CTUIR GRANDE RONDE SUBBASIN RESTORATION PROJECT

A Columbia River Basin Fish Habitat Project

Dark Canyon Fish Habitat Enhancement Project Final Report

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Fiscal Year 2010

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Project Overview

The CTUIR Grande Ronde Subbasin Restoration Project was initiated by the Confederated Tribes of the Umatilla Indian Reservation in 1996 to protect, enhance, and restore riparian and instream habitat for natural production of anadromous salmonids in the Grande Ronde River Subbasin. The project works with other agencies and private landowners to promote land stewardship and enhance habitat for focal fish, primarily spring chinoook salmon, summer steelhead, bull trout, and resident trout. Emphasis is placed on improving improving juvenile rearing habitat and adult spawning habitat with emphasis on restoring natural channel morphology and floodplain function, cold water refuge and complex aquatic habitat that supports required life histories for focal species.

Planning and coordination for the Dark Canyon (Cunha) Fish Habitat Enhancement Project was initiated in 2009 by the CTUIR to protect and enhance fish habitat along an approximate 0.75 mile reach of lower Meadow Creek and 2.2 miles of lower Dark Canyon Creek. Project planning, design, and development of a BiOp funding proposal through the Grande Ronde Model Watershed (GRMW) was completed in early 2010 in preparation for construction during summer 2010. Project permitting, including ESA compliance and ODSL/US Army Corps fill-removal permits and compliance was also completed in June 2010. Concurrence from the Oregon State Historic Preservation Office was issued conditionally for instream work, but excluded proposed removal of an approximate 500 lineal foot segment of historic railroad grade adjacent to lower Meadow Creek, pending additional analysis and consultation.

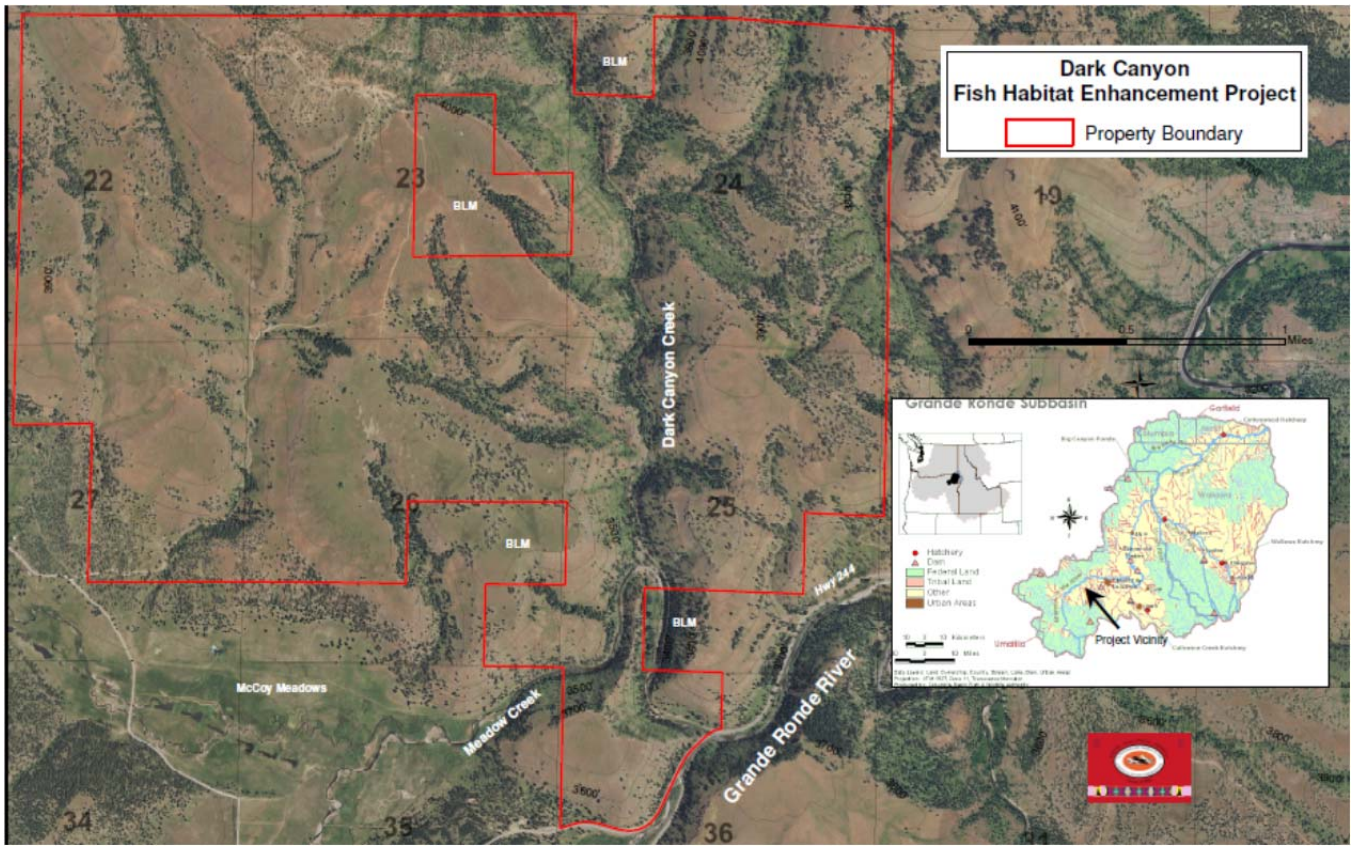
Instream habitat enhancement, including installation of large wood complexes and boulder clusters along Meadow Creek and Dark Canyon Creek was completed during July 2010. Removal of the railroad grade segment along lower Meadow Creek was delayed pending completion of SHPO concurrence. Additional investigation and reporting through the CTUIR Cultural Resource Program and BPA Archaeological Program finalized an MOA with SHPO in February 2011, but work could not be completed due to high water conditions, which resulted in BPA deciding to close the active contract under the GRMW Project (#1992-026-01) and transferring remaining project funds to the CTUIR's FY2012 Grande Ronde Subbasin Restoration Project (#1996-08-300). Completion of the project is scheduled for summer 2012. Key project accomplishments to date include:

- Implemented habitat enhancement along 0.75 miles of Meadow Creek and 2.2 miles of Dark Canyon Creek on the Dark Canyon (Cunha) Fish Habitat Enhancement Project, including placement of instream boulders and large wood complexes to enhance instream complexity.
- Conducted monitoring and evaluation activities on project areas.
- Project planning also included coordination with the landowner and NRCS to development and implement upland developments under the FSA EQUIP program and easement negotiations to protect Dark Canyon and lower Meadow Creek. During fall 2011, four spring developments were completed as part of the program to redistribute livestock from fish bearing streams. Approximately 4 miles of pasture fence installation is planning during summer 2012 under the EQUIP program and discussions are ongoing regarding conservation easements along Dark Canyon and Meadow Creek. Landowner options include CREP enrollment or a potential permanent easement that is currently being negotiated by through a cooperative effort between the CTUIR, Rocky Mountain Elk Foundation, and ODFW.

INTRODUCTION and DESCRIPTION OF THE PROJECT AREA

The project is located near Starkey, Oregon in the Upper Grande Ronde Subbasin. The project legal description is: Township 3 South, Range 35 East, portions of Sections 24, 25, and 36, Willamette Meridian, Union County Tax Lot 500. The project encompasses approximately 2.2 miles of Dark Canyon Creek and 0.75 miles of Meadow Creek beginning at the confluence of Meadow Creek with the mainstem Grande Ronde River upstream along Meadow Creek to McCoy Meadows and along Dark Canyon to the Wallowa-Whitman National Forest Boundary. The project area includes private land and two BLM tracts, one along Dark Canyon at the upper reaches of the project area and along the lower reach of Meadow Creek. See Figure 1.

FIGURE 1 DARK CANYON PROJECT LOCATION



The project was developed to protect and enhance fish habitat along lower Meadow Creek and Dark Canyon Creek and to address habitat limiting factors associated with priority ESA fish habitat in the Upper Grande Ronde Subbasin for Threatened Snake River ESU summer steelhead and spring-summer Chinook.

