not be implemented. Reservoir inlets and spillways that are choked with debris may during high flow events cause earthen dams to fail thereby creating unacceptable and significant risks.

Culvert Upsize: There will be significant risks to natural resources and private property should the proposed action not be implemented. Inadequate culvert sizing will severely limit the capacity for processing post-fire related increases in stream flow to a level that is unacceptable.

Flood Warning Signs: Significant risks to public health and safety will be the cost of not implementing the proposed action. The public needs to be made aware of the risks inherent in a post-fire environment and to not provide this information is unacceptable.

Alternative(s) Yes [X] No [ ] Rationale for answer:

Storm Patrol: There are no viable alternatives to the proposed action
Reservoir Patrol: see Storm Patrol, above.

Culvert Upsize: see Storm Patrol, above.
Flood Warning Signs: see Storm Patrol, above.

2. Is the probability of success of the proposed action, alternatives or no action acceptable given their costs?

Proposed Action Yes [X] No [ ] Rational for answer:

Storm Patrol: The probability of success by implementing the proposed action is sufficient to justify the modest costs that will be incurred, particularly when considering the certain and unacceptable risks that would result otherwise.

Reservoir Patrol: See Storm Patrol, above.
Culvert Upsize: See Storm Patrol, above.
Flood Warning Signs: See Storm Patrol, above.

No Action Yes [ ] No [X] Rational for answer:

Storm Patrol: The risks posed by unregulated flows and associated debris deposition are unacceptable when compared with the modest costs of implementing the proposed action.

Reservoir Patrol: The risks posed by earthen dam failure resultant from accumulation of debris at inlets and spillways are unacceptable when compared with the modest cost of implementing the proposed action.

Culvert Upsize: See Storm Patrol, above.

Flood Warning Signs: The risks posed by not informing the public of the health and safety hazards associated with post-fire environments is unacceptable when compared with the modest cost of implementing the proposed action.

3. Which approach will most cost-effectively and successfully attain the Emergency Stabilization and Rehabilitation objectives and therefore is recommended for implementation from a Cost/Risk Analysis standpoint?

Proposed Action Yes [X] No [ ] Rational for answer:

Storm Patrol: The proposed action is the only viable and cost effective alternative to ensure that culverts are cleaned on a regular basis, thereby greatly reducing the risks posed by elevated flow events. The probability of success is commensurate with the modest costs for implementation.

Reservoir Patrol: The proposed action is the is the only viable and cost effective alternative for ensuring that reservoir inlets and spillways are kept free of debris, thereby significantly reducing the risk of earthen dam failure and resultant downstream effects. The probability of success is commensurate with the modest costs for implementation.

Culvert Upsize: The proposed action represents the only alternative for ensuring capacity necessary for processing elevated stream flows that are expected from post-fire watershed events. The probability of success is commensurate with the modest costs for implementation.

Flood Warning Signs: The proposed action represents the only practical alternative for ensuring that the public is apprised of the risks associated with a post-fire landscape. The probability of success is commensurate with the modest costs for implementation.

Rosebud Sioux Tribe
Game, Fish & Parks

1165 Circle Drive
PO Box 300
Rosebud, SD 57570-0300
Phone 605-747-2289 Fax 605-747-2809
Toll-Free 1-888-747-8686
www.rstgfp.net

BAER MEETING SUMMARY
For the 08-01-2012 Meeting
Valentine, NE

To all interested parties:

After our 44,000 acre fire that took place, there are four major steps that need to be taken. The first step is the initial *suppression rehabilitation*, which is carried out by a different team that the BAER plan does not cover. After phase one is complete, the next step is *Emergency Stabilization (ES)*, which needs to be implemented within one year from the day the fire was deemed "contained." The third step is the *Burn Area Rehabilitation (BAR)*, which is non-emergency rehab and needs to be implemented within 3 years. The fourth and final phase is *restoration* of the burn area. The BAER, Burn Area Emergency Response, plan is a combination of steps 2 and 3.

The first of the BAER Plan meetings was more of an informational meeting than anything. The team members discussed what data they had, and what they still needed. One of the first topics discussed was that of assessing the risk value downstream from the effected dams/reservoirs. They were asking for historical data on flooding in the area, and what housing, if any, could potentially be at risk. Elton from BIA gave what information he knew and he suggested that the team leaders contact Mr. Syed Huq from Water Resources to possibly get more useful information.

The next discussion was on possible aid for damaged fences. The first issue is that a full field assessment needs to be completed to determine the condition of the fence. If the fence is usable, it will be reported as such. If the fence is damaged, however, someone will first have to determine the pre-existing condition of the fence to see if the fence was old or new or in a condition that is eligible to receive financial aid. The team will do some assessments but the Tribe and operators should also be documenting the damage themselves, with photos when possible. Because the BAER process is designed for Natural Resources, only perimeter fencing, such as those associated with Rights-Of-Way, are eligible to be paid for through BAER. I was told that the NRCS may have funding available for any interior pasture fence damage repair and that the Tribe and permittees should work with this agency as much as they can for supplemental funding sources.

There was a small discussion on providing the BAER team with some land status/ownership data to speed up the work, but Sonny from BIA will be assisting the team with those land issues.

For today, August 2, 2012, the team was going to spend the morning gathering data from the appropriate Tribal departments, as well as doing more aerial surveys from a helicopter. This afternoon, the team will get into the field and do on the ground surveys. The team will also be getting their BARC imaging this afternoon and will be able to get a lot of assessment done via the BARC, as well. BARC is an acronym for Burn Area Reflectance Classification and it is a specialized satellite imagery that will be used to perform more detail assessment over a large area. Otherwise, the time frame for the field assessments would take quite a bit longer. There will be a satellite image from both before the fire and after to compare the two.

There was some discussion on the NEPA requirements and the important role the THPO plays in this process. There was some confusion because our Tribe has unique laws that the team was unaware of, but a meeting was scheduled to discuss these issues.

If the Tribe has any wishes that any reseeding or other rehabilitation take place on the fire trails or other areas that meet criteria for rehab, now would be the time to think about and identify these areas.

I will be attending these meetings every evening at 7, so if you would like me to take any issues that you have for discussion please email them to me. I will be giving updates as they become available. Please contact me if you have any questions or concerns. The office phone number is 605-747-2289 or my cell phone is 605-828-6197 and email is rstgfp@gwtc.net .

Thank you for your time and attention to this matter.

Respectfully,

Emily Boyd, Biologist

Rosebud Sioux Tribe
Game, Fish & Parks

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Rosebud, SD 57570-0300
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Toll-Free 1-888-747-8686
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BAER MEETING SUMMARY
For the 08-02-2012 Meeting
Valentine, NE

To all interested parties:

The following were topics that were discussed at this meeting:

- ➔ Any individuals or Tribal programs that have any photos of the fire or damage that they would like to include in the assessment report should provide them to myself or a member of the BAER team.
- ➔ The BARC imagery is now available. Mr. Hawk Wing from BIA received a digital copy of the satellite imagery. It is worth noting that the data received at this meeting is in "raw data" form. The team wanted to stress this point because the data has not been field verified and could change after they have had time to check the actual field conditions and compare to the remotely sensed data.
- ➔ Mr. Dan Hall, an archaeologist for the fire, arrived and is now available and would be beneficial to meet with the THPO. I did ask about a known site, the Running Horse house and site, and was told that it did burn. So, this might want to be discussed if a meeting does take place with THPO.
- ➔ As far as hydrology is concerned, there was good news after the initial aerial surveys. The watersheds that were burned are showing that a lot of buffering vegetation is still intact. This buffering vegetation is estimated to be in 80-90% of the watershed channels, and include both the riparian vegetation along with live trees along the riparian zone. This *buffer zone* acts as both a stabilizing agent, as well as a filtering mechanism for any pollutants in the watershed to minimize the contamination of the dams/reservoirs. More surveying is needed, but from this initial assessment, the flooding risk is estimated at low to moderate.
- ➔ Like many of us know, the soils in this area are very sandy and prone to high erosion activity. The good news is that the grass and vegetation cover create a crust like mat on the sandy soil and their root structure is really the only stabilizing factor. There is a concern that if the fire burned so hot as to result in total vegetation loss and cannot regenerate, the soil would erode drastically and there is not much, in terms of rehabilitation, that could be done. The field guys will be checking some areas of concern, but nothing at this time shows that any irreversible damage has been done.
- ➔ From the aerial surveys, the fire pattern appeared to show that the fire moved quickly, and that there was a high level of live fuel moisture. On average, it appears that there was a 50% mortality rate on the timber, with some areas higher

than others. Another promising sign is that there are quite a few cones left on the remaining live trees. So, hopefully we will have a high level of natural regeneration.

- ➔ As far as fencing goes, there needs to more discussion, and it will start Friday with the team visiting with Sonny Farmer from BIA land operations. At this meeting, however, it was said that there will not be enough time to complete a full fence inventory but the team will instead focus on the fences that can be rehabilitated under this plan, such as perimeter/boundary fences.
- ➔ As for Friday, August 03, 2012, the team will have meetings with a few people but the majority of the day will be spent doing field work.
- ➔ The team also stressed the importance of Tribal involvement at the planning meetings. They are the experts for the BAER process but we hold the knowledge of our Tribal lands and natural resources. So, any affected or interested Tribal entities are invited to attend.

I will be attending these meetings every evening at 7, so if you would like me to take any issues that you have for discussion please email them to me. I will be giving updates as they become available. Please contact me if you have any questions or concerns. The office phone number is 605-747-2289 or my cell phone is 605-828-6197 and email is rstgfp@gwtc.net .

Thank you for your time and attention to this matter.

Respectfully,

Emily Boyd, Biologist

LONGHORN BAER CLOSEOUT August 8, 2012

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MISSION, SOUTH DAKOTA (395620)

Period of Record Monthly Climate Summary

Period of Record : 6/ 2/1966 to 4/30/2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	32.8	36.5	45.7	57.5	68.5	78.8	87.0	85.6	75.8	61.8	45.7	35.2	59.2
Average Min. Temperature (F)	9.7	13.3	22.0	33.0	43.6	53.8	60.0	57.7	46.7	34.1	22.2	12.2	34.0
Average Total Precipitation (in.)	0.38	0.50	1.17	2.26	3.25	3.49	2.75	1.85	1.65	1.57	0.64	0.47	20.00
Average Total SnowFall (in.)	5.9	5.9	8.2	5.0	0.2	0.0	0.0	0.0	0.1	1.5	5.2	6.3	38.2
Average Snow Depth (in.)	2	1	1	0	0	0	0	0	0	0	1	2	1

Percent of possible observations for period of record:

Max. Temp.: 98.7% Min. Temp.: 99.1% Precipitation: 99.7% Snowfall: 96.9% Snow Depth: 93.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

High Plains Regional Climate Center, contact us.

