

DEER CREEK CULVERT REPLACEMENT

BPA Contract #00037152

BPA Project #1992-026-01

Completion Report

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By:

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Abstract

An existing 8.4'x5.0' open-bottom arch at RM 11.7 on Deer Creek, a tributary to the Wallowa River, was undersized and a barrier to fish passage. Additionally, a 3-foot high waterfall over a log weir 15 feet downstream of the culvert outlet ensured only large fish got past this point. Replacing the arch and removing the log weir opened 2.5 miles of habitat for juvenile steelhead trout and 5.0 miles of habitat for juvenile and sub-adult bull trout. The undersized arch and log weir were replaced with a 23'(span) x 7'(rise) x 40' bottomless concrete box with wing walls set at stream grade, and the simulated streambed constructed through the project area was integral to restoring up- and down-stream connectivity for all aquatic organisms. Partners included the Grande Ronde Model Watershed Program (GRMWP), Bonneville Power Association (BPA) & Wallowa-Whitman National Forest (W-WNF).

Introduction

The objective of this project was to restore season-long passage of all aquatic organisms, including juvenile steelhead and juvenile/sub-adult bull trout, in the Deer Creek subwatershed by replacing the undersized arch with trash rack and log weir waterfall at the Deer Creek crossing with an open-bottom arch and a simulated streambed which connected the upstream and downstream portions of Deer Creek at a consistent grade.

The former arch was rated "very high" for replacement in the 2001 Culvert Fish Passage Rating and Prioritization Report by the W-WNF staff based on Region 6 fish passage evaluation criteria. The Nez Perce Tribe (NPT) also ranked the Deer Creek arch and downstream log weir as high replacement priorities in Wallowa County (Barrier Prioritization, Wallowa County, 2007, www.nezperce.org/~dfrm/Watershed/). W-WNF aquatics personnel worked with local private, state, and tribal counterparts in identifying the need to replace this culvert, and determined that replacing this arch was the number one priority over all other culverts in the county. The Deer Creek arch was also the W-WNF's highest priority for replacement in 2008. Replacement of this culvert was considered a key recovery action for bull trout while also benefiting steelhead.

In addition, the GRMWP Action Plan (1994) states:

"Site-specific passage problems can affect salmonid fish production over a large area. Projects to address passage problems receive the highest priority for near-term action because project success is virtually certain – quickly reducing fish mortality and improving production without making any societal or individual sacrifices."

Also, the Stream and Riparian Condition in the Grande Ronde Basin prepared for the Grande Ronde Model Watershed Board (1993) rates treating serious passage problems for anadromous fish at man-made structures as a must-address priority.

Methods and Materials

Methods and materials for each project component are described below (Table 1).

Table 1. Methods and Materials for Deer Creek Culvert Replacement, 2008.

Project Component	Materials Description	Accomplished by:
Culvert Replacement	Excavator, dump truck, concrete, concrete box arch, sump pump, fish nets, plastic tarp, culvert	Contractor
Restoration	grass seed, shovel, native hardwood plants, mulch	W-WNF & NPT employees

Project Description

An existing 8.4' x 5' x 61' arch was removed and replaced with a 23' x 7' x 40' concrete bottomless box arch with wingwalls on Deer Creek in Wallowa County on USFS land. The box arch was designed to pass the 100-year peak flow event and to be 5 feet wider than the bankfull width of Deer Creek to accommodate stream banks inside the arch. The log weir downstream was removed, and 248 total feet of stream channel (extending 116 feet upstream and 68 feet downstream of concrete box arch) was reconstructed to its natural gradient of 5% with a bankfull width of 18' using the San Dimas Technology and Development Center's Stream Simulation design. Thirteen rock steps were constructed approximately 20 feet apart throughout the reconstructed channel to provide grade control and imitate the natural steps found in the channel up- and down-stream of project area. More than 20 mature hardwood plants at least 2" in diameter were trimmed to 5-6 feet were transplanted by the contractor from places close by to the disturbed streambanks on both sides of Deer Creek.

