

(Reference FSH 2509.13)

Douglas-fir; Spruce-fir; Whitebark pine

P. Dominant Soils:

Soils on the Cliff Creek Fire can be characterized by 36 Landtypes mapped inside the burn perimeter, 35 of which received some level of burn severity. The area is most influenced by 9 dominant Landtypes. These 9 landtypes are well drained throughout with thin surface horizons about 5 to 7 inches deep and consist of 20 to 35 percent gravels and cobbles.

Q. Geologic Types:

Geology within the burn perimeter is predominantly Quaternary alluvium and colluvium, glacial deposits, and landslide deposits; and Paleocene sedimentary rocks (Love and Christiansen, 1985). Cretaceous sedimentary rocks are exposed in the far west and east portions of the burn perimeter.

Landslides are common in the Gros Ventre Range (Wyoming State Geological Survey [WSGS] 2013). Previously mapped landslides within the burn perimeter are generally composed of combinations of basic landslide types, but the predominant types appear to be slumps and flows. The primary contributing factors are local geology, geologic structures, hydrology, and precipitation. Human activities such as road construction have also contributed to the occurrence of landslides.

R. Miles of Stream Channels by Order or Class: (46) Perennial (48) Intermittent

S. Transportation System: Trails: 25 miles Roads: 5 miles

PART III - WATERSHED CONDITION

A. Burn Severity: 6,612 acres (unburned) 9,471 acres (low) 11,096 acres (moderate) 4,482 acres (high)

B. Water-Repellent Soil (NFS acres only): 15,578 acres (moderate + high burn severity)

C. Soil Erosion Hazard Rating (Burned NFS acres only):
3% (low) 30% (moderate) 67% (high)

D. Erosion Potential: tons/acre: 1.0 tons/acre

E. Sediment Potential: cubic yards/square mile: 584 yds³/mi²

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years): 1-3 grass, 20-25 shrubs, 20-50 conifers

B. Design Chance of Success, (percent): 80 %

C. Equivalent Design Recurrence Interval, (years): 25 year

D. Design Storm Duration, (hours): 1 hour

E. Design Storm Magnitude, (inches): 1.03

F. Design Flow, (cubic feet / second/ square mile): 12

G. Estimated Reduction in Infiltration, (percent): 72%

H. Adjusted Design Flow, (cfs per square mile): 206

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

Potential Values and the associated criticality of their threat is listed in Table 1 below.

Table 1. Potential values at risk and criticality

Potential Value	Critical	Non-Critical	Notes
Heritage Resources	X		Details provided in Heritage Report
Grazing Production & Permits	X		Rest of burned areas will occur Administratively
Naturalized Ecosystems (Noxious & Invasives)	X		Throughout moderate & high soil burn severities
Soil Productivity & Hydrologic Function	X		Throughout moderate & high soil burn severities
Water Quality & Fisheries	X		Throughout moderate & high soil burn severities
FS Road & Motorized Trail Prisms	X		Drainages along FS Roads 30519, FS Road 30624 & Trail 2149
Non-Motorized Trail Prisms	X		Will be addressed in an Interim Report in FY17
Hazardous Condition Warning	X		Districts will address with appropriate signage
Highway 191			Highway 191
Swift Creek Ditch			FS will coordinate with NRCS and SUP Holder of the increased risk of flooding and other hazards.
Granite Creek, Dell Creek, Bondurant & Jack Creek Private In-holdings			FS will notify landowners of the increased risk of flooding and other hazards.
Jack Pine Summer Homes			FS will notify the SUP Holders of the increased risk of flooding and other potential hazards.
Lower Valley Gas Pipeline			Located along Hwy 191 w/in WY DOT's ROW

The removal of vegetation and increased soil hydrophobicity due to fire have the potential to decrease slope stability. This can result in numerous types of landslides. Based on review of the local geology and the types of historic landslides that have occurred in the fire perimeter, the most likely to occur would be slumps and debris flows or a combination of thereof. These may potentially impact a significant distance downslope from the point of initiation.