MISSION, SOUTH DAKOTA

Period of Record General Climate Summary - Precipitation

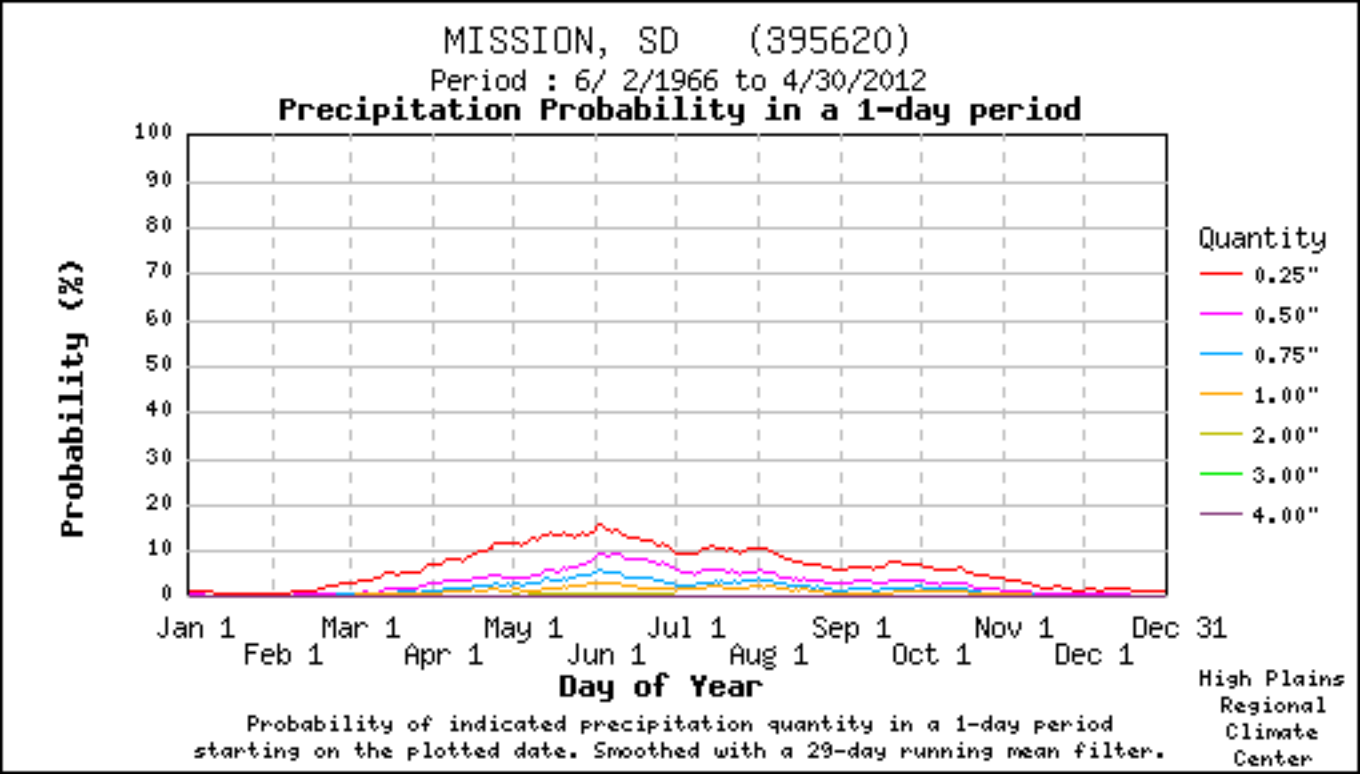
Station:(395620) MISSION

From Year=1966 To Year=2012

	Precipitation											Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	0.38	1.57	2010	0.00	1989	0.76	07/2010	5	1	0	0	5.9	17.3	1996
February	0.50	1.50	2011	0.02	1979	1.08	29/2012	5	2	0	0	5.9	15.6	2011
March	1.17	5.13	1977	0.03	1978	1.22	28/1977	7	3	1	0	8.2	53.0	1977
April	2.26	5.74	1971	0.40	2004	3.34	20/1971	9	5	1	0	5.0	25.3	1995
May	3.25	8.26	1977	0.34	1992	3.43	16/1991	11	7	2	1	0.2	3.0	2002
June	3.49	8.71	2011	0.33	2002	2.85	16/1979	11	6	3	1	0.0	0.0	1966
July	2.75	6.89	1972	0.17	2007	2.29	08/1990	9	6	2	1	0.0	0.0	1966
August	1.85	4.80	1994	0.23	2001	1.93	10/1994	8	4	1	0	0.0	0.0	1966
September	1.65	4.95	1989	0.23	1991	2.83	21/1989	7	4	1	0	0.1	3.0	1985
October	1.57	4.50	1995	0.08	1999	2.77	01/2004	7	4	1	0	1.5	11.0	1970
November	0.64	2.06	1985	0.00	1974	1.23	24/2001	5	2	0	0	5.2	25.0	1985
December	0.47	1.45	2009	0.00	1991	0.65	06/1976	5	2	0	0	6.3	27.0	2009
Annual	20.00	31.54	1977	10.73	1974	3.43	19910516	87	45	12	4	38.2	88.8	1977
Winter	1.35	3.38	2010	0.39	2002	1.08	20120229	15	4	0	0	18.1	43.0	2010
Spring	6.68	15.61	1977	1.99	1992	3.43	19910516	27	15	4	1	13.3	56.0	1977
Summer	8.10	15.06	2011	1.56	2002	2.85	19790616	27	17	5	2	0.0	0.0	1966
Fall	3.87	7.92	1973	0.81	1974	2.83	19890921	18	9	2	1	6.8	28.0	1985

Table updated on May 22,
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

High Plains Regional Climate Center, contact us.


MISSION, SD (395620)
Period : 6/ 2/1966 to 4/30/2012
Precipitation Probability in a 1-day period
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Dec 31
Day of Year
Quantity
0.25"
0.50"
0.75"
1.00"
2.00"
3.00"
4.00"
Probability of indicated precipitation quantity in a 1-day period
starting on the plotted date. Smoothed with a 29-day running mean filter.
High Plains
Regional
Climate
Center

WOOD, SOUTH DAKOTA (399442)

Period of Record Monthly Climate Summary

Period of Record : 1/ 1/1913 to 3/31/2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	34.2	38.9	48.0	61.5	71.8	81.6	90.8	89.3	79.7	66.3	49.2	37.5	62.4
Average Min. Temperature (F)	9.4	13.3	21.9	33.9	44.6	54.5	60.8	59.0	48.9	36.9	24.0	13.7	35.1
Average Total Precipitation (in.)	0.48	0.61	1.21	2.19	3.13	3.38	2.46	1.90	1.52	1.34	0.70	0.47	19.39
Average Total SnowFall (in.)	5.1	5.6	7.4	3.4	0.1	0.0	0.0	0.0	0.1	1.2	4.3	5.1	32.3
Average Snow Depth (in.)	2	2	2	0	0	0	0	0	0	0	1	2	1

Percent of possible observations for period of record:

Max. Temp.: 92.1% Min. Temp.: 92.1% Precipitation: 92.4% Snowfall: 82.8% Snow Depth: 82.5%
Check Station Metadata or Metadata graphics for more detail about data completeness.

High Plains Regional Climate Center, contact us.

WOOD, SOUTH DAKOTA

Period of Record General Climate Summary - Precipitation

Station:(399442) WOOD

From Year=1913 To Year=2012

	Precipitation											Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	0.48	2.53	1944	0.00	1933	2.33	09/1939	4	1	0	0	5.1	19.1	1996
February	0.61	2.99	1953	0.00	1949	1.47	23/1977	4	2	0	0	5.6	21.0	1978
March	1.21	5.24	1977	0.08	1925	2.00	17/1946	5	3	1	0	7.4	38.0	1977
April	2.19	6.33	1968	0.00	1952	2.89	12/1970	7	5	1	0	3.4	38.6	1995
May	3.13	8.84	1962	0.11	2006	2.92	05/1942	9	6	2	1	0.1	4.0	1916
June	3.38	8.13	1947	0.42	1933	3.52	04/1991	10	6	2	1	0.0	0.0	1913
July	2.46	6.79	1989	0.09	2007	4.30	14/1989	7	5	2	0	0.0	0.0	1913
August	1.90	5.94	1922	0.25	1947	4.59	02/1922	6	4	1	0	0.0	0.0	1913
September	1.52	6.09	1946	0.06	1933	1.93	07/1946	5	3	1	0	0.1	4.0	1939
October	1.34	4.70	1998	0.00	1917	2.22	10/1949	5	3	1	0	1.2	11.0	1929
November	0.70	3.16	1920	0.00	1914	2.37	01/1920	4	2	0	0	4.3	22.5	1919
December	0.47	2.21	1951	0.00	1930	1.26	06/1951	4	1	0	0	5.1	18.5	2009
Annual	19.39	33.49	1915	8.92	1934	4.59	19220802	71	43	12	4	32.3	82.0	1995
Winter	1.56	4.57	1953	0.29	1989	2.33	19390109	12	5	1	0	15.7	40.3	1997
Spring	6.53	13.99	1942	1.83	1926	2.92	19420505	22	14	4	1	10.9	50.8	1995
Summer	7.75	15.31	1966	1.96	1936	4.59	19220802	24	16	5	2	0.0	0.0	1913
Fall	3.55	9.44	1946	0.17	1933	2.37	19201101	14	8	2	1	5.6	21.1	1995

Table updated on May 22,
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
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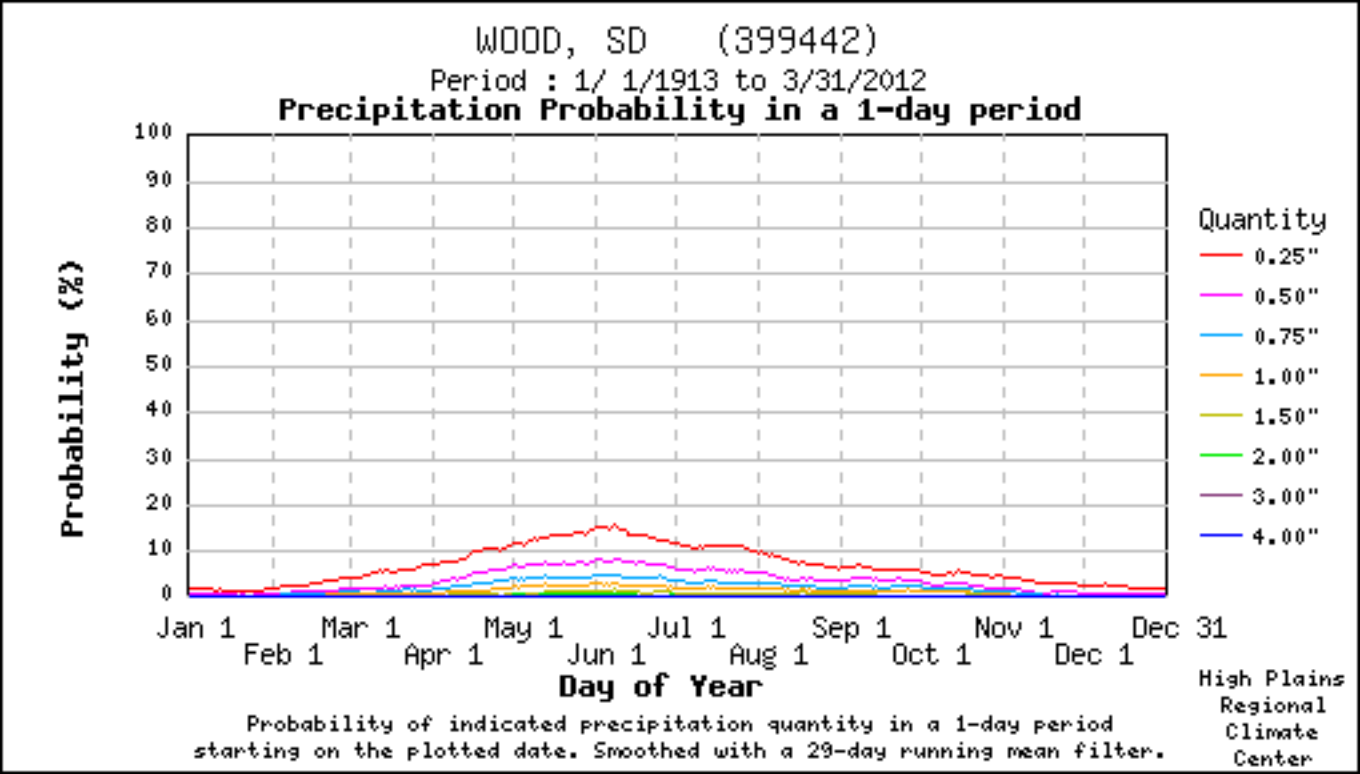
High Plains Regional Climate Center, contact us.