Habitat Limiting Factors and Existing Conditions

Habitat assessments and field surveys were initiated by CTUIR staff in June 2009 and consisted of a walk through survey along the Dark Canyon and Meadow Creek project reach to inventory large wood and qualitatively assess riparian, instream, and morphological condition. Baseline channel morphology and habitat surveys included instream large wood inventory, channel cross sections, longitudinal profile, and channel substrate. Generally, the upper reaches of Dark Canyon Creek are in fair condition compared with the lower reaches of both Dark Canyon and Meadow Creek with a more intact and mature riparian plant community, higher occurrence of large woody debris, and generally greater habitat

complexity. The lower 2 miles of Dark Canyon Creek illustrates a long history of riparian logging, extensive livestock grazing, and a general lack of large wood within the floodplain. Instream habitat conditions degrade from upstream to downstream reaches with poor habitat complexity, lack of large pool habitat, and excessive streambank erosion. Meadow Creek within the project area provides limited habitat complexity with poor availability of large pool habitat and a constrained floodplain created by an old railroad grade. Following is a summary of specific habitat limiting factors with additional discussion.

Habitat Conditions/Habitat Complexity – Channel instability associated with removal of streamside cover, logging in riparian areas, historic splash dam logging, and railroad grade construction has resulted in modification of natural channel processes, altered width/depth ratio's, elevated erosion, and simplified habitat. Field surveys along Dark Canyon Creek indicated an average of 13 pieces of large wood/per mile with the upper 1.5 miles providing higher quality riparian habitat and wood recruitment compared to the lower 1.5 miles which contained only 3 pieces of wood greater than 12 inches in diameter. Future wood recruitment potential in the upper and middle reaches of Dark Canyon is generally good with mid-seral stands of Douglas-fir, spruce, and ponderosa pine compared to the lower. Riparian shrub and tree cover is notably lacking, though the upper reaches of the Dark Canyon Creek contain scattered, mature cottonwoods. Meadow Creek within the project area provides poor habitat with a distinct lack of pool habitat and structure. Additionally, the entire length of Meadow Creek within the project area is constrained by the railroad grade located along its length on the left bank and along an approximate 800 foot segment along the right bank. The lower 0.25 miles of Meadow Creek has a wider, historic floodplain while the upper 0.5 miles are located within a confined valley form with limited potential for meander development. Channel classification transitions from a Rosgen "B" channel form to a "C" form but is largely constrained and disconnected from its historic floodplain by the railroad grade.

Sediment – Loss of upland and streamside vegetative cover has increased the rates of erosion. Soils lost from upland areas has overwhelmed hydraulic processes resulting in decreased availability of large pool habitat, spawning areas, riffle food production, and hiding cover. Field observations of Dark Canyon Creek and Meadow Creek within the project indicate locations with chronic streambank erosion and sediment transport to fish bearing streams. Road segments and portions of the historic railroad grade are actively eroding and streambank stability along lower Dark Canyon Creek is generally poor due to unstable channel morphology, lateral channel migration, and poor riparian conditions.

Riparian Function – Riparian habitat degradation is the most serious habitat problem in the subbasin for fish (McIntosh 1994, ICBEMP 2000). Loss of floodplain connectivity by roads, dikes, and channel incision, and in many streams reduced habitat suitability for beaver, has altered dynamically stable floodplain environments, which has contributed to degradation and limited habitat recovery. This loss leads to secondary effects that are equally harmful and limiting, including increased water temperature, low summer flows, excessive winter runoff, and sedimentation.

Low Flow – Water resources in many streams have been over-appropriated resulting in limited summer and fall base flow, development of fish passage barriers, and increased summer water temperatures. Water temperature monitoring initiated by the CTUIR in 2009 on Dark Canyon Creek documented 7 day summer maximum temperatures exceeding 23 ºC near the confluence with Meadow Creek 22 ºC at the upstream property boundary (Figure 1). Ongoing monitoring along Meadow Creek at McCoy Meadows reveals summer maximum temperatures exceeding 28 ºC.

METHODS, RESULTS, AND DISCUSSION

The following sections present work elements, milestones, and milestone descriptions followed by discussion of accomplishments for the project during the contract period.

Manage and Administer Projects

This work element includes a suite of management actions required to administer the project, including development of the statement of work and budget, reporting on milestones and metrics in Pisces, supervising and directing staff activities, payroll, purchasing, subcontracting for services, and administering/inspecting habitat enhancement activities. CTUIR staff coordinated with the GRMW and BPA in preparation of a funding proposal and securing and contracting funding through BPA. CTUIR staff prepared project designs, all permitting documentation, and construction subcontracting documents, project stakeout, field construction administration, and subcontract administration.

Environmental Compliance and Permits

Environmental compliance methods include development of appropriate documentation under various federal and state laws and regulations governing federally funded project work. Methods involve coordination with various federal and state agencies and development, oversight, and submittal of permit applications, biological assessments, cultural resource surveys, etc. Primary accomplishments during the reporting period included coordination with BPA environmental compliance personnel to complete HIPII BiOp documentation for ESA chinook and summer steelhead, review of USFWS ESA species of concern, cultural resource surveys and preparation of reports, and preparation of permit applications and documentation for USCOE and Oregon DSL permits. BPA consultation with SHPO associated with proposed railroad grade segment removal extended approximately May 2010 to February 2012, which created extensive delay in completing fish habitat enhancement on the project. The consultation required development of an MOA which required mitigation. Mitigation for the railroad removal effort will be completed by the CTUIR Cultural Resource Program under the CTUIR Grande Ronde Subbasin Restoration Project during summer 2012. Mitigation consists of 20 miles of field reconnaissance and documentation of off-site railroad segments.

Project Construction/Implementation

Large Wood and Boulder Additions:

A total of approximately 150 pieces of large wood were installed at 30 sites along Dark Canyon and Meadow Creek in existing pools,

or placed in a manner to create pool habitat and provide in-stream habitat complexity. The objective of the large wood and boulder additions included: pool creation, providing velocity refuge, encourage floodplain activation, store and sort sediment, and provide thermal and predatory refuge for aquatic species. Clearing of in-channel diversity

such as boulders and large wood associated with historic railroad construction and logging has simplified habitat within the project area.

Large pool habitat was limited to existing limited wood complexes, limited large boulders, and hard rock outcroppings. Riffle and shallow glide habitat dominated available habitat in the existing condition. Boulders were placed either individually, or in clusters, in existing riffles and pools to increase complexity and enhance availability of pocket and step-pool habitat.

Large wood structures included whole conifers with intact rootwads (greater than 24 inch diameter at breast height (DBH) and 35 feet in length) which were donated by the Oregon Department of Transportation. Logs were placed in debris jam configurations and ballasted with large boulders along lower gradient reaches of Meadow Creek with the highest potential to form large, complex pool habitat (existing pools with gravel substrate) and in areas that can potentially provide thermal refuge in conjunction with complex pool habitat (i.e. the confluence of Dark Canyon Creek and the side channels associated with an existing abandoned floodplain caused by the railroad grade). The objective of these structures is to provide a hardened structure to direct the stream's thalweg and energy in order to scour or maintain pool depths and to provide channel complexity where little existed previously.

Log jams were installed on Dark Canyon Creek at 18 sites along the lower section and 10 sites near the upper property boundary. The wood utilized for the lower section was hauled from offsite areas and was generally between 16 and 24 inch DBH and greater than 35 feet long. Large wood used in the upper section was collected from adjacent uplands using mainly dead and/or downed material that was generally limited to 12-16 inch DBH and greater than 20 feet in length. Logs were placed in configurations that mimicked natural wood recruitment.