From a hydrologic standpoint, an emergency condition does exist. The amount and location of high and moderate burn severities create a likely potential for unacceptable losses to Highway 189/191, USFS roads and trails, the Jack Pine Summer Home Area, the Swift Creek diversion, private inholdings, soil & site productivity, and water quality.

Potential Values and Values at Risk

Risks were evaluated and assigned based on Interim Directive No.: 2520-2014-1 guidance.

Table 2. Risk assessment table displaying results of critical values risk evaluation

Critical Value	Critical Value Type	Probability of Damage	Magnitude of Consequence	Risk
Heritage Resources	Cultural & Heritage Resources	Unlikely	Minor	Very Low
Soil Productivity & Hydrologic Function	Natural Resources	Likely	Moderate	High
Water Quality & Fisheries	Natural Resources	Likely	Moderate	High
FS Roads & Motorized Trail Prisms	Property	Likely	Moderate	High

Swift Creek Ditch	Human Life & Safety; Property	Possible	Major	High
Nonmotorized Trail Prisms	Property	Very Likely	Moderate	Very High
Naturalized Ecosystems (Noxious & invasives)	Natural Resources	Likely	Major	Very High
Hazardous Condition Warning	Human Life & Safety	Very Likely	Major	Very High

Table 3. Off National Forest Values That May Be of Risk

Granite Creek, Dell Creek, Bondurant & Jack Creek Private In-holdings	Human Life & Safety; Property			
Highway 189/191	Human Life & Safety; Property			
Lower Valley Gas Pipeline	Human Life & Safety; Property			
Jack Pine Summer Homes	Human Life & Safety; Property			
Swift Creek Ditch	Human Life & Safety; Property			

B. Emergency Treatment Objectives:

- Nonmotorized Trails – Although numerous hazard trees were observed from the air within moderate to severe burn areas throughout the Cliff Creek Fire perimeter, actual hazard tree numbers and overall road and trail conditions were not surveyed due to firefighter safety concerns. An interim report will be filed in FY17 after one winter to investigate any remaining BAER qualifying stabilization measures.
- Invasives – Weeds and native vegetation recovery; Reduce the risk from expansion of existing weed seed beds into burned areas and to allow burned plant communities to recover more rapidly.
- Roads/Motorized Trails – Decrease the potential for low to moderate intensity, short to moderate duration precipitation/snow melt events to result in damage or loss of high value infrastructure (FS Roads 30519, 30624, Trail 2149, State Highway 189/191, loss of irrigation from Swift Creek Ditch and potential for stream capture of Swift Creek by the Swift Creek Ditch)
- Signs – Inform the public of the dangers present within the burned area to reduce the risk of injury or death resulting from an increase in hazard trees throughout the area.

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

Invasives **90%** (prior to seed) Channel **N/A%** Roads & Motorized Trails **70%**
Protection/Safety(signs) **90%**

D. Probability of Treatment Success

Table 4. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Invasives	90	75	N/A
Channel	N/A	N/A	N/A
Roads/Trails	80	80	70
Protection/Safety	75	50	N/A

E. Cost of No-Action (Including Loss):

Cost of No-Action Alternative assumes that a low to moderate intensity, short to moderate duration precipitation/snow melt event occurring over the areas proposed for treatment would result in a loss of the ingress/egress to the Jack Pine Recreational Residences, the loss of the FS Road 30624 and Trail 2149 prism resulting in a complete rebuild of those two road prisms for at least likely impacting several miles. There is currently a relatively low amount of noxious/invasive weeds in the area. Not acting quickly to maintain control of the existing infestations, would be a significant loss of future plant communities. The potential injury or loss of life from hazards within the burn perimeter resulting from inadequate signage notifying public users would far exceed any request for sign funding.