WOOD, SD (399442)
Period : 1/ 1/1913 to 3/31/2012
Precipitation Probability in a 1-day period
Probability (%)
100
90
80
70
60
50
40
30
20
10
0
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Dec 31
Day of Year
Quantity
0.25"
0.50"
0.75"
1.00"
1.50"
2.00"
3.00"
4.00"
Probability of indicated precipitation quantity in a 1-day period
starting on the plotted date. Smoothed with a 29-day running mean filter.
High Plains
Regional
Climate
Center

ERMiT Soil Texture Properties

sandy loam (SW, SP, SM, SC)
Glacial outwash areas; finer-grained granitics and sand

Element 1 --- ERMiT_h4 Soil texture: sandy loam		
Albedo of the bare dry surface soil	0.2	
Initial saturation level of the soil profile porosity	0.75	m m^{-1}
Baseline interrill erodibility parameter (k_i)	3000000	kg s m^{-4}
Baseline rill erodibility parameter (k_r)	0.001	s m^{-1}
Baseline critical shear parameter (τ_c)	2	N m^{-2}
Effective hydraulic conductivity of surface soil (k_e)	5	mm h^{-1}
	layer 1	
Depth from soil surface to bottom of soil layer	400	mm
Percentage of sand	55	%
Percentage of clay	10	%
Percentage of organic matter (by volume)	5	%
Cation exchange capacity	15	meq per 100 g of soil
Percentage of rock fragments (by volume)	5	%

```
95.1
#  WEPP 'sandy loam' 'hhh4' forest soil input file for ERMiT
#  Data from RMRS Soil and Water Engineering Project, Moscow FSL
#  Created by 'createsoilfile' version 2002.11.27
1       0
'ERMiT_h4'      'sandy loam'    1       0.2     0.75    3000000 0.001   2       5
400     55      10      5       15      5
```

Erosion Risk Management Tool

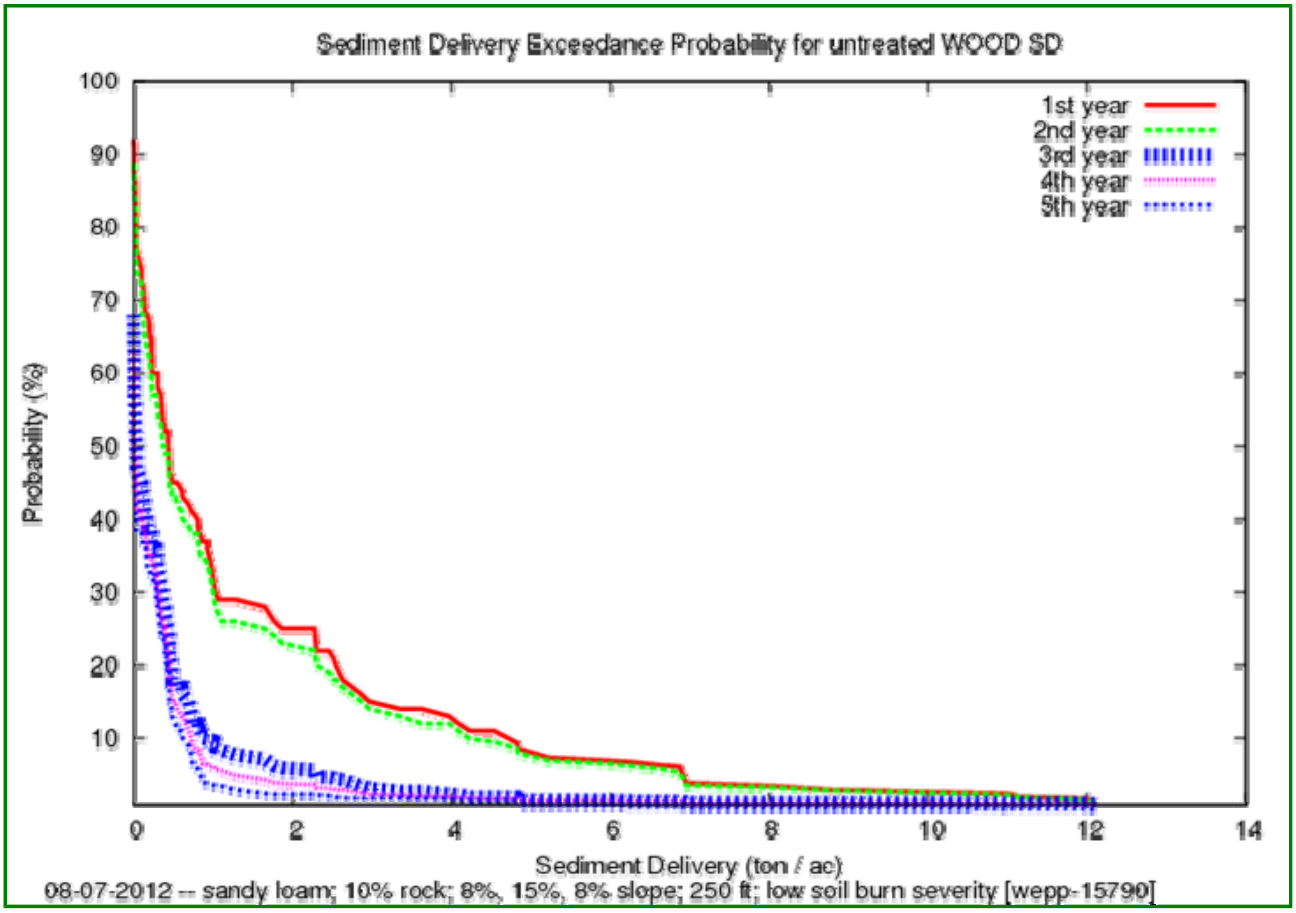
WOOD SD
sandy loam soil texture, **10%** rock fragment
8% top, 15% average, 8% toe hillslope gradient
250 ft hillslope horizontal length
low soil burn severity on **range**
Prefire community **15% shrub, 70% grass, 15% bare**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
1.6	**in**	annual runoff from rainfall from	500	events
0.13	**in**	annual runoff from snowmelt or winter rainstorm from	33	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	2.96	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	2.12	3.93	8.54	4.69	3.82	July 4 year 91
10 (10-year)	1.83	3.93	5.87	2.29	2.08	July 23 year 27
20 (5-year)	1.13	2.31	7.78	5.37	3.56	July 24 year 11
50 (2-year)	0.64	1.40	4.03	3.09	2.09	February 19 year 97
75 ($1^1/_3$-year)	0.41	1.47	6.23	2.30	1.75	July 11 year 29



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	**Event sediment delivery (ton ac^{-1})**				
	Year following fire				
	1st year	**2nd year**	**3rd year**	**4th year**	**5th year**
Untreated	1.04	1.01	0.35	0.3	0.28
Seeding	1.04	0.35	0.3	0.28	0.28
Mulch (0.5 ton ac^{-1})	0.35	0.32	0.35	0.3	0.28
Mulch (1 ton ac^{-1})	0.32	0.3	0.35	0.3	0.28
Mulch (1.5 ton ac^{-1})	0.32	0.29	0.35	0.3	0.28
Mulch (2 ton ac^{-1})	0.32	0.28	0.35	0.3	0.28
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	1.01	0.35	0.3	0.28

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-15790
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