Lower Dark Canyon Photo Point 1(pre-project and post project)

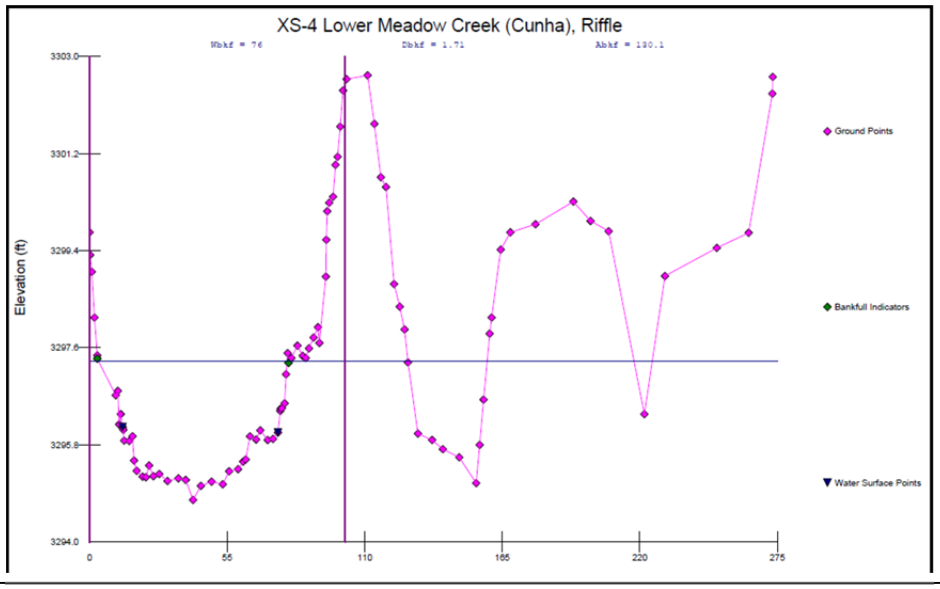
Photo Point along Lower Dark Canyon Creek

Photo point at confluence of Dark Canyon and Meadow Creek

Enhance Floodplain Connectivity and Riparian Habitat Condition

An approximate 500 foot segment of historic railroad grade adjacent to lower Meadow Creek is scheduled for removal to improve floodplain connectivity and enhance riparian and wetland habitat. The following figure illustrates a cross sectional view of the lower Meadow Creek which depicts the historic railroad grade within the middle of the historic floodplain.

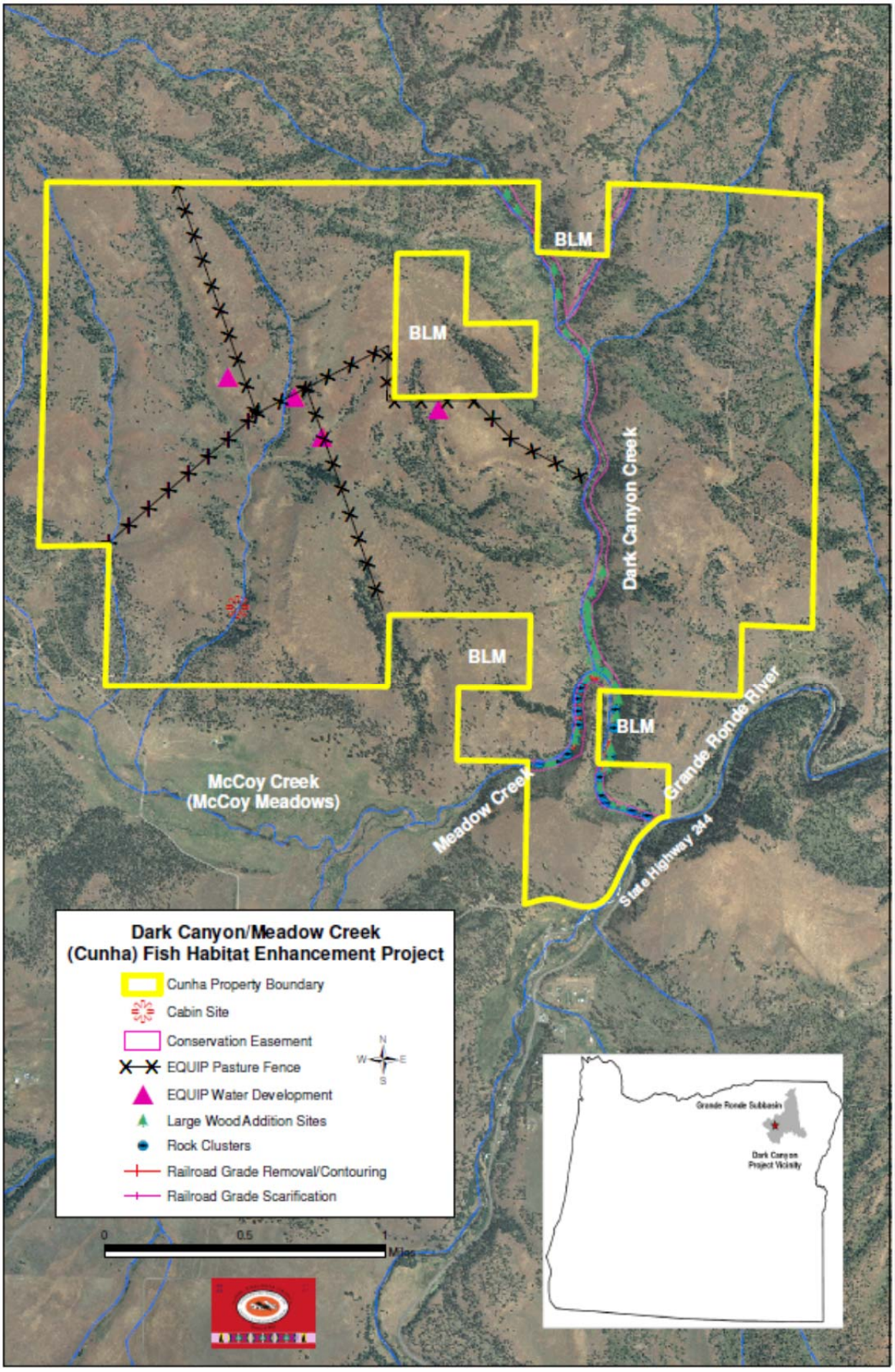
FIGURE 2 MEADOW CREEK CROSS SECTION ILLUSTRATING FLOODPLAIN CONSTRAINT DUE TO THE HISTORIC RAILROAD GRADE



The reach is characterized as high gradient, wide and shallow, a width to depth ratio of nearly 45, and lacks complexity. Removal of the railroad grade segment in conjunction with floodplain contouring, installation of large wood and structure rock would increase the flood prone area, decrease gradient, allow for lateral channel migration and promote recovery of riparian and instream habitat.

This component of the project was originally scheduled to be completed during 2010, but concurrence from Oregon SHPO on cultural resources was not received promptly and resulted in delaying construction until summer 2012. Funds remaining for this work under this contract were transferred by BPA to the CTUIR Grande Ronde Subbasin Restoration Project (199608300) under the FY2012 contract. Work will be completed during early July 2012. Photo illustrates Meadow Creek viewing upstream towards Dark Canyon Creek. The historic railroad grade is located along the right bank in center right of photo.

FIGURE 3 DARK CANYON FISH HABITAT PROJECT OVERVIEW



Monitoring & Evaluation

Monitoring and evaluation efforts for the project include photo-points, water temperature, stream channel cross sections and longitudinal profiles, pebble counts, juvenile fish population and habitat surveys. For a complete overview of CTUIR Grande Ronde Fish Habitat Project monitoring and evaluation efforts, please refer to annual reports located at: http://www.cbfish.org/Report.mvc/SearchPublications/SearchByTextAndAuthorAndDate. CTUIR biologists conducted initiated baseline field surveys during summer 2010 throughout the project area to document existing conditions, identify habitat limiting factors, and develop project objectives and associated actions. Following is a summary of monitoring efforts for the project.

Water Temperature Monitoring

During 2010, thirty three (33) temperature probes were deployed within the Grande Ronde Basin by the CTUIR (compared to 22 sites in 2009), all recording at 1-hour intervals. The CTUIR Grande Ronde Fish Habitat Program has monitored water temperatures on Dark Canyon Creek within the Cunha Ranch since summer 2009. Two probes are deployed each year at river mile 1.9 (at the upstream property boundary) and 0.06 (near the confluence with Meadow Creek) (See Figure 4). Three years of record are available for temperature probes within the project area. In addition to these probes the Columbia River Inter Tribal Fish Commission (CRITFC) provided temperature data along Meadow Creek to CTUIR for 2010 – these probes are deployed at river mile 0.03 and 0.90 within the Cunha Ranch.

Summary statistics are calculated for each probe and include the number of records when temperatures were at or exceeded the DEQ lethal limit of 25ºC, when temperatures were within a range of 10ºC to 15.6ºC (the preferred temperature range of juvenile Chinook salmon – as cited by Yanke et. al. 2003. The number of days when the mean temperature was at or exceeded the DEQ standard of 17.8ºC was also calculated.