F. Cost of Selected Alternative (Including Loss): Refer to Table 6 – Treatment Cost Summary

G. Skills Represented on Burned-Area Survey Team:

☒ Hydrology ☒ Soils ☒ Geology ☐ Range ☐ Forestry ☐ Wildlife ☐ Fire Mgmt
☐ Engineering ☐ Contracting ☐ Ecology ☐ Botany ☒ Archaeology ☐ Fisheries
☐ Research ☐ Landscape Arch ☒ GIS

Team Leaders:

David Marr, Soil Scientist, Caribou-Targhee NF davidmarr@fs.fed.us Phone: 208-557-5782
Trevi Robertson, Hydrologist, Bridger-Teton NF trevlynrobertson@fs.fed.us Phone: 307-886-5317

Core Team Members:

- Ronna Simon – Hydrology
- Brad Higginson – Hydrology
- Cindy Stein - Trails
- Jamie Schoen - Archeology
- Shannon Connolly - Invasives
- Chris McCollister – GIS/Avalanche
- Diane Wheeler - Geology

H. Treatment Narrative:

Invasives:

Known infestations of noxious weed species existing inside the fire perimeter include; musk thistle and Canada thistle totaling about 7.3 acres. There are also known occurrences of invasive species which are not listed in Wyoming as noxious. Cheatgrass occurs adjacent to the burned area and within the fire camp area and may require treatment to prevent sudden expansion associated with fire induced mortality of native deep-rooted perennial grasses. A total of 421 acres of burned area are within a .25 mile of known weed infestations. Of the 421 acres, 224 acres are either moderate or high severity burn and 197 acres are moderate or low severity burn. These mapped infestations are primarily species with wind dispersed seeds, which increases the potential for establishment in recently burned areas. Weed species within the fire perimeter and adjacent to the fire perimeter were buffered .25 miles to determine the highest and most immediately susceptible areas within the fire perimeter.

Table 5. Cost estimate for invasives treatment

	Units	Unit Cost	# Units	BAER \$
Detection/mapping/rapid response	Days	\$500	8	\$4,000
Treatment: Labor equipment and supplies (ATV spraying)*	Acres	\$90	50	\$4,500
Treatment: Labor, equipment, and supplies (backpack spraying)*	Acres	\$200	10	\$2,000
Total				\$10,500

Roads and Motorized Trails Treatments:

BAER funds are appropriate for treatment of anticipated fire erosion events on roads but not to improve roads to standards over pre-fire conditions. The objective of the proposed road treatments are to stormproof the road investments from accelerated erosion, sediment transport, and sediment deposition on travel routes and reduce the sediment transfer from the routes while maintaining access to the Forest for administrative, private lands access, and public use. Wildfire accelerated surface flows down roads are probable and if not treated will cause significant surface erosion and failure in localized areas.

- Cliff Creek Road Culvert Cleanout (FSR 30530): There is a 30-inch CMP at the start of the Cliff Creek road near Highway 189/191 that drains water across the road towards Cliff Creek. This culvert could receive drainage from the Hoback River Trib1 subwatershed discussed above in the highway section. It is associated with a riparian area (willows) and highway drainage. The culvert inlet and outlet is compromised from the excessive vegetation growing around them. There is also some sediment build up at the culvert outlet (< 1/4 plugged with sediment). The inlet and outlet should be brushed to improve the culvert efficiency. Any sediment should also be removed.
- Jack Pine Creek Road/Stream Crossing (FSR 30519): There is a 36-inch CMP on the crossing of Jack Pine Creek. The undersized culvert is at risk of failing due to the amount of high and moderate burn severities located within the Jack Pine Creek Watershed. The crossing itself didn't burn, but the Jack Pine Creek drainage experienced moderate and high severity. The potential for increased runoff from burned area could easily exceed pipe capacity. The crossing could likely plug and fail, which would deliver excessive sediment to Jack Pine Creek and the Scenic reach of Granite Creek downstream. The road is also the only ingress and egress to the Jack Pine Summer Home area.
 - See Appendix A for a detailed spec sheet outlining treatment costs based on Regional IDIQ contract estimates
- • Road/Stream Crossings on FSR 30624 and Motorized Trail 2149: Install seven low water armored fords. FSR 30624 has four stream crossings: Riling Draw, an unnamed stream, Parody Draw, and Rock Creek. There are three unnamed stream/wetland crossings on Motorized Trail 2149 located west of the large beaver pond on Porcupine Creek. These stream crossings are at risk of impairing water quality, loss of the road or trail prism, and capturing the stream channel resulting in a loss of downstream riparian habitat. .
 - See Appendix B for a detailed spec sheet outlining treatment costs based on Regional IDIQ contract estimates