Erosion Risk Management Tool

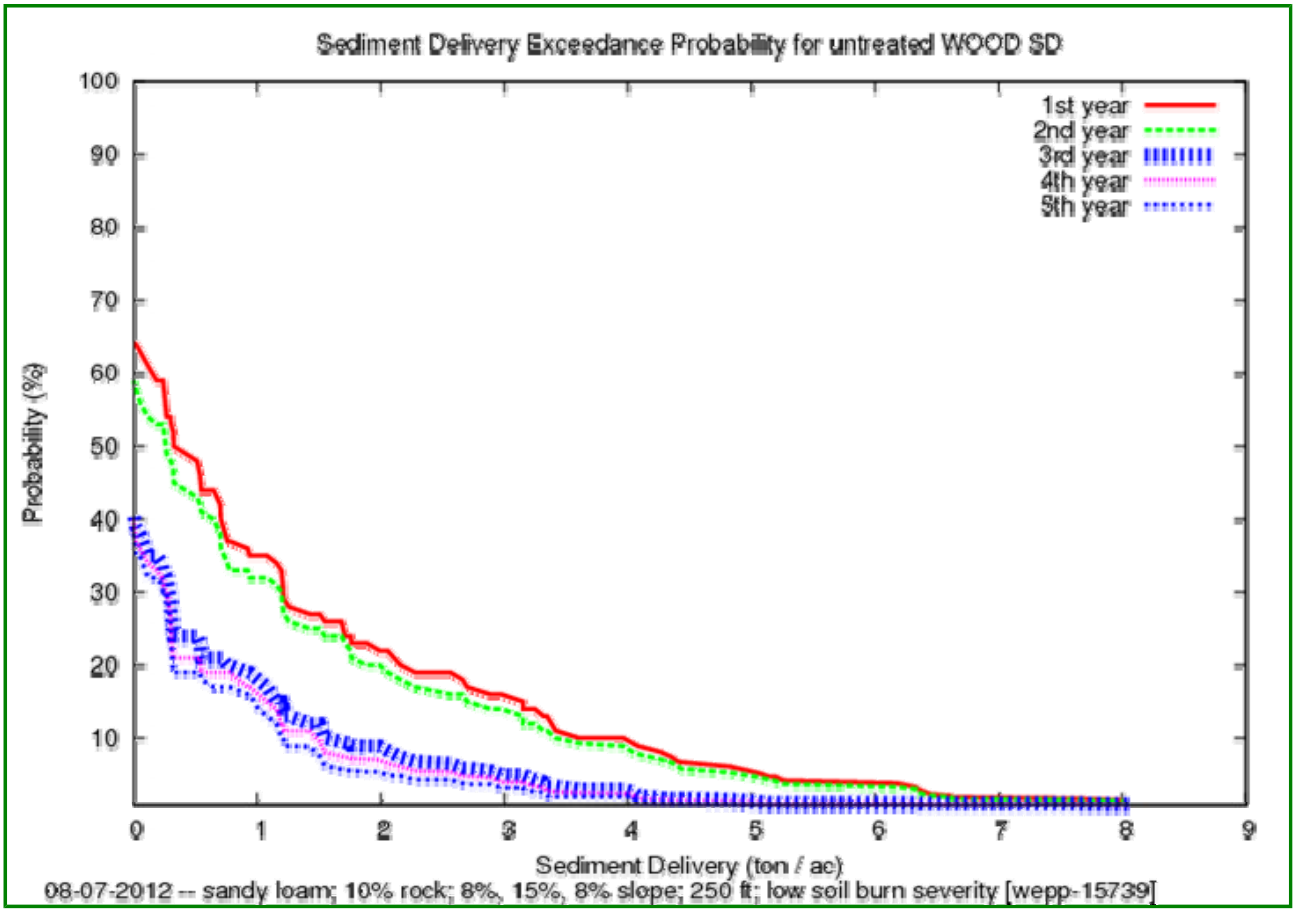
WOOD SD
sandy loam soil texture, **10%** rock fragment
8% top, 15% average, 8% toe hillslope gradient
250 ft hillslope horizontal length
low soil burn severity on **forest**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
2.4	**in**	annual runoff from rainfall from	706	events
0.15	**in**	annual runoff from snowmelt or winter rainstorm from	38	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	3.25	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	**2.30**	**3.93**	**8.54**	**4.69**	**3.82**	**July 4 year 91**
10 (10-year)	**2.02**	**3.40**	**3.84**	**5.25**	**4.02**	**June 1 year 75**
20 (5-year)	**1.31**	**2.35**	**2.60**	**4.00**	**2.98**	**June 4 year 46**
50 (2-year)	**0.81**	**1.40**	**4.03**	**3.09**	**2.09**	**February 19 year 97**
75 ($1^1/_3$-year)	**0.56**	**1.62**	**3.83**	**1.14**	**1.02**	**May 14 year 80**



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	Event sediment delivery (ton ac^{-1})				
	Year following fire				
	1st year	2nd year	3rd year	4th year	5th year
Untreated	1.21	1.2	0.29	0.27	0.24
Seeding	1.21	0.29	0.27	0.24	0.24
Mulch (0.5 ton ac^{-1})	0.3	0.28	0.29	0.27	0.24
Mulch (1 ton ac^{-1})	0.29	0.27	0.29	0.27	0.24
Mulch (1.5 ton ac^{-1})	0.29	0.25	0.29	0.27	0.24
Mulch (2 ton ac^{-1})	0.29	0.24	0.29	0.27	0.24
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	0	0	0	0

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-15739
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

Erosion Risk Management Tool

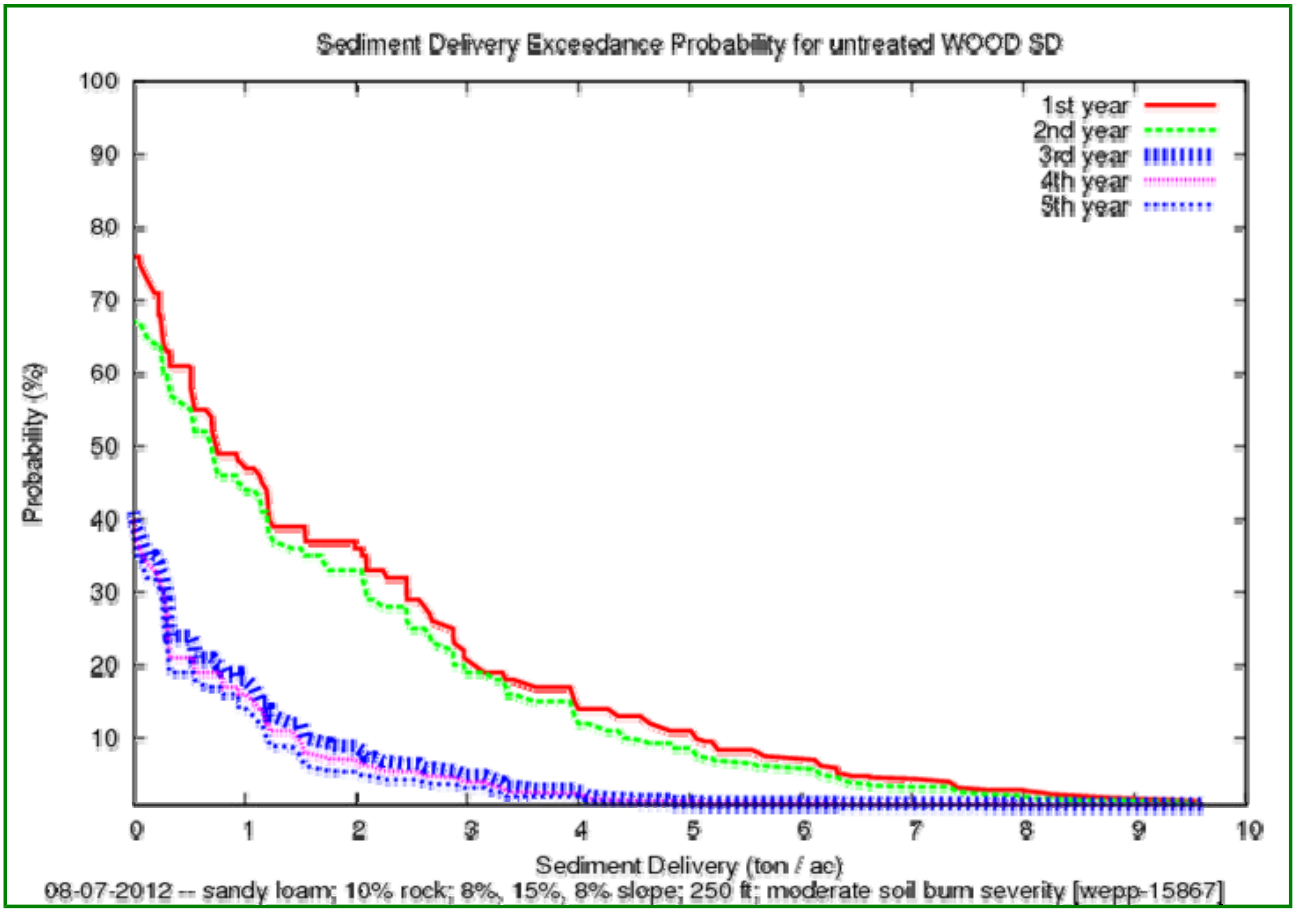
WOOD SD
sandy loam soil texture, **10%** rock fragment
8% top, 15% average, 8% toe hillslope gradient
250 ft hillslope horizontal length
moderate soil burn severity on **forest**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
2.4	**in**	annual runoff from rainfall from	706	events
0.15	**in**	annual runoff from snowmelt or winter rainstorm from	38	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	3.25	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	**2.30**	**3.93**	**8.54**	**4.69**	**3.82**	**July 4 year 91**
10 (10-year)	**2.02**	**3.40**	**3.84**	**5.25**	**4.02**	**June 1 year 75**
20 (5-year)	**1.31**	**2.35**	**2.60**	**4.00**	**2.98**	**June 4 year 46**
50 (2-year)	**0.81**	**1.40**	**4.03**	**3.09**	**2.09**	**February 19 year 97**
75 ($1^1/_3$-year)	**0.56**	**1.62**	**3.83**	**1.14**	**1.02**	**May 14 year 80**



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	Event sediment delivery (ton ac^{-1})				
	Year following fire				
	1st year	2nd year	3rd year	4th year	5th year
Untreated	2.46	2.11	0.29	0.27	0.24
Seeding	2.46	0.82	0.27	0.24	0.24
Mulch (0.5 ton ac^{-1})	0.82	0.62	0.29	0.27	0.24
Mulch (1 ton ac^{-1})	0.32	0.32	0.29	0.27	0.24
Mulch (1.5 ton ac^{-1})	0.31	0.31	0.29	0.27	0.24
Mulch (2 ton ac^{-1})	0.31	0.31	0.29	0.27	0.24
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	0	0	0	0

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-15867
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