Table 1 Water temperature probe metrics for 18 sites in the Upper Grande Ronde Basin and Meadow Creek sub-basin during 2010

Probe id	Stream Name	River Mile	Start Date	End Date	Days deployed	Hours deployed	Hours for analysis	Hours Between 10-15.6°C	Hours >=25°C	# Days $\bar{x}$ >=17.8°C
BATTLE1	Battle	0.04	3/29	11/19	235	5640	4915	1623	0	0
CLC1	Clear	0.06	5/11	10/28	170	4080	4007	1220	0	0
DC1	Dark Canyon	0.06	4/7	11/19	226	5424	5398	2156	0	0
DC2	Dark Canyon	1.90	4/7	11/19	226	5424	5399	1761	0	6
GR4	Grande Ronde	194.23	5/11	10/28	170	4080	4079	1467	4	18
GR5	Grande Ronde	199.75	6/22	10/28	128	3072	3023	1314	0	0
GR6	Grande Ronde	202.30	5/11	10/28	170	4080	4079	1276	0	0
GR7	East Fork Grande Ronde	0.05	5/11	10/28	170	4080	4078	1152	0	0
GR8	Grande Ronde	203.02	5/11	10/28	170	4080	2528	908	0	0
MCCOY1	McCoy	2.70	3/29	11/19	235	5640	3648	1255	23	40
MCCOY6	McCoy	1.50	3/29	11/19	235	5640	5605	1816	71	46
MCCOY7	McCoy	0.10	3/29	11/19	235	5640	5533	1803	101	51
MEADOW1	Meadow	2.90	5/1	11/19	202	4848	4765	1462	231	64
MEADOW2	Meadow	1.50	5/1	11/19	202	4848	4719	1614	88	51
MEADOW3	Meadow	1.06	3/29	8/5	129	3096	2749	822	122	26
MEADOW4	Meadow	0.17	3/29	8/5	129	3096	2716	908	105	19
MEADOW5	Meadow	7.53	3/29	11/19	235	5640	4891	1514	32	15
MEADOW6	Meadow	6.77	6/22	11/19	150	3600	2892	1060	19	17

Dark Canyon Creek is a source of cool water for Meadow Creek. In the 3 seasons of monitoring water temperature there were no instances of temperatures >=25°C (a lethal limit for salmonid spp.), and only a total of 13 days when mean daily temperatures were >=17.8°C (see Table 1 for the distribution). Temperature ranges at the upper probe were within 10°C to 15.6°C (the preferred range for salmonid

spp.) for 31% of the data in 2009 rising to 46.5% in 2011. These ranges were recorded for 34% of the lower probe data in 2009 and were for 60.9% of the data collected at the lower site in 2011.

Diurnal fluctuations in water temperature are plotted and compared for each year/season of deployment to give a visualization of any post-restoration changes compared to pre-restoration, with a narrowing of water temperature fluctuations being the preferred outcome. Figure 5 indicates that for the upper section of Dark Canyon (at the upstream property boundary) there has been little change in water temperature fluctuations during the monitoring period. Data collected from the lowermost monitoring station (Figure 6) indicates that the diurnal fluctuations in water temperature have narrowed during the post-restoration period (2011) compared to the pre-restoration period (2009 and 2010). There were some differences between years at the upper site with an increase in the percent of time in a preferred temperature range in 2011 compared to 2009 but these differences are not as great as those observed at the lower site. It could be argued that these differences may be a function of seasonal weather patterns rather than any restoration effort, however, further exploration of stream flow on Meadow Creek <½ mile below the mouth of Dark Canyon Creek indicates that while early season flows were higher in 2011 compared to 2009, flows from August of each year were similar (Figure 7).