Signs:

Post warning signs at road and trail portals to notify public of increased hazards as a result of post wildfire conditions to minimize .

Table 6. Cost estimate for hazard sign purchase & installation

Description	Number	Cost	Total
GS-5 Seasonal	6 days	\$130/day	\$780
Hazard Tree Warning Sign	15	\$100	\$1500

No treatments are proposed for road drainage systems deeper within the fire perimeter as a result of the high number of hazard trees, BAER Team members did not go much beyond the fire perimeter.

Table 7. Treatment Cost Summary

Line Items	Units	Unit Cost	NFS Lands		Total \$
			# of Units	BAER \$	
A. Land Treatments					
EDRR	1	500	8	\$4,000	\$4,000
Weeds (ATV spray)	1	90	50	\$4,500	\$4,500
Weeds (Backpack)	1	200	10	\$2,000	\$2,000
<i>Subtotal Land Treatments</i>				\$10,500	\$10,500
B. Channel Treatments					
none				\$0	\$0
<i>Subtotal Channel Treat.</i>				\$0	\$0
C. Road & Motorized Trails					
Armored Fords-Road	4	10195	4	\$40,780	\$40,780
Armored Fords-Trail	3	10195	3	\$30,585	\$30,585
Culvert Crossing	1	42700	1	\$42,700	\$42,700
<i>Subtotal Road & Trails</i>				\$114,065	\$114,065
D. Protection/Safety					
Signs	1	100	15	\$1,500	\$1,500
GS5 Tech	1	130	6	\$780	\$780
				\$0	\$0
<i>Subtotal Structures</i>				\$2,280	\$2,280
E. BAER Evaluation					
Team Salary	9	350	43		\$15,050
Per Diem	3	270	15		\$4,050
<i>Subtotal Evaluation</i>				---	\$19,100
F. Monitoring					
				\$0	\$0
<i>Subtotal Monitoring</i>				\$0	\$19,100
G. Totals				\$126,845	\$165,045
Previously approved					
Total for this request				\$126,845	

Protection/Safety Treatments:

I. Monitoring Narrative:

Implementation monitoring is proposed and will occur as the treatments are installed or applied. Inspectors will monitor all contracted treatments to ensure proper implementation. The cost of the implementation monitoring is included in the treatment costs.

Part VI – Emergency Stabilization Treatments and Source of Funds

Non-Forest Service Treatments: The following recommendations are made to reduce risks to infrastructure not directly owned or managed by the US Forest Service. The infrastructure may be located on NFS lands and authorized under a Special Use Permit. Therefore, the agency should notify all special permit holders of changed conditions in the watershed that may lead to increased risk of flooding and other hazards. The agency should also work with permittees to allow and facilitate them to reduce the risk to their improvements or infrastructure:

- Highway 189/191: The Forest should coordinate with the Wyoming Department of Transportation (WYDOT) to facilitate flooding and debris flow mitigation. The coordination work has already begun and WYDOT has begun implementation of the recommended treatments within the highway corridor. Contact: Darin Martens: USFS/WYDOT Project Liaison & Landscape Architect, Bridger-Teton NF, SO. darinmartens@fs.fed.us 307-739-5545
- Swift Creek Irrigation Diversion & Ditch: The Forest should coordinate with the Soil and Water Conservation District to facilitate flooding and debris flow mitigation. The coordination work has already begun by Hydrologists on the Bridger-Teton NF: Trevlyn Robertson and Ronna Simon. Additional sources of funding may be available from the Emergency Watershed Protection (EWP) managed by the Natural Resources Conservation Service (NRCS). More information on this program is available at: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/wy/programs/financial/ewp/>
- Jack Pine Summer Home Area & FSR 30519A: Notify all special permit holders of changed condition in the watershed that may lead to increased risk of flooding and other hazards. Work with permittees to allow them to reduce the risk to their improvements. The Lamb residence is of particular concern due its proximity below an ephemeral drainage.
 - o This caution should also be extended to private land owners in the Jack Pine area (i.e. Safari Club International, Janet Moore, Payson Ranch, and the 7-Mile Ranch) and the Jack Creek area (Daniel Ranch).
- Lower Valley Gas Pipeline: Notify the special permit holder of changed condition in the watershed that may lead to increased risk of flooding and other hazards. Pipeline Contact: Miranda Galadima.

PART VII - APPROVALS

for 
Forest Supervisor (signature)


Date

2. /s/ George C. Iverson (for) 08/12/2016
Regional Forester (signature) Date

Appendix A - Jack Pine Creek Road/Stream Crossing (FSR 30519)

**BURNED AREA EMERGENCY RESPONSE
TREATMENT SPECIFICATION FORM
CLIFF CREEK BAER**

SPECIFICATION TITLE:	Jack Pine Creek Road/Stream Crossing (FSR 30519)	JURISDICTION:	USFS - BTNF
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I. WORK TO BE DONE

1. General Description: Upsize the stream culvert crossing on Jack Pine Creek. Install an armored dip at the crossing and install road drainage on each side of the crossing to reduce sediment inputs. Bankfull stream width is 6 feet.
2. Location (Suitable) Sites: Jack Pine Creek crossing on FSR 30519.
3. Design/Construction Specification(s): Upsize culvert to span 1.25 times the stream bankfull width. Bankfull width = 6 feet, culvert opening should be ~7.5 feet.
4. Purpose of Treatment Specification: The existing 36-inch is undersized for the expected increasing in flows following the fire. The potential for increased runoff from the burned area could easily exceed pipe capacity. The crossing could likely plug and fail, which would deliver excessive sediment to Jack Pine Creek and the Scenic reach of Granite Creek downstream. The road is also the only ingress and egress to the Jack Pine Summer Home area. There is concern with potential loss of property due to potential flooding of roads and washout.

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
COR – Engineer = \$350/day * 3 days	\$1,050
Hydrologist = \$350/day * 3 days	\$1,050
Contract Preparation and requisition preparation = \$350/day * 3 days	\$1,050
TOTAL PERSONNEL SERVICE COST	\$3,150
EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
N/A	N/A
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	N/A
MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost)	COST/ITEM
Squashed or pipe arch CMP culvert sized to accommodate 1.25 times bankfull width = 7.5 foot opening; Length = 40 feet; Estimate includes shipping.	\$13,000
Bedding Rock	\$1,000

TOTAL MATERIALS AND SUPPLY COST	\$14,000
TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
Misc. Travel Cost	\$500
TOTAL MATERIALS AND SUPPLY COST	\$500

CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
Contract cost to install culvert: Cost are based on R4 Regional IDIQ contracts with Kessler Construction and Cook and Suns: <ul style="list-style-type: none"> • 48" CMP \$105/LF * 40 ft. = \$4,200 → 7.5 ft. culvert estimated at \$6,000 • Erosion Plan = \$250 • Rolling Dips = \$1,200 * 2 = \$2,400 • Rip-Rap = \$90/CY * 130/CY * 35CY = \$3,150 • Aggregate (bedding) = \$28/CY x 130 CY = \$3,733 • Location Adjustment = \$15,533 * 1.49 location adjustment = \$23,144 • Year of contract adjustment = \$23,144 * 1.06 = \$24,532 	\$25,000

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY-1	\$42,700		1	\$42,700	BAER	Contract
TOTAL	\$42,700			\$42,700		

Other useful information: The existing crossing is a 36-inch CMP that is 31 feet long.