Erosion Risk Management Tool

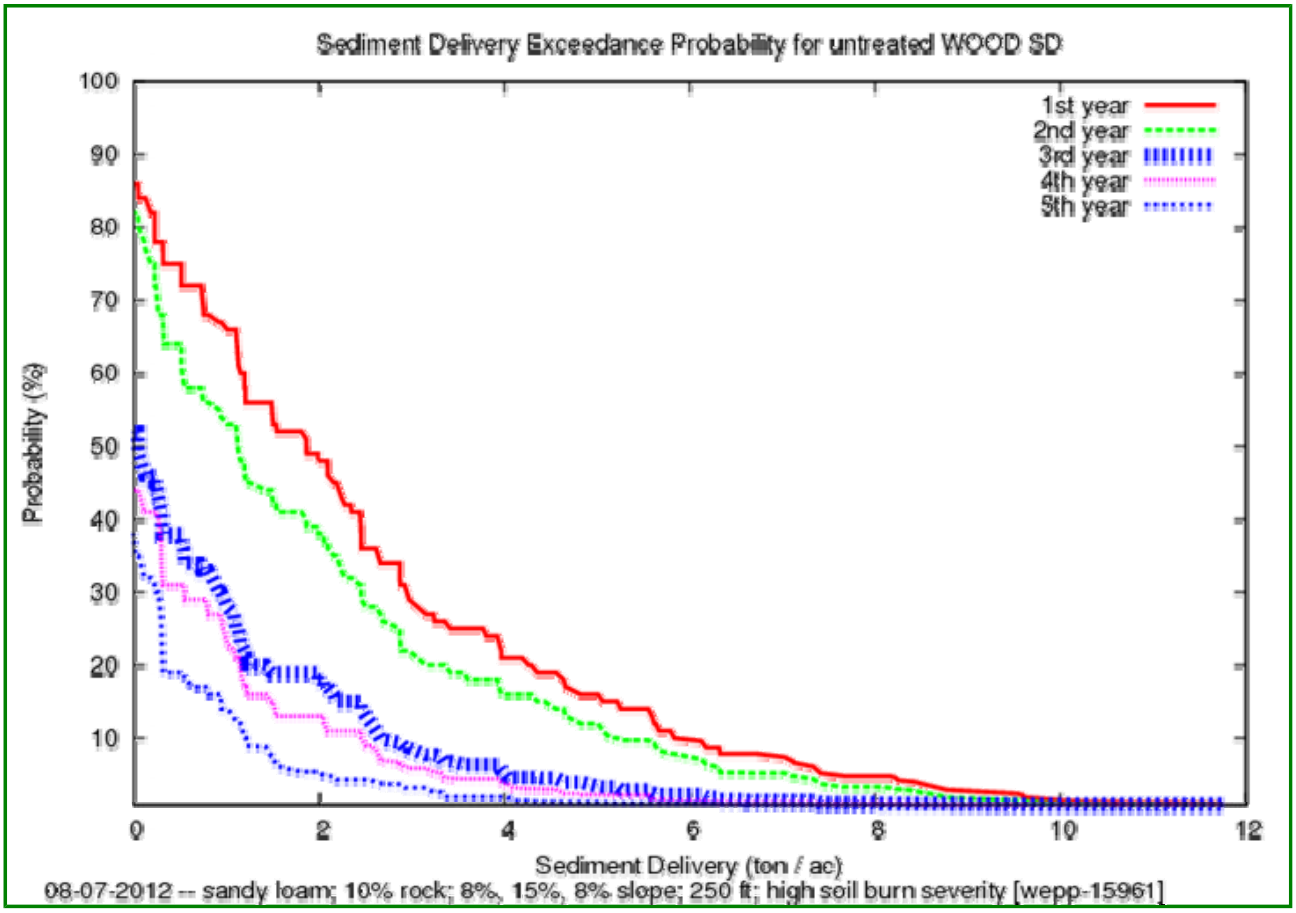
WOOD SD
sandy loam soil texture, **10%** rock fragment
8% top, 15% average, 8% toe hillslope gradient
250 ft hillslope horizontal length
high soil burn severity on **forest**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
2.4	**in**	annual runoff from rainfall from	706	events
0.15	**in**	annual runoff from snowmelt or winter rainstorm from	38	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	3.25	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	**2.30**	**3.93**	**8.54**	**4.69**	**3.82**	**July 4 year 91**
10 (10-year)	**2.02**	**3.40**	**3.84**	**5.25**	**4.02**	**June 1 year 75**
20 (5-year)	**1.31**	**2.35**	**2.60**	**4.00**	**2.98**	**June 4 year 46**
50 (2-year)	**0.81**	**1.40**	**4.03**	**3.09**	**2.09**	**February 19 year 97**
75 ($1^1/_3$-year)	**0.56**	**1.62**	**3.83**	**1.14**	**1.02**	**May 14 year 80**



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	Event sediment delivery (ton ac^{-1})				
	Year following fire				
	1st year	2nd year	3rd year	4th year	5th year
Untreated	2.95	2.46	0.95	0.6	0.24
Seeding	2.95	1.08	0.87	0.31	0.24
Mulch (0.5 ton ac^{-1})	0.99	0.95	0.95	0.6	0.24
Mulch (1 ton ac^{-1})	0.94	0.94	0.95	0.6	0.24
Mulch (1.5 ton ac^{-1})	0.94	0.94	0.95	0.6	0.24
Mulch (2 ton ac^{-1})	0.94	0.94	0.95	0.6	0.24
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	0	0	0	0

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-15961
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

Erosion Risk Management Tool

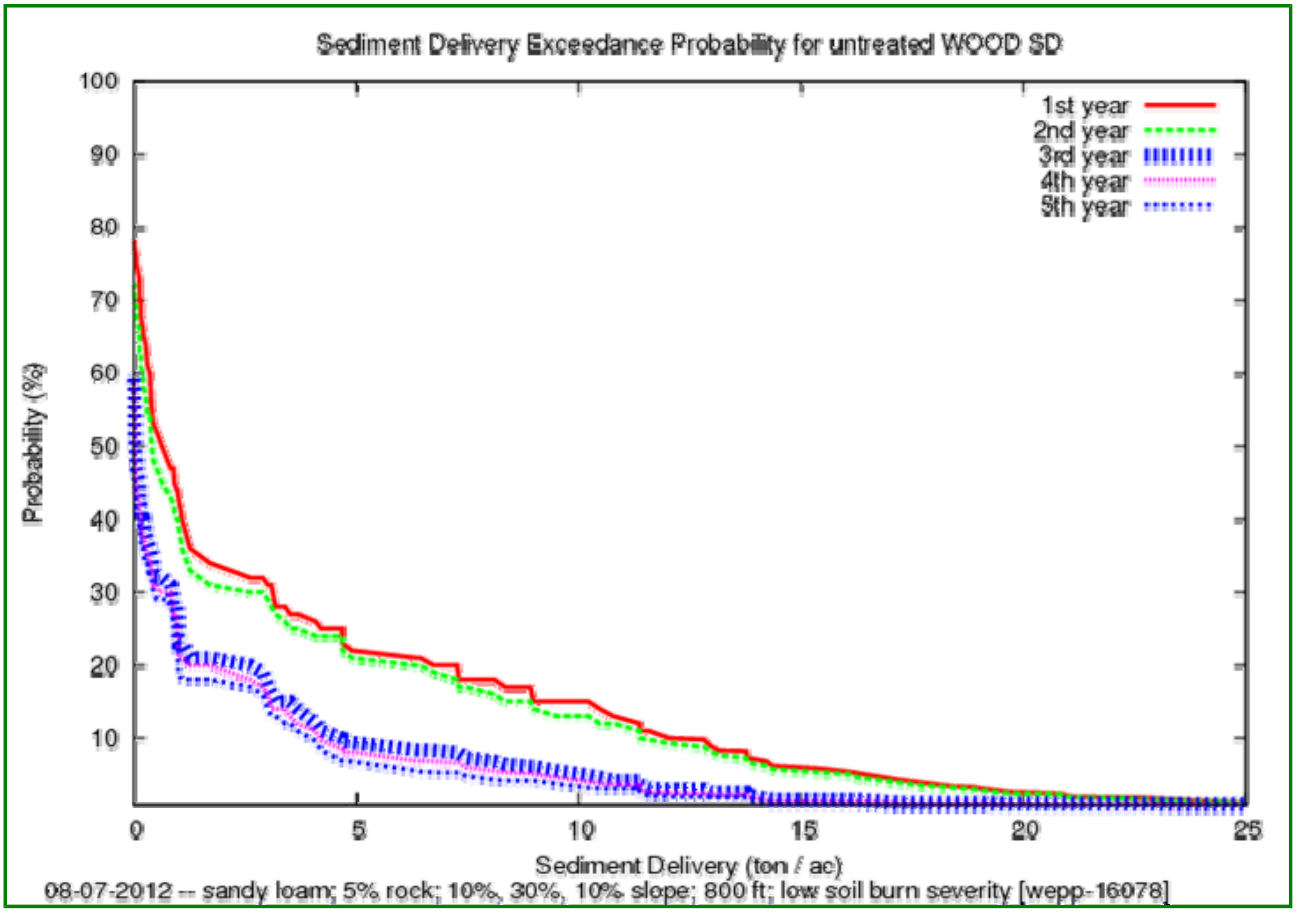
WOOD SD
sandy loam soil texture, **5%** rock fragment
10% top, 30% average, 10% toe hillslope gradient
800 ft hillslope horizontal length
low soil burn severity on **forest**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
2.1	**in**	annual runoff from rainfall from	703	events
0.15	**in**	annual runoff from snowmelt or winter rainstorm from	44	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	3.24	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	**2.29**	**3.93**	**8.54**	**4.69**	**3.82**	**July 4 year 91**
10 (10-year)	**2.01**	**3.40**	**3.84**	**5.25**	**4.02**	**June 1 year 75**
20 (5-year)	**1.30**	**2.35**	**2.60**	**4.00**	**2.98**	**June 4 year 46**
50 (2-year)	**0.83**	**1.02**	**2.37**	**1.48**	**1.16**	**March 1 year 92**
75 ($1^1/_3$-year)	**0.55**	**1.62**	**3.83**	**1.14**	**1.02**	**May 14 year 80**



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	Event sediment delivery (ton ac^{-1})				
	Year following fire				
	1st year	2nd year	3rd year	4th year	5th year
Untreated	3.13	2.55	0.85	0.82	0.44
Seeding	3.13	0.85	0.82	0.44	0.44
Mulch (0.5 ton ac^{-1})	0.9	0.84	0.85	0.82	0.44
Mulch (1 ton ac^{-1})	0.88	0.63	0.85	0.82	0.44
Mulch (1.5 ton ac^{-1})	0.88	0.44	0.85	0.82	0.44
Mulch (2 ton ac^{-1})	0.87	0.44	0.85	0.82	0.44
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	0	0	0	0

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-16078
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