FIGURE 4 CTUIR WATER TEMPERATURE PROBE LOCATIONS WITHIN THE MEADOW CREEK DRAINAGE

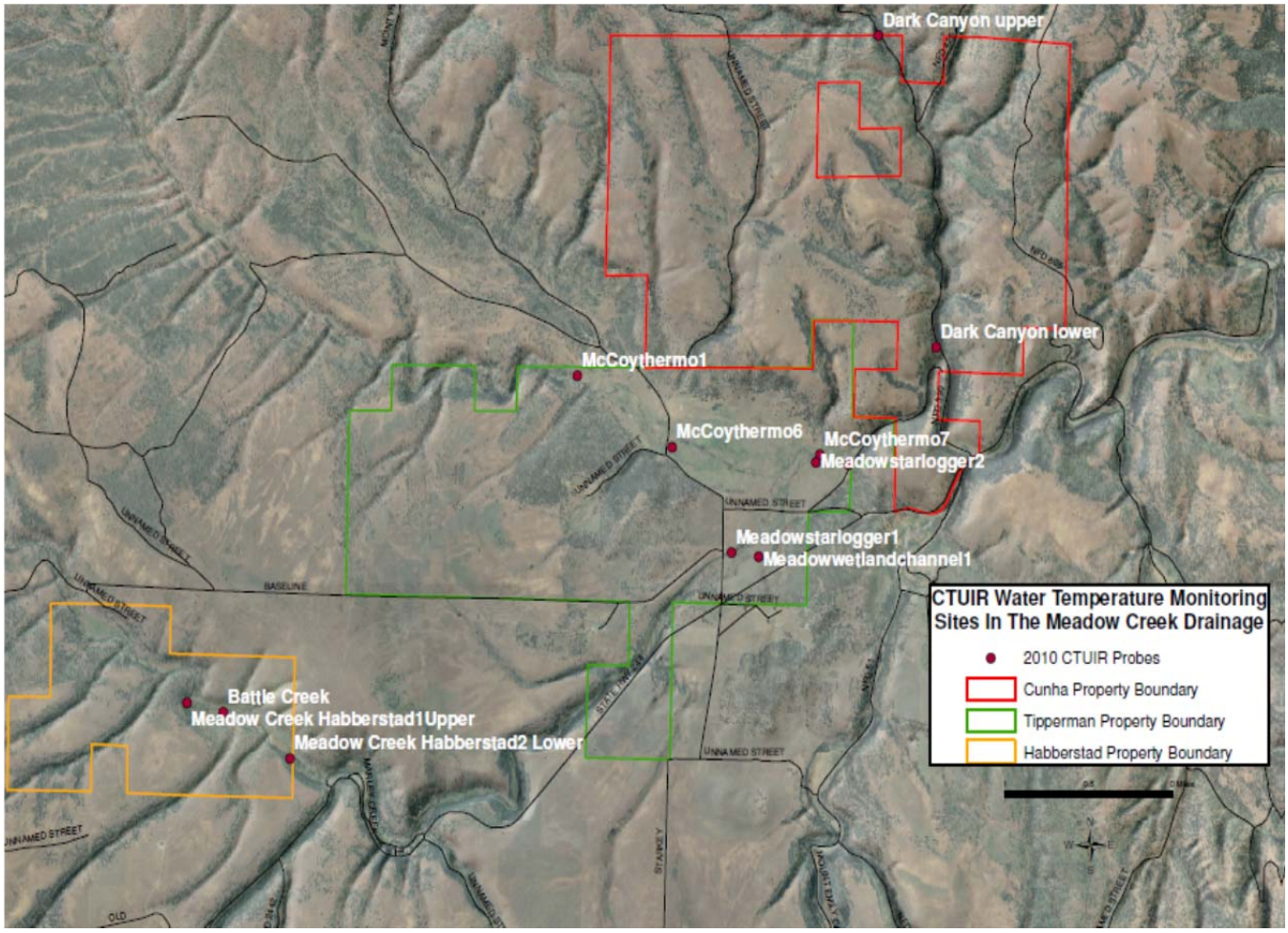


FIGURE 5 DARK CANYON CREEK DIURNAL WATER TEMPERATURES AT RM 1.9 DURING 2009-2011

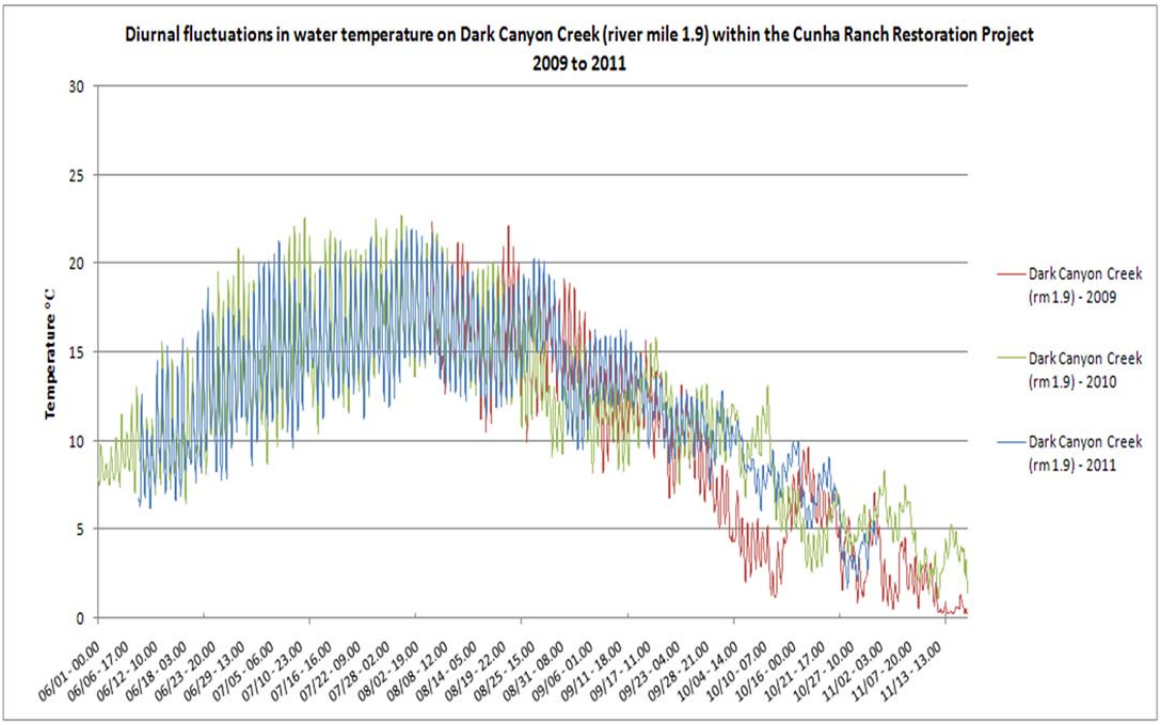


FIGURE 6 DARK CANYON CREEK DIURNAL WATER TEMPERATURES AT RM 0.06 DURING 2009-2011

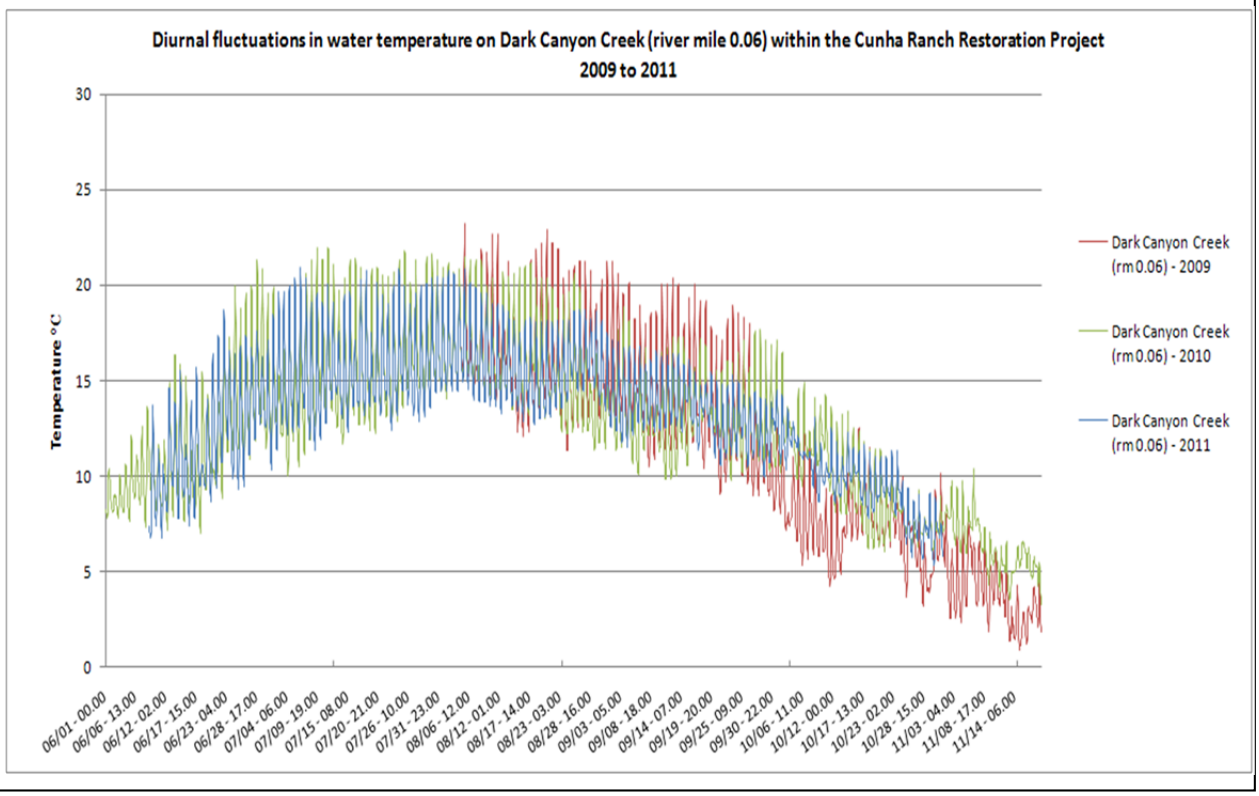
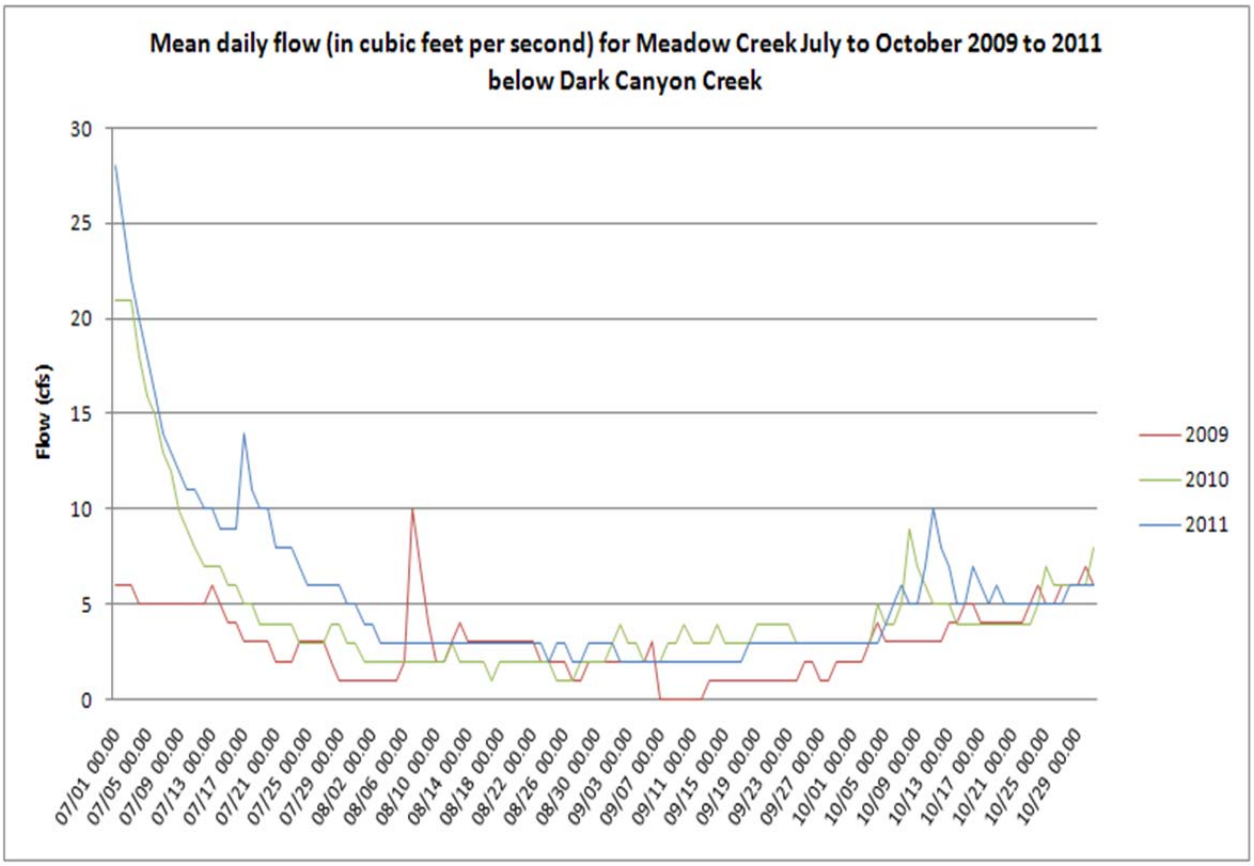