Excavation and construction occurred from 25 July – 30 August 2008. Disturbed areas were seeded with native grasses immediately following construction by W-WNF Hydrologist Dana Nave. Seventy additional native hardwoods were planted in the spring of 2009 by W-WNF Riparian Technician Cynthia Erickson, the W-WNF fire crew and Cindy Sloan from the NPT.

A comparison of the original BPA contract task and the final accomplishment is shown in Table 2.

Table 2. Summary of work performed in Deer Creek Culvert Replacement, 2008.

Tasks	Location	Date	Final Accomplishments	Original Contract	Difference
Culvert Replacement	T01S R42E Sec 18	07/25- 08/30	Deer Creek box arch culvert installed	Install Deer Creek arch	none

Project Participants

Table 3. Summary of Deer Creek project participants, responsibilities and fiscal contributions, 2008.

Participant	Responsibilities	Fiscal Contribution
Grande Ronde Model Watershed	Purchased and arranged for transportation of concrete box arch; assisted in grant writing, project logistics and reporting	\$4,598
Wallowa Mountains Office of the W-WNF	Developed DSL/ACoE permits; conducted initial site surveys; provided engineering designs; provided oversight and inspection for contract work; spread native grass seed and planted hardwoods; assisted in project reporting	\$70,155
Bonneville Power Administration	Fiscal contributor	\$169,659

Results and Discussion

The Wallowa Mountains Office of the Wallowa-Whitman NF and the Grande Ronde Model Watershed teamed up to replace the Deer Creek Culvert in July and August, 2008. The existing 8.4'x 5.0' arch was replaced with a 23'x 7'x 40' concrete bottomless box arch in July and August, 2008. Aquatic and Engineering experts from the USFS used streambed simulation techniques when designing of the streambed to insure passage for all life stages of threatened fish species in Deer Creek, as well as passage for all life stages of other aquatic species, such as amphibians, whose movements may have been impeded by the waterfall at the former log weir or accelerated velocities through the former arch. Streambed construction oversight by the Hydrologist and Engineer was especially important as the contractor had not constructed a streambed prior to this project. A particularly difficult part of the project came when the excavator was building the streambed within the arch footprint, but then had to "walk" over the new streambed in order to place the concrete arch blocks. That would depress the streambed below the desired level and had to be repaired before placing the next block, and so forth. This situation could have been avoided if there had been more room and the excavator could be positioned to the side of the arch, but Deer Creek is confined in a narrow valley at the arch site and the project area was likewise confined. Despite the difficulty, however, the streambed through the arch turned out to adequately portray what was described by the designs.

Twenty riparian shrubs at least 2" in diameter were trimmed to 5-6 feet tall by the contractor and transplanted in the streambanks to the east and west of Deer Creek both upstream and downstream of the new structure immediately following construction. The project was completed by a local Wallowa County contractor, Henderson Logging, Inc., with oversight from Joe Neer, W-WNF Engineer, and Dana Nave, W-WNF Hydrologist.

Disturbed soil was seeded with a native seed mixture in September by Dana Nave, and the riparian area was planted with 70 hardwoods in the following spring of 2009 by the W-WNF Riparian Plant Specialist, Cynthia Erickson, with help from the WMO fire crew and Cindy Sloan from the NPT.

Project changes from the original designs included using local streambed simulation rock instead of a commercial source, correcting one inaccurate footing elevation in the designs, and pouring more concrete than expected, resulting in a change order and increased cost to the project for which the W-WNF paid.

Summary and Conclusions

The Deer Creek culvert replacement was a definite success for both aquatic organism passage and the GRMWP & W-WNF partnership. The stream channel has undergone some minor adjustments, but looks great and is definitely functioning for all aquatic organism passage. The culvert replacement would not have occurred in 2008 had the GRMWP been unwilling to purchase the arch in time for it to be available for the July 15 – August 15 instream work window.