- Existing length = ~31feet; new culvert estimated at 40 feet.
- Bankfull width at this location is 6 feet. The culvert opening (span) should be sized to 7.5 feet.
- Install rolling dip on each side of drainage.
- Road fill will need to be brought up/lifted to accommodate pipe arch culvert.
- Consider installing armored dip at crossing.





Appendix B. Rock Creek Road/Stream Crossing (FSR 30624) & Motorized Trail 2149

BURNED AREA EMERGENCY RESPONSE TREATMENT SPECIFICATION FORM CLIFF CREEK BAER

SPECIFICATION TITLE:	Low water crossings - Armored Fords	JURISDICTION:	USFS - BTNF
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I. WORK TO BE DONE

4. General Description: Install armored fords on stream crossings on FSR 30624 and motorize trail 2149.
5. Location (Suitable) Sites: Four stream crossings on FSR 30624 = Riling Draw, unnamed draw, Parody Draw, Rock Creek (remove existing undersized culvert and install armored ford). Three unnamed stream/wetland crossings on Motorized Trail 2149 located west of the large beaver pond on Porcupine Creek.
6. Design/Construction Specification(s): Install armored ford. See BAER catalog page 81:
http://www.fs.fed.us/t-d/pubs/pdf/BAERCAT/lo_res/06251801L.pdf