FIGURE 7 MEAN DAILY FLOW FOR MEADOW CREEK (JULY-OCTOBER 2009-2011)



Plot of mean daily flow 2009 to 2011 on Meadow Creek <1/2 mile below Dark Canyon Creek. Plots show similar flow ranges from August to October each year. Differences in temperatures between probes at river mile 1.9 and 0.06 were observed on Dark Canyon Creek during this time period and are not explained by an increase in water within the monitoring area.

Table 2 Summary Statistics for the Dark Canyon Creek Temperature Probes within the Cunha Ranch During 2009-2011

Stream	Probe id	River Mile	Max Temperature (°C)			Percent 10-15.6 °C			# Days mean >=17.8°C		
			2009	**2010**	2011	2009	**2010**	2011	2009	**2010**	2011
Dark Canyon Creek	DC2	1.9	22.3	22.7	22.0	31.0	32.6	46.5	2	6	4
Dark Canyon Creek	DC1	0.06	23.1	22.0	20.9	34.3	39.9	60.9	1	0	0

Both CTUIR and CRITFC monitor water temperatures on Meadow Creek at several locations. There are two probes deployed by CTUIR upstream of the Cunha Ranch at river mile 1.5 and 2.9, while CRITFC deploys two probes within the property boundary at RM 0.03 and 0.90. Data from the CRITFC probes during summer 2010 show temperatures >=25°C for a total of 308 hours out of the 4,104 hours of data collected (112 hours at the lower site near the confluence with the Grande Ronde river and 196 at the upper site). For the CTUIR probes during the same period there were a total of 308 hours >=25°C out of 4,224 hours of data (223 hours at river mile 2.9 near the McIntyre road bridge and 85 hours at river mile 1.5 above the confluence with McCoy Creek). The percent of records when temperatures were between 10°C and 15.6°C were 29.7% (at RM 2.9), 34.0% (at RM 1.5), 32.8% (at RM o.9), and

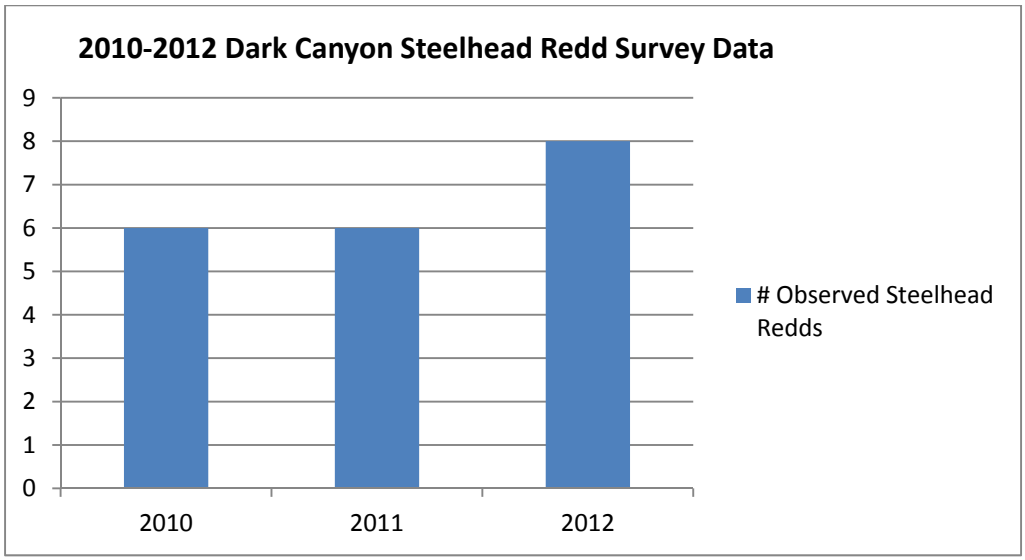
33.9% at the lowest probe (RM 0.03). From these data it appears that water temperatures on Meadow Creek enter the McCoy Meadows Ranch and cool slightly as it passes through the wetland complex area, re-activated in 2006, then warms again as McCoy Creek enters the system only to cool somewhat as it receives water from Dark Canyon Creek.

Fish Populations

Fish Spawning and Rearing Surveys

Steelhead spawning surveys have been conducted within the project area beginning in 2010 between late March and early June along an approximate 2.2 mile reach. The sample reach extends from the confluence of Dark Canyon with Meadow Creek upstream to the Wallowa-Whitman National Forest boundary. For the period between 2010-2012, an average of 3 redds per mile have been observed within the project. Summer steelhead spawning activity has been observed as early as late March and into early June. Table 3 presents a graphical view of the survey data. ODFW conducted spring Chinook spawning surveys along Meadow Creek in 2010 and 2011 but found no adult fish or redds.

Table 3 2010-2012 Dark Canyon Steelhead Redd Survey Summary



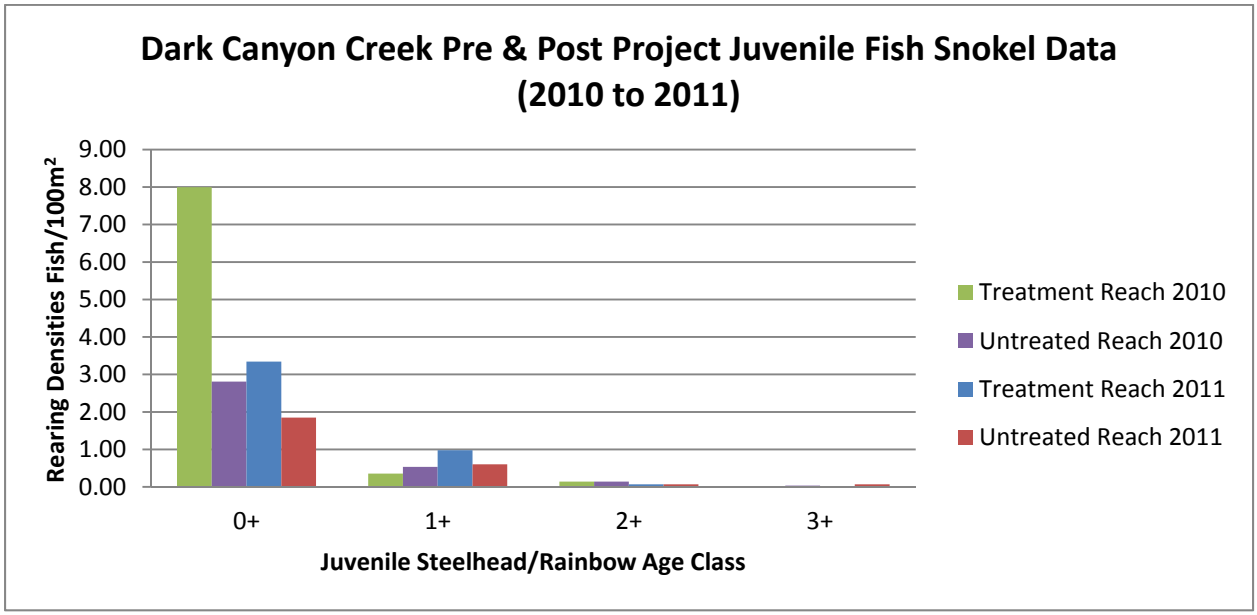
Juvenile Population Surveys

In 2010 the CTUIR Fish Habitat Program, as part of the restoration efforts within the Cunha Ranch, began a long term monitoring plan designed to compare pre-restoration salmonid compositions within Dark Canyon Creek with those of post-restoration and also to compare a section of stream that has logjams installed with that of one that does not.