The project didn't go as smoothly as Henderson Logging would have preferred. They struggled to keep the site dewatered, but did a good job overall with the culvert replacement, rising to the "dewatering" challenge by using several different techniques and finally utilizing a combination of collection ponds with sump pumps and a French drain that worked in unison with the diversion culvert to keep the site mostly dry. The project also started later than anticipated as water flows were much higher than normal for that time of year. The delayed start also caused a delayed finish, with the project needing a work window extension which the Oregon Department of Fish and Wildlife granted immediately.

All partners involved should be commended for their ability and willingness to respond quickly and favorably in the face of changing project demands. In particular, the willingness of the GRMW to front the money for the purchase and transportation of the box arch for this project. That purchase was critical to

getting the project completed as the W-WNF would not have been able to wait to receive the BPA grant before ordering the arch and still get the arch installed during the limited one-month instream work window.

Summary of Expenditures

Table 4. Summary of expenditures for the Deer Creek Culvert Replacement, 2008.

	GRMW	USFS	USFS Legacy Roads \$	BPA	Total
Personnel					
GRMWP Project Manager (100 hours @\$45/hour)	\$4,500				\$4,500
GRMW Travel (200 mi @ \$0.4875/mi)	\$98				\$98
USFS Personnel (2007 work: Engineer's survey & design @ \$9,375; pre- implementation work for Hydrologist @ \$3,600. 2008 work: Engineer 160 hrs @\$35/hr (\$5,600), survey & staking @ \$1,500, testing @ \$2,500, and Hydrologist 80 hrs @ \$40/hr)		\$24,975			\$24,975
Subtotal	\$4,598	\$24,975	\$0	\$0	\$29,573
Excavation & Installation					
Mobilization (Lump sum)			\$21,789		\$21,789
Purchase and transportation of 23'x7'x40' bottomless concrete box arch with all foundations, wingwalls and curbs (Lump sum)	\$67,840				\$67,840
Clearing & grubbing (Lump sum)				\$2,000	\$2,000
Removal of existing culvert (Each)				\$3,450	\$3,450
Excavation and embankment (1696 cy @ \$25/cy)				\$42,400	\$42,400
Streambed channel excavation and rebuilding (191 cy @ \$50/cy)				\$9,550	\$9,550
Aggregate base, grading D, compaction A (36 cy @ \$45/cy)				\$1,620	\$1,620
Bottomless concrete box arch installation (Lump sum)				\$8,985	\$8,985
Additional Structural concrete, class A(AE), for footings - Reinforcing steel incidental item		\$15,180			\$15,180
Placed stream bed simulation rock, bed class 12, (Commercial Source) (116 cy @ \$50/cy)				\$5,800	\$5,800
Placed stream channel rocks, 16-24" (Commercial Source) (375 @ \$50 each)				\$18,750	\$18,750
Soil erosion and pollution control			\$8,211	\$7,015	\$15,226
Purchase and planting of 70 native hardwoods in spring 2009				\$2,249	
Subtotal	\$67,840	\$15,180	\$30,000	\$101,819	\$214,839
Direct Project Total	\$72,438	\$40,155	\$30,000	\$101,819	\$244,412
Administration					
USFS Indirect Expenses (8% of salary)		\$1,998			\$1,998
GRAND TOTAL	\$72,438	\$42,153	\$30,000	\$101,819	\$246,410
Percent of Budget	29.4%	17.1%	12.2%	41.3%	100%

Project Photographs - Photo Points



Deer Creek culvert inlet with trash rack; Aug 2006



Deer Creek arch inlet; May 2009



Deer Creek culvert outlet; Aug 2006



Deer Creek arch outlet; Sep 2008

Project Photographs – Construction Photos



Deer Creek upstream fish net and diversion; Jul 2008



Deer Creek footing construction; Aug 2008



Deer Creek box arch placement; Aug 2008



Transplanting native hardwoods with bucket; Aug 2008

Project Photographs - Channel Progression Upstream



Deer Creek view upstream from culvert; May 2007



Deer Creek view upstream from arch post-construction; Sep 2008



Deer Creek view upstream from arch; Oct 2009

Project Photographs - Channel Progression Downstream



Deer Creek view downstream from new arch; Sep 2008



Deer Creek view downstream from arch; May 2009



Deer Creek view downstream from arch; Oct 2009