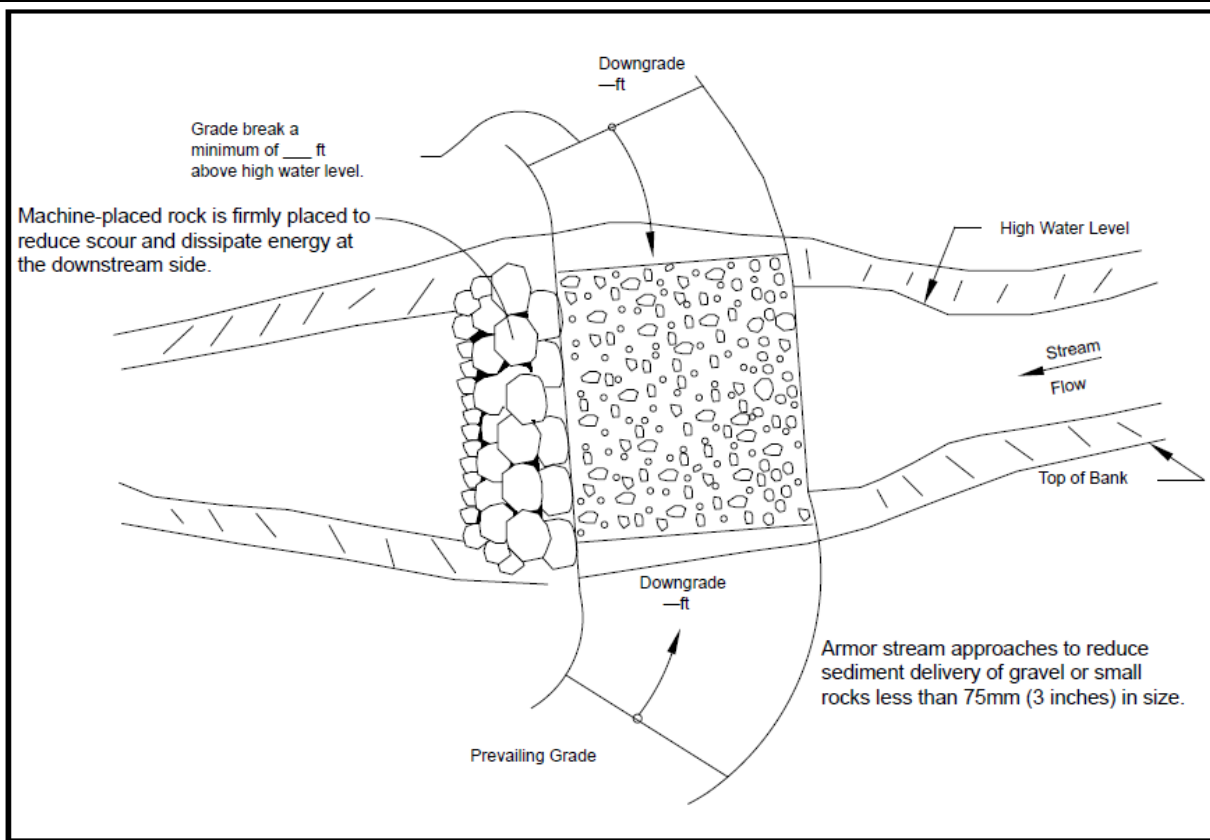


Figure 75—Low-water stream crossing diagram.

5. Purpose of Treatment Specification: A low-water stream crossing (LWSC) protects transportation infrastructure, reduces or eliminates the loss of control of water, and reduces the threat to water quality. LWSCs can be designed to accommodate aquatic passage. LWSCs prevent stream diversion and keep water in its natural channel. A LWSC prevents erosion of the road fill and reduces adverse effects to water quality. LWSCs maintain access to areas once storm runoff rates diminish.

II. LABOR, MATERIALS AND OTHER COST

PERSONNEL SERVICES (Grade @ cost/hour X # hours X fiscal year = cost/item) Do not include contract personnel costs here - see contract services below	COST/ITEM
COR – Engineer = \$350/day * 3 days	\$1,050
Hydrologist = \$350/day * 6 days; Trails/Recreation = \$350/day * 6 days	\$4,200
Contract Preparation and requisition preparation = \$350/day * 3 days	\$1,050
TOTAL PERSONNEL SERVICE COST	\$7,350
EQUIPMENT PURCHASE, LEASE OR RENTAL (item @ cost/hour or day X #hours or days X fiscal year = cost) Do not include contract personnel costs here -see contract services below	COST/ITEM
N/A	N/A
TOTAL EQUIPMENT PURCHASE, LEASE, OR RENTAL COST	N/A
MATERIALS AND SUPPLIES (item @ cost/each X quantity x fiscal year = cost	COST/ITEM

TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST (Personnel @ rate X round trips X fiscal year = cost)	COST/ITEM
Misc. Travel Cost	\$1,000
TOTAL MATERIALS AND SUPPLY COST	\$1,000

CONTRACT COST (Labor, equipment, and travel @ cost/hr. X hrs. X fiscal year = cost)	COST/ITEM
<p>Contract cost to install culvert: Cost are based on R4 Regional IDIQ contracts with Kessler Construction and Cook and Suns:</p> <ul style="list-style-type: none"> Rip-rap: machine placed commercial source: \$65/CY * 60 CY/crossing * 7 crossings = \$27,300 Haul from government = North Fork Fisherman Creek Gravel Pit = \$0.50/CY Mile * 12,600 CY Mile = \$12,600 Location Adjustment = \$39,900 * 1.49 location adjustment = \$59,450 Year of contract adjustment = \$59,450 * 1.06 = \$63,020 	\$63,020

III. SPECIFICATION COST SUMMARY

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
FY-1	\$71,370		1	\$71,370	BAER	Contract
TOTAL	\$71,370			\$71,370		