The survey protocol included snorkel surveys along two 1000 meter sections – one starting at river mile 0.02 and the other starting at river mile 0.60. Pre-project snorkel surveys were initiated in July 2010 and repeated post-project in July 2011. Survey reaches were delineated as treated and untreated (control) with the treated reach located along the lower reaches of Dark Canyon Creek and the upper control reach located along a segment with no treatment (See Figure 9). Data collected included number and species of salmonids by age class, identification and

enumeration of other fish species observed, and measurement of channel length and wetted width to provide the basis from which to calculate salmonid rearing densities per 100 square meters of habitat.

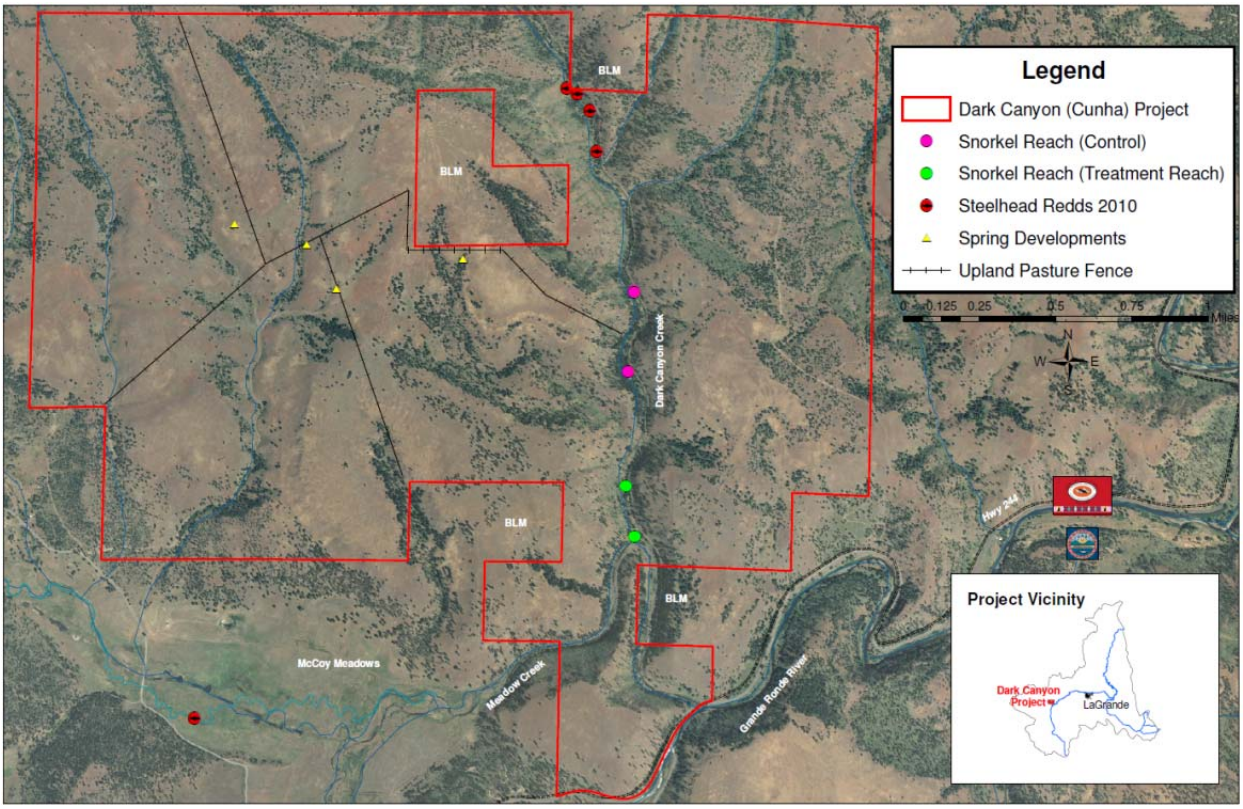
FIGURE 8 2010-2011 DARK CANYON CREEK JUVENILE FISH SNORKEL DATA



Pre-project surveys in 2010 documented a total of 213 O.mykiss (all age classes) in the lower Dark Canyon Creek treatment reach with low densities of cyprinids (3), sucker (2),and sculpin (1). Juvenile O.mykiss rearing densities in the upper control reach were about 33% of the population observed in the lower reaches (104 total O.mykiss) with a single cyprinid, zero sucker, and 3 sculpin observed. During the 2010 survey, no juvenile spring Chinook were observed. Surveys during July 2011 following project construction documented 124 O.mykiss, 5 cyprinids, zero suckers, and 4 sculpin in the treatment reach and 73 O.mykiss, zero cyprinids, zero suckers, zero sculpin in the control reach. Figure 8 presents the 2010 and 2011 data by sample reach.

Of note during the 2011 surveys was the large presence of juvenile spring Chinook in both Dark Canyon Creek and Meadow Creek. A total of 202 juvenile Chinook were observed in lower Dark Canyon Creek in the treatment reach with 7 observed in the upper control reach. The presence of juvenile Chinook is thought to be associated with CTUIR fish production efforts associated with placement of surplus chinook eggs (pumping redds) from Grande Ronde hatchery operations.

FIGURE 9 UPPER GRANDE RONDE SUBBASIN SUMMER STEELHEAD REDD SURVEYS AND JUVENILE FISH SNORKEL SURVEY LOCATIONS



SUMMARY AND CONCLUSIONS

Project construction completed in 2012 initiated the first phases of restoration and protection with the project area. Installation of instream structural complexity in the form of large wood and boulders has enhanced habitat diversity, is initiating gravel storage and routing, and developing complexity. Long term development and proteciton of instream, floodplain, and riparian resources will provide higher quality habitat and improve juvenile rearing and adult spawning habitat. Dark Canyon provides an important cold water resource in the lower Meadow Creek watershed and is well connected to upstream restoraiton actions which cummulatively should improve anadromous and residentf fish productivity.

Additional work within the Cunha ownership includes upland water developments and pasture fence installation to improve livestock distribution and management and protect riparian habitat along Dark Canyon Creek and Meadow Creek. These actions are being funded under Federal Service Administration (FSA) EQUIP and CREP programs. Four upland water developments were completed during 2011 and approximately 4 miles of upland pasture fence is scheduled for installation during 2012. Fall 2012 CREP enrollment along the Dark Canyon and Meadow Creek corridors will facilitate installation of riparian fencing to exclude livestock and riparian planting to restore riparian plant communities.

SUMMARY OF EXPENDITURES

A final financial was not available at the time this annual report was compiled. The total project budget was $110,121 and approximately CTUIR Administration and Accounting will have a final financial prepared within 30 day of the end of this contract period and will be posted when it becomes available.

APPENDIX A – DARK CANYON (CUNHA) FISH HABITAT ENHANCEMENT PROJECT, GRWM Ripples Article

Ripples in the Grande Ronde

Spring 2010

RIVERS UNITING NEIGHBORS · QUARTERLY NEWS FROM THE GRANDE RONDE MODEL WATERSHED

A New Chapter in the History of Cunha Ranch

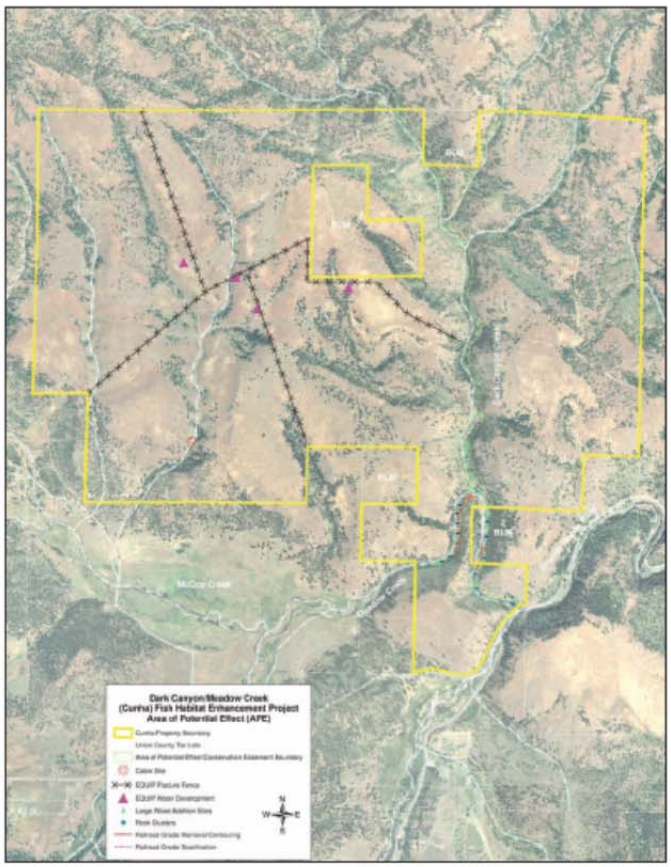
by Allen Childs, Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
All photos courtesy of the CTUIR