Erosion Risk Management Tool

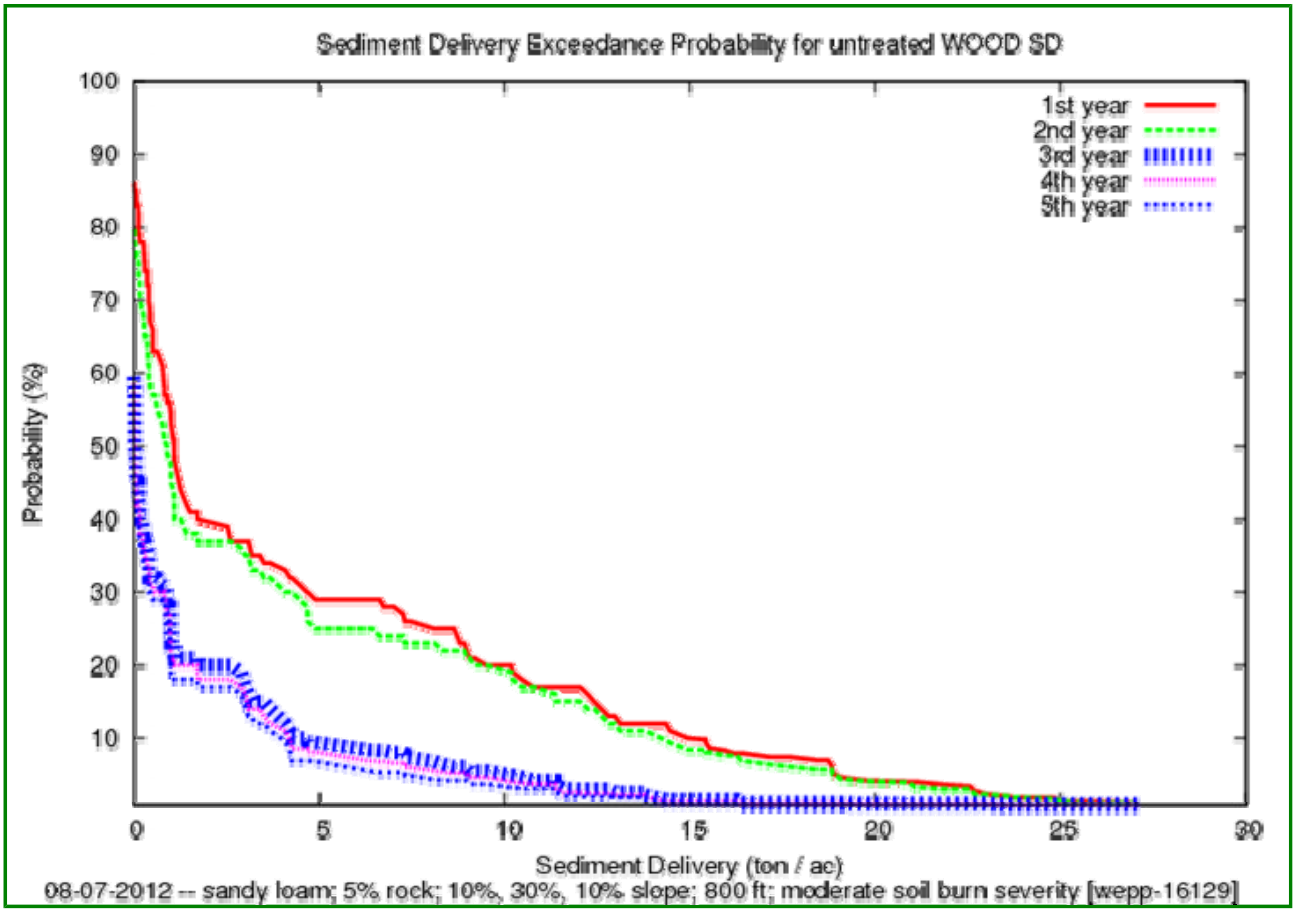
WOOD SD
sandy loam soil texture, **5%** rock fragment
10% top, 30% average, 10% toe hillslope gradient
800 ft hillslope horizontal length
moderate soil burn severity on **forest**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
2.1	**in**	annual runoff from rainfall from	703	events
0.15	**in**	annual runoff from snowmelt or winter rainstorm from	44	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	3.24	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	**2.29**	**3.93**	**8.54**	**4.69**	**3.82**	**July 4 year 91**
10 (10-year)	**2.01**	**3.40**	**3.84**	**5.25**	**4.02**	**June 1 year 75**
20 (5-year)	**1.30**	**2.35**	**2.60**	**4.00**	**2.98**	**June 4 year 46**
50 (2-year)	**0.83**	**1.02**	**2.37**	**1.48**	**1.16**	**March 1 year 92**
75 ($1^1/_3$-year)	**0.55**	**1.62**	**3.83**	**1.14**	**1.02**	**May 14 year 80**



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	Event sediment delivery (ton ac^{-1})				
	Year following fire				
	1st year	2nd year	3rd year	4th year	5th year
Untreated	4.75	4.28	0.85	0.82	0.44
Seeding	4.75	1.01	0.82	0.44	0.44
Mulch (0.5 ton ac^{-1})	1.13	1	0.85	0.82	0.44
Mulch (1 ton ac^{-1})	1	0.99	0.85	0.82	0.44
Mulch (1.5 ton ac^{-1})	1	0.99	0.85	0.82	0.44
Mulch (2 ton ac^{-1})	1	0.99	0.85	0.82	0.44
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	0	0	0	0

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-16129
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

Erosion Risk Management Tool

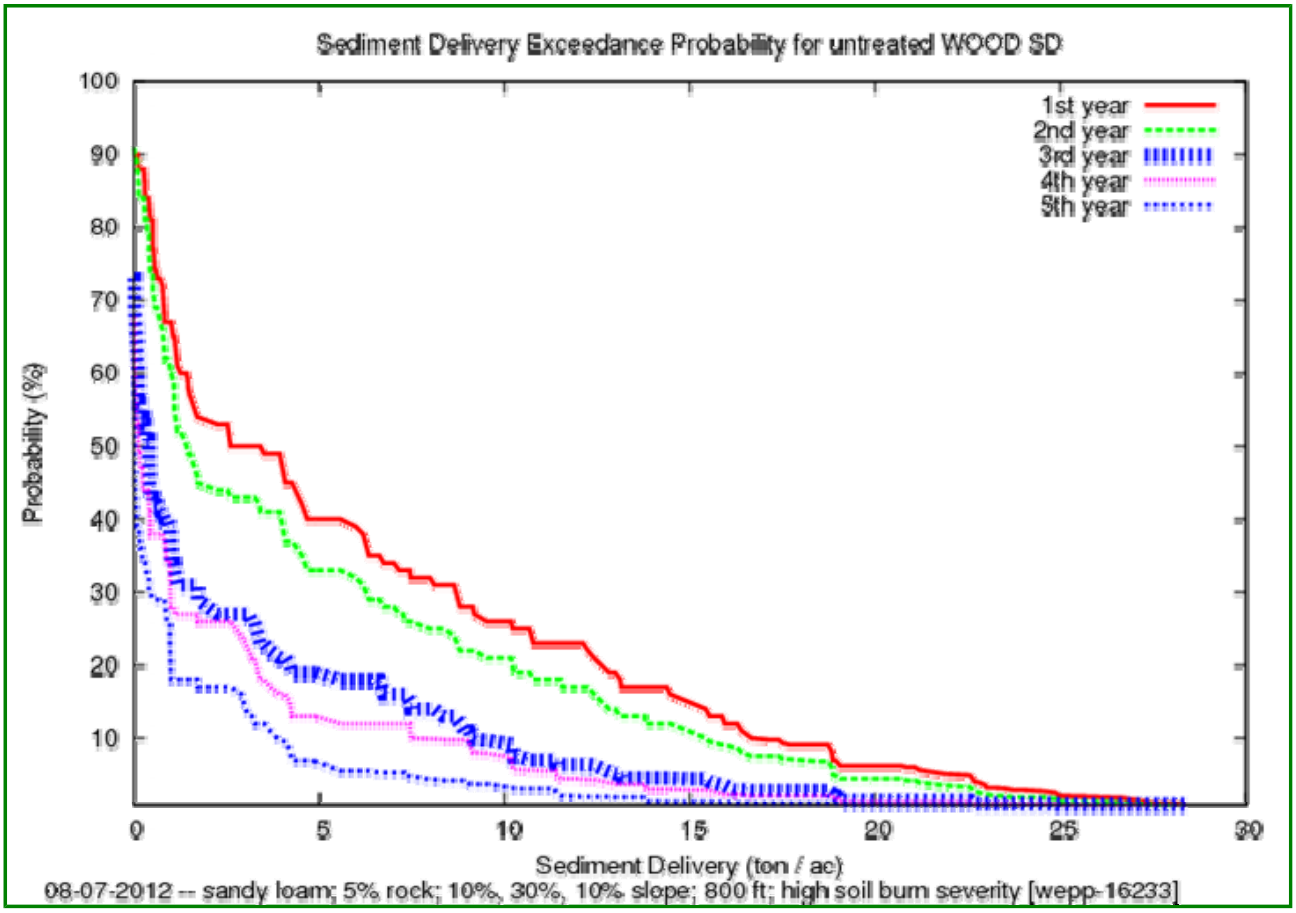
WOOD SD
sandy loam soil texture, **5%** rock fragment
10% top, 30% average, 10% toe hillslope gradient
800 ft hillslope horizontal length
high soil burn severity on **forest**

100 - YEAR MEAN ANNUAL AVERAGES

			Total in 100 years	
19	**in**	annual precipitation from	6186	storms
2.1	**in**	annual runoff from rainfall from	703	events
0.15	**in**	annual runoff from snowmelt or winter rainstorm from	44	events

Rainfall Event Rankings and Characteristics from the Selected Storms

Storm Rank based on runoff (return interval)	Storm Runoff (in)	Storm Precipitation (in)	Storm Duration (h)	10-min Peak Rainfall Intensity (in h^{-1})	30-min Peak Rainfall Intensity (in h^{-1})	Storm Date
1	3.24	5.16	7.39	2.41	2.24	June 29 year 40
5 (20-year)	**2.29**	**3.93**	**8.54**	**4.69**	**3.82**	**July 4 year 91**
10 (10-year)	**2.01**	**3.40**	**3.84**	**5.25**	**4.02**	**June 1 year 75**
20 (5-year)	**1.30**	**2.35**	**2.60**	**4.00**	**2.98**	**June 4 year 46**
50 (2-year)	**0.83**	**1.02**	**2.37**	**1.48**	**1.16**	**March 1 year 92**
75 ($1^1/_3$-year)	**0.55**	**1.62**	**3.83**	**1.14**	**1.02**	**May 14 year 80**



Mitigation Treatment Comparisons					
Probability that sediment yield will be exceeded 30 % go	Event sediment delivery (ton ac^{-1})				
	Year following fire				
	1st year	2nd year	3rd year	4th year	5th year
Untreated	8.7	6.41	1.72	1	0.44
Seeding	8.7	3.32	1.72	0.99	0.44
Mulch (0.5 ton ac^{-1})	3.4	2.53	1.72	1	0.44
Mulch (1 ton ac^{-1})	3.31	2.3	1.72	1	0.44
Mulch (1.5 ton ac^{-1})	3.3	2.21	1.72	1	0.44
Mulch (2 ton ac^{-1})	3.29	2.17	1.72	1	0.44
Erosion Barriers: Diameter 0.15 ft Spacing 50 ft go ?					
Logs & Wattles	0	1.71	0	0	0

Return to input screen

[Sediment yield--probability table]
[Sediment delivery paragraphs]
Sediment yield--probability of exceedance tables
[untreated | seeding | mulching 47% cover | 72% cover | 89% cover | 94% cover]
[Log & straw wattle efficiency tables]

Citation:
Robichaud, Peter R.; Elliot, William J.; Pierson, Fredrick B.; Hall, David E.; Moffet, Corey A. 2006. **Erosion Risk Management Tool (ERMiT) Ver. 2012.06.27.** [Online at <http://forest.moscowfsl.wsu.edu/fswepp/>.] Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

WEPP VERSION 2000.100
ERMiT run ID wepp-16233
Observed annual precip 461.3 mm; July, August, September precip 148.7 mm (32.23 percent): MONSOONAL climate

USGS South Dakota StreamStats

Streamstats Ungaged Site Report

Date: Mon Aug 6 2012 06:42:14 Mountain Daylight Time
Site Location: South_Dakota
NAD27 Latitude: 43.1959 (43 11 45)
NAD27 Longitude: -101.0062 (-101 00 22)
NAD83 Latitude: 43.1959 (43 11 45)
NAD83 Longitude: -101.0066 (-101 00 24)
Drainage Area: 13.57 mi2

Peak Flows Region Grid Basin Characteristics

100% Subregion C (13.6 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	13.6	0.06	904

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	110	110	1.8	25.6	474
PK5	327	67	4.8	119	901
PK10	566	58	8.3	233	1370
PK25	922	53	12	405	2100
PK50	1260	53	15	559	2860
PK100	1660	55	17	714	3850
PK500	2830	65	17	1060	7550

USGS South Dakota StreamStats

Streamstats Ungaged Site Report

Date: Sun Aug 5 2012 22:45:45 Mountain Daylight Time
Site Location: South_Dakota
NAD27 Latitude: 43.2163 (43 12 59)
NAD27 Longitude: -100.9898 (-100 59 23)
NAD83 Latitude: 43.2163 (43 12 59)
NAD83 Longitude: -100.9902 (-100 59 25)
Drainage Area: 4.91 mi2

Peak Flows Region Grid Basin Characteristics

100% Subregion C (4.91 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	4.91	0.06	904

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	61.8	110	1.8	14.3	266
PK5	182	67	4.8	65.9	502
PK10	314	58	8.3	129	763
PK25	515	53	12	226	1180
PK50	708	53	15	312	1610
PK100	933	55	17	400	2180
PK500	1610	65	17	600	4310

USGS South Dakota StreamStats

Streamstats Ungaged Site Report

Date: Mon Aug 6 2012 07:27:38 Mountain Daylight Time
Site Location: South_Dakota
NAD27 Latitude: 43.2582 (43 15 29)
NAD27 Longitude: -100.9069 (-100 54 25)
NAD83 Latitude: 43.2582 (43 15 29)
NAD83 Longitude: -100.9073 (-100 54 26)
Drainage Area: 4.15 mi2

Peak Flows Region Grid Basin Characteristics

100% Subregion E (4.15 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	4.15 (below min value 10)	10	760

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	26.7		4.3		
PK5	45.1		16		
PK10	57.2		27		
PK25	73.3		30		
PK50	86.5		27		
PK100	100		24		
PK500	137		19		

USGS South Dakota StreamStats

Streamstats Ungaged Site Report

Date: Mon Aug 6 2012 07:42:04 Mountain Daylight Time
Site Location: South_Dakota
NAD27 Latitude: 43.2630 (43 15 47)
NAD27 Longitude: -100.9176 (-100 55 03)
NAD83 Latitude: 43.2630 (43 15 47)
NAD83 Longitude: -100.9180 (-100 55 05)
Drainage Area: 857.389999999999 mi2

Peak Flows Region Grid Basin Characteristics

1% Subregion D (4.88 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	857 (above max value 137)	0.11	137

39% Subregion C (335 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	857	0.06	904

60% Subregion E (518 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Contributing Drainage Area (square miles)	857 (above max value 760)	10	760

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Peak Flows Region Grid Streamflow Statistics Area-Averaged

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record
PK2	771		3.3
PK5	2140		12
PK10	3630		20
PK25	5940		23
PK50	8270		23
PK100	11100		21
PK500	20200		18

Peak Flows Region Grid Streamflow Statistics Subregion D

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	875		2.3		
PK5	4970		7.4		
PK10	12800		18		
PK25	35100		39		
PK50	65200		53		
PK100	112000		59		
PK500	323000		58		

Peak Flows Region Grid Streamflow Statistics Subregion C

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	1170	110	1.8	260	5230
PK5	3600	67	4.8	1270	10200

PK10	6240	58	8.3	2510	15500
PK25	9920	53	12	4240	23200
PK50	13400	53	15	5780	31200
PK100	17300	55	17	7240	41500
PK500	28400	65	17	10300	78400

Peak Flows Region Grid Streamflow Statistics Subregion E

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	514		4.3		
PK5	1170		16		
PK10	1860		27		
PK25	3090		30		
PK50	4400		27		
PK100	6050		24		
PK500	12000		19		

included subtraction of drainage areas upstream from two flood-control structures in the upper Fall River Basin.

Several other moderate-sized regulating structures that are operated as pass-through reservoirs presumably cause at least minor attenuation of some peak flows but do not necessarily have substantial effects on peak-flow characteristics for downstream gaging stations. Included in this category are Stockade Lake on French Creek, Center Lake on Grace Coolidge Creek, and Sheridan Lake on Spring Creek (table 1). Various other small regulating structures exist within the Black Hills region; however, their potential effects on peak-flow characteristics are considered minimal.

Large annual peak flows occurred in tributaries in various parts of the Black Hills region during 1938, 1952, 1955, 1962, 1972, 1976, 1982, and 1996 (*table 8*). Individual peak flows that occurred in nearly all these years were used in defining frequency relations for the regional high-outlier population.

A large peak for station 06405800 (Bear Gulch near Hayward; map number 62) occurred in 1989 (*table 8*), about 1 year after almost the entirety of the drainage area was essentially denuded following an intensive wildfire (Driscoll and others, 2004). This peak was truncated prior to application of the mixed-population analysis because it is not representative of typical conditions for the drainage.

Estimation of the return period for the destructive 1972 flooding in the Rapid City area has persisted as a question ever since the flood. The mixed-population analysis indicates recurrence intervals for the 1972 peak flows of slightly less than 1,000 years for stations 06412500 and 06414000 (map numbers 79 and 81; figs. 11.79 and 11.81 in *Appendix 2*) and slightly less than 200 years for station 06421500 (map number 82; fig. 11.82). Recurrence intervals for most other stations where high-outlier peak flows were recorded during 1972 also fall into a general range of about several hundred years to 1,000 years. The uncertainty regarding these estimates cannot be statistically defined and is quite large. However, the mixed-population analysis might provide a more realistic perspective than can be obtained by using the default Bulletin 17B procedure. Also, and perhaps more importantly, for most stations that were affected by the 1972 event (or other high-outlier peak flows), the mixed-population analysis results in peak-flow frequency estimates in the 25- to 100-year range that are much more consistent with systematic records.

Cheyenne River Tributaries Downstream from the Black Hills Region

Seven gaging stations are on tributaries to the Cheyenne River downstream from the confluence with the Belle Fourche River. The total drainage area of the Cheyenne River Basin downstream from the confluence of the Belle Fourche River is about 3,000 mi^2 (table 6). Given the relatively small drainage area of this part of the Cheyenne River Basin, the tributary stations are reasonably representative of a wide variety of drainage areas (table 6). Six of the stations have either long-term or intermediate record lengths and have drainage areas ranging from very small to large. In general, peak-flow frequency is reasonably well characterized for tributaries in this reach of the Cheyenne River. However, most of the stations with very small drainage areas are located in proximity.

Large annual peak flows occurred in tributaries of the lower Cheyenne River during 1962, 1967, 1978, 1982, and 1996 (*table 8*). Occurrence of large peak flows from one or more of these years in the systematic record for a given station generally helps define the upper end of frequency curves.

Bad River

The Bad River heads just southeast of the confluence of the Cheyenne and Belle Fourche Rivers, and altitudes in the basin range from about 2,800 ft above NGVD 29 in the headwater areas to about 1,420 ft near the confluence with the Missouri River downstream from Oahe Dam. This basin is composed primarily of outcrops of the Cretaceous-age Pierre Shale, with outcrops of other Cretaceous and Tertiary rocks in the headwater areas (fig. 5; Martin and others, 2004). Soils in the basin tend to have high clay content with relatively low infiltration capacity. The total drainage area of the Bad River is about 3,180 mi^2 (table 6).

Peak-flow frequency estimates are provided for seven stations in the Bad River Basin. Two long-term stations are on the main stem and have large drainage areas (table 6). These stations (map numbers 130 and 134) represent about 46 and 98 percent of the drainage area. In general, peak-flow frequency probably is well characterized for the Bad River main stem.

Five stations are on tributaries to the Bad River (table 6), that given the relatively small drainage area of the Bad River, are reasonably representative of a variety of drainage areas. All five tributary stations are short term. Record-extension procedures were applied only for station 06440200 (map number 128) by using the two-station analysis (table 3). In general, peak-flow frequency estimates for very small and small basins probably are not well characterized, primarily owing to short periods of record.

Numerous stock reservoirs exist within the Bad River Basin; however, major influence from individual regulating structures with flood control purposes is not known to occur for any of the gaging stations. Large annual peak flows occurred in the Bad River Basin during 1952, 1967, 1978, 1991, and 1996 (*table 8*).

White River

The White River heads within northwestern Nebraska and flows into South Dakota near Slim Butte. Altitudes in the basin in South Dakota range from about 3,200 ft above NGVD near the Nebraska border to about 1,365 ft where the White River enters Lake Francis Case (fig. 1). Surficial geology transitions from the Pierre Shale and other Cretaceous rocks near the Nebraska border (fig. 5) to various Tertiary deposits

just downstream that include the Arikaree Formation and the White River Group (Martin and others, 2004). Extensive areas with badlands topography occur from approximately where the White River begins to flow in a northeasterly direction (near map number 152 in figure 1) through the remainder of the Tertiary deposits. These areas are typified by very steep slopes with minimal vegetation cover and highly erodible clays soils. In contrast, in the vicinity of the Sand Hills physiographic division near the Nebraska border (fig. 2), Quaternary deposits of wind-blown sands (fig. 5) have particularly high infiltration capacities. Sandy soils derived from the Tertiary-age Ogallala Formation also occur in much of the drainage basin of the Little White River, which is the largest tributary to the White River. The total drainage area of the White River is about 9,980 mi^2, of which about 8,310 mi^2 is in South Dakota (table 6). The total drainage area of the Little White River is about 1,650 mi^2, of which about 1,580 mi^2 is in South Dakota and about 260 mi^2 does not contribute to surface-water runoff.

Peak-flow frequency estimates are provided for 21 stations in the White River Basin (*table 7*). Five stations are on the main stem of the White River and have large drainage areas (table 6). Three of these stations are long term. One intermediate-record length station (06445685; map number 150) on the main stem of the White River has a drainage area of 1,440 mi^2. The analysis period for this station was obtained by combining systematic records for stations 06445685 and 06445700 (table 2). Although the drainage areas for these two stations are very similar (within about 4 percent), examination of 7 years of concurrent record (table 8) shows that peak flows attenuated between the stations in all years, and sometimes this attenuation was substantial. Combining records for the two stations substantially increased the available peak-flow information for this general reach of the main-stem White River; however, the reported peak-flow frequency estimates for station 06445685 might not be entirely representative of the specific location of that station.

Peak flows for stations 06445685 and 06447000 (*table 8*; map numbers 150 and 157) indicate substantial variability that might be due to variable effects of attenuation and large tributary inflows. In this reach, large areas with badlands topography have very large peak-flow potential, as exemplified by four stations (06446250, 06446400, 06446430, and 06446550; map numbers 153–156), for which numerous large peaks have been recorded (*table 8*) relative to the small drainage areas. An example of the large variability in peak flows within this reach is illustrated by a large peak of 9,240 ft^3/s recorded at station 06445700 (drainage area 1,500 mi^2) in June 1967 (*table 8*). Proceeding downstream, the peak flow at station 06446000 (drainage area 2,200 mi^2; map number 152) had substantially attenuated to 3,270 ft^3/s, but the peak flow at station 06446200 (drainage area 3,000 mi^2; this station has only 9 years of systematic record and is not included in *table 7*) had increased to 11,800 ft^3/s (*table 8*).

Stations on the main stem (map numbers 150, 152, 157, and 170) represent about 14, 22, 50, and 100 percent of the White River drainage area. In general, peak-flow frequency probably is well characterized for the main stem from near station 06447000 (map number 157) and downstream. Farther upstream, peak-flow frequency for station 06446000 (map number 152) also is well characterized, but substantial differences in peak-flow characteristics along the main stem may be possible at locations close to this station. Peak-flow frequency estimates for station 06445685 (map number 150) probably are not well characterized.

Five stations are on the main stem of the Little White River, which accounts for about 20 percent of the White River drainage area in South Dakota. Four of these stations are long term, and records for the fifth station (06449300; map number 163) were extended on the basis of records for nearby station 06449500 (table 3; map number 165). Stations on the main stem (map numbers 158, 161, 163, 164, and 168) represent about 19, 36, 54, 62, and 95 percent of the Little White River drainage area; thus, peak-flow frequency is well characterized for the main stem.

Six additional stations are on other tributaries to the White River and represent a wide range of drainage areas (ranging from about 0.2 to 340 mi^2). Record lengths are either intermediate or long term for five of these stations. Six more stations on tributaries to the Little White River also represent a wide range of drainage areas (ranging from about 2.5 to 120 mi^2), and four of these stations have intermediate-length or long-term records. Two of these stations (06448000 and 06449250; map numbers 159 and 162) are influenced by noncontributing drainage areas and sandy soils in the Sand Hills physiographic division (fig. 2), resulting in distinctively small peak-flow characteristics, relative to drainage area. In general, peak-flow frequency is reasonably well characterized for tributaries in the Little White River Basin; however, available data for tributaries to the remainder of the White River Basin are very sparse.

Lake Creek in the upper Little White River Basin has been consistently regulated since the 1930s by a series of dams in the Lacreek National Wildlife Refuge. Large annual peak flows occurred in the White River Basin during 1942, 1952, 1967, and 1999 (*table 8*).

James River

Altitudes along the main stem of the James River range from about 1,200 ft above NGVD 29 at the North Dakota/South Dakota border to about 1,150 ft near the confluence with the Missouri River downstream from Lewis and Clark Lake. A substantial part of the basin extends into North Dakota. In South Dakota, the basin is largely within the glaciated James River Lowlands physiographic division (fig. 2), which is characterized by poor drainage with numerous lakes and wetlands. The total drainage area of the James River is about 20,900 mi^2, of which about 14,600 mi^2 is in South Dakota and about 4,000 mi^2 does not contribute to surface-water runoff (table 6).

Peak-flow frequency estimates are provided for 47 stations in the James River Basin. Eight stations are on the main

Table 7. Station information and peak-flow frequency estimates for selected gaging stations.—Continued

[Shaded cells identify procedures, whereas unshaded cells identify unused default procedure. Historical adjustment values are shown in parentheses for analysis period length and analysis period]

Map number (fig. 1)	Station number	Station name	Drainage area (square miles)	Contributing drainage area (square miles)	Characteristics of systematic record		Characteristics of analysis period			Peak flow, in cubic feet per second, for recurrence interval, in years, and annual exceedance probability, in percent							
					Systematic record length (years)	Period of systematic record (water years)	Analysis period length (years)	Analysis period (water years)	Analytical procedure[1]	2	5	10	25	50	100	200	500
										50	20	10	4	2	1.0	0.5	0.2
Minor tributary to Missouri River (Group 5)—Continued																	
148	06442900	Elm Creek near Gann Valley, SD	381	381	12	1988–99	12	1988–99	1	1,240	2,720	4,180	6,680	9,120	12,100	15,800	21,900
149	06442950	Crow Creek near Gann Valley, SD	670	670	13	1972–84	13	1972–84	1	806	1,720	2,540	3,850	5,040	6,410	7,980	10,400
White River Basin																	
150	06445685	White River near Nebraska-South Dakota State line	1,440	1,440	14	1988–2001	14	1988–2001	1	772	1,600	2,390	3,760	5,100	6,740	8,780	12,200
							26	1962–73, 1988–2001	1, 9	841	2,190	3,890	7,580	12,000	18,600	28,300	48,100
							26 (54)	1962–73, 1988–2001 (1948–2001)	1, 9, 14	811	1,960	3,300	6,030	9,140	13,500	19,600	31,400
151	06445980	White Clay Creek near Oglala, SD	340	340	30	1966–81, 1988–2001	30	1966–81, 1988–2001	1	137	317	496	805	1,100	1,470	1,910	2,640
152	06446000	White River near Oglala, SD	2,200	2,200	58	1944–2001	58	1944–2001	1	915	1,780	2,490	3,550	4,450	5,450	6,540	8,140
153	06446250	Porcupine Creek tributary near Rockyford, SD	1.65	1.65	11	1968, 1970–79	11	1968, 1970–79	1	264	463	619	842	1,030	1,230	1,440	1,760
154	06446400	Cain Creek tributary at Imlay, SD	15.8	15.8	25	1956–80	25	1956–80	1	650	1,290	1,880	2,830	3,720	4,770	6,020	8,030
155	06446430	White River tributary near Conata, SD	.17	.17	17	1956–58, 1960–73,	17	1956–58, 1960–73,	1	110	198	274	395	505	634	785	1,020
156	06446550	White River tributary near Interior, SD	.32	.32	25	1956–80	25	1956–80	1	193	374	522	739	920	1,120	1,330	1,640
157	06447000	White River near Kadoka, SD	5,000	5,000	60	1942–2001	60	1942–2001	1	9,000	14,200	18,000	23,100	27,100	31,200	35,400	41,400
158	06447500	Little White River near Martin, SD	310	230	43	1938–40, 1962–2001	43	1938–40, 1962–2001	1	196	431	669	1,090	1,510	2,050	2,720	3,870
159	06448000	Lake Creek above Refuge near Tuthill, SD	58	23	26	1938–40, 1962–78, 1996–2001	26	1938–40, 1962–78, 1996–2001	1	85	121	145	174	196	217	239	267
160	06449000	Lake Creek below Refuge near Tuthill, SD	120	60	42	1938–40, 1963–2001	42	1938–40, 1963–2001	1, 2	87	137	181	254	322	405	505	671
161	06449100	Little White River near Vetal, SD	590	415	42	1960–2001	42	1960–2001	1	313	654	1,010	1,660	2,330	3,220	4,370	6,430
162	06449250	Spring Creek near St. Francis, SD	57	10	15	1960–74	15	1960–74	1	36	53	65	80	92	105	117	135
163	06449300	Little White River above Rosebud, SD	890	630	18	1982–99	18	1982–99	1	537	918	1,250	1,780	2,260	2,820	3,490	4,550
							58	1944–2001	1, 3	592	1,050	1,450	2,110	2,720	3,450	4,330	5,760

Table 7. Station information and peak-flow frequency estimates for selected gaging stations.—Continued

[Shaded cells identify procedures, whereas unshaded cells identify unused default procedure. Historical adjustment values are shown in parentheses for analysis period length and analysis period]

Map number (fig. 1)	Station number	Station name	Drainage area (square miles)	Contributing drainage area (square miles)	Characteristics of systematic record		Characteristics of analysis period			Peak flow, in cubic feet per second, for recurrence interval, in years, and annual exceedance probability, in percent							
					Systematic record length (years)	Period of systematic record (water years)	Analysis period length (years)	Analysis period (water years)	Analytical procedure[1]	2	5	10	25	50	100	200	500
										50	20	10	4	2	1.0	0.5	0.2
White River Basin—Continued																	
164	06449400	Rosebud Creek at Rosebud, SD	50.8	50.8	23	1975–97	23	1975–97	1	85	241	433	834	1,300	1,950	2,860	4,600
									1, 6, 7	93	253	426	745	1,070	1,480	1,990	2,860
165	06449500	Little White River near Rosebud, SD	1,020	760	58	1944–2001	58	1944–2001	1	703	1,460	2,240	3,660	5,110	6,990	9,420	13,700
									1, 6, 7, 8	631	1,540	2,370	3,650	4,750	5,970	7,300	9,220
166	06449700	Little Oak Creek near Mission, SD	2.58	2.58	25	1956–80	25	1956–80	1	32	135	306	765	1,420	2,510	4,290	8,360
									1, 6, 7, 8	24	135	317	756	1,290	2,070	3,140	5,140
167	06449750	West Branch Horse Creek near Mission, SD	6.31	6.31	15	1956–70	15	1956–70	1	28	120	270	664	1,210	2,110	3,540	6,730
168	06450500	Little White River below White River, SD	1,570	1,310	56	1930–32, 1939–40, 1951–2001	56	1930–32, 1939–40, 1951–2001	1	1,840	4,070	6,330	10,400	14,400	19,600	26,100	37,200
									1, 6, 7, 8	1,510	4,040	6,500	10,500	14,000	18,100	22,600	29,400
169	06451750	Cottonwood Creek tributary near Winner, SD	4	4	10	1971–80	10	1971–80	1	69	142	207	307	395	496	609	780
170	06452000	White River near Oacoma, SD	10,200	9,940	73	1929–2001	73	1929–2001	1	11,300	19,900	26,900	37,200	46,000	55,700	66,400	82,400
Minor tributary to Missouri River (Group 6)																	
171	06452250	Fivemile Creek tributary near Iona, SD	2.35	2.35	10	1970–79	10	1970–79	1	36	64	86	116	139	165	191	228
172	06452320	Platte Creek near Platte, SD	741	741	13	1989–2001	13	1989–2001	1	383	1,720	3,650	8,010	13,200	20,400	30,300	48,600
							26	1967–79, 1989–2001	3, 6	356	1,330	2,370	4,080	5,570	7,200	8,920	11,300
173	06453150	Choteau Creek tributary near Tripp, SD	.54	.54	10	1970–79	10	1970–79	1	30	86	147	260	374	518	696	994
174	06453250	Choteau Creek tributary near Wagner, SD	15.6	15.6	10	1970–79	10	1970–79	1	34	85	139	234	329	447	593	836
							54	1939–40, 1950–2001	3	49	117	186	304	418	557	726	1,000
175	06453255	Choteau Creek near Avon, SD	602	602	19	1983–2001	19	1983–2001	1	1,040	2,960	5,130	9,240	13,500	19,000	26,000	38,100
							40	1962–2001	3	707	2,160	3,670	6,220	8,570	11,300	14,300	18,900
176	06453400	Ponca Creek near Naper, NE	373	373	14	1961–74	14	1961–74	1	714	1,570	2,360	3,670	4,870	6,280	7,940	10,500
177	06463900	Antelope Creek near Mission, SD	60	60	12	1990–2001	12	1990–2001	1	53	68	78	91	101	111	121	135
178	06464100	Keya Paha River near Keyapaha, SD	466	466	20	1982–2001	20	1982–2001	1	500	877	1,160	1,570	1,890	2,230	2,590	3,100
179	06464500	Keya Paha River at Wewela, SD	1,070	1,070	54	1939–40, 1950–2001	54	1939–40, 1950–2001	1	776	1,680	2,540	3,940	5,240	6,800	8,620	11,500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