Joseph Cunha is a lifelong resident of northeast Oregon and the owner of the 3,000-acre Joseph Cunha Ranch, LLC., near Starkey. He has seen his share of change in his lifetime as a member of a ranching family in the Grande Ronde subbasin. As a 5-year old, Joe remembers 1955 as one of the last years that the family grazed sheep on the ranch. It is not surprising that the sheep ranching left an impression on a young boy, as the grazing operation included six bands of sheep (more 6,000 ewes and lambs) that provided wool and meat for the market, which the family depended on for their livelihood. In the 1960s and continuing to the present day, ranchers turned to cattle ranching and logging activities to make ends meet.

A long history of splash-dam logging on both Meadow Creek and Dark Canyon Creek as well as livestock grazing, road and railroad construction, and commercial logging has shaped the landscape on the Cunha Ranch. Upland range conditions are generally poor in the harsh, dry environment found on the shallow, rocky soils. Historic alteration of riparian and riverine habitat, particularly related to railroad and road construction, has limited normal habitat formation processes by constricting or eliminating floodplains and decreasing the diversity of in-stream habitat types normally found in un-altered rivers and streams.

Revitalizing Cunha Ranch Rangeland and Fish Habitat

In order to improve some of these rangeland and watershed conditions on their ranch, Joe and his wife, Patricia, recently decided to embark on a rangeland and fish and wildlife habitat enhancement project. Their land straddles about one mile of lower Meadow Creek and more than three miles of Dark Canyon Creek near the confluence of Meadow Creek and the Grande Ronde River. The project emphasizes restoring upland grasslands for big game and livestock as well as riparian and in-stream habitat for salmon and steelhead. Joe and Patricia initially contacted the local Natural Resource Conservation Service (NRCS) to look into available conservation programs, with the objective of trying to find ways to increase the quantity and quality of range resources and improve water availability for livestock. Watering sites are limited in the upland pastures, and operators have been forced to utilize Dark Canyon Creek and Meadow Creek for decades. Both Joe and Patricia felt that something could be done to enhance and restore upland and watershed conditions, but they needed technical and financial assistance to design and fund necessary range infrastructure and attract interest in the fish habitat their ranch provides to the subbasin.



ABOVE: Vicinity map of the Cunha Ranch project.

Building the Project Team

Following initial contact with local NRCS Conservationist Mike Burton, Joe and Patricia elected to invite biological staff from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Grande Ronde Fish Habitat Program (based at the Agriculture Service Station in Island City) to discuss additional conservation and cost-share opportunities to meet their overall objectives. CTUIR biologists then initiated habitat surveys and field review along Dark Canyon Creek and Meadow Creek to assess existing conditions, identify factors limiting fish production, and develop a list of opportunities to improve in-stream and riparian habitat conditions.

The Project's Objectives

Following the initial assessment, both NRCS and CTUIR with assistance from the Cunhas completed a more detailed plan that identified management practices, infrastructure needs, habitat project elements, and a strategy to fund project elements. The overall project plan includes construction of 3.4 miles of upland pasture cross-fencing and installation of four livestock watering facilities on existing springs to provide for improved livestock distribution and management.

Project objectives include:

- **Developing Protect Habitat.** This objective involves developing a riparian conservation easement along 3.5 miles of Dark Canyon and 0.5 miles of Meadow Creek. Currently, Bureau of Land Management tracts within the project area are fenced and excluded from grazing, which will be opened with the new conservation easement.
- **Enhancing In-stream Structural Diversity and Complexity.** This objective involves installing large wood complexes and rock structures to facilitate the development of riffle, run, pool, and glide habitat representation and provide in-stream diversity, mimicking the natural recruitment of wood and rock needed for productive fish habitat.
- **Enhancing Floodplain Connectivity.** This objective involves removing and/or breaching segments of old railroad grade that currently restrict floodplain function and riparian/wetland habitat along Meadow Creek.
- **Enhancing Riparian Habitat Conditions.** In conjunction with planned upland infrastructure developments and establishment of the riparian conservation easement, this objective involves eliminating livestock use of riparian habitat along Dark Canyon Creek and Meadow Creek, enhancing hydrologic connectivity where feasible, and increasing riparian aquatic plant communities through artificial (planting/seeding) and natural recruitment strategies.

The fish habitat component of the project encompasses approximately 3.5 miles of Dark Canyon Creek and 0.75 miles of Meadow Creek, beginning at the confluence of Meadow Creek with the Grande Ronde River and continuing upstream along Meadow Creek to McCoy Meadows, then along Dark Canyon to the Wallowa-Whitman National Forest boundary. Fish habitat improvements include placing wood and rock clusters in-stream to enhance in-stream diversity and create pool habitat as well as removing a portion of an old railroad grade to re-activate the floodplain along Meadow Creek during high-water events. Funding for the fish habitat component of the project will be provided by the GRMW, the Bonneville Power Administration, and the CTUIR.

Following completion of the in-stream habitat work planned for Summer 2010, the landowners will enroll approximately 65 acres of riparian habitat along Dark Canyon and Meadow Creek into the Conservation Reserve and Enhancement Program (CREP), which will provide funding for the installation of riparian fencing and planting to be completed by Summer 2011.

Project Benefits

Project benefits include the Cunhas' enhanced ability to manage livestock by using a rest pasture rotation system with adequate upland water resources. Another benefit is the protection of approximately four miles of summer steelhead spawning and rearing habitat as well as protection of rearing habitat for spring Chinook salmon. Under the project plan, grassland communities and riparian and in-stream habitat should improve significantly over the long term.

The project is closely related to ongoing and proposed restoration activity in the Meadow Creek watershed. Since the mid-1980s, ongoing restoration efforts along Meadow Creek and its tributaries (McCoy Creek, McIntyre Creek, and Dark Canyon Creek) have included obliteration of extensive amounts of roadways, removal of railroad grade, the addition of large woody structures, construction of meandering river channels in areas where streams had been previously channelized, and improvement of rangeland conditions, such as water developments and fencing, riparian planting, and noxious weed control.

The foresight and willingness of landowners like Joe and Patricia to contribute to conservation efforts while maintaining a working ranch help improve fish and wildlife habitats within the Grande Ronde Basin. Projects like this one on the Cunha Ranch greatly contribute to other restoration actions in the watershed by providing connectivity between projects near the confluence of the mainstem Grande Ronde River. This connectivity is important for the long-term improvement of available habitat needed to sustain threatened and endangered fish species as well as wildlife.

ABOVE: Cunha Ranch on Dark Canyon Creek looking south (downstream) toward its confluence with Meadow Creek.

ABOVE: Meadow Creek. Note the abandoned floodplain at left and the railroad grade (the mound of earth at right).

ABOVE: Lower Meadow Creek. The old railroad grade is located along the right side of the streambank.

Appendix B Dark Canyon (Cunha) Fish Habitat Enhancement Project, Grande Ronde Model Watershed BiOp Funding Proposal

GRANDE RONDE MODEL WATERSHED
Watershed Enhancement Project Proposal
March 2010

1. **Project Name:** Dark Canyon/Meadow Creek (Cunha) Fish Habitat Enhancement Project

2. **Applicant:** Confederated Tribes of the Umatilla Indian Reservation, Grande Ronde Subbasin Fish Habitat Restoration Project

3. **Participating Landowner(s) and Agencies:**

   Joseph Cunha
   43530 Shetland Court, Pendleton, Oregon 97801
   pjcunha@q.com
   541-276-8031 (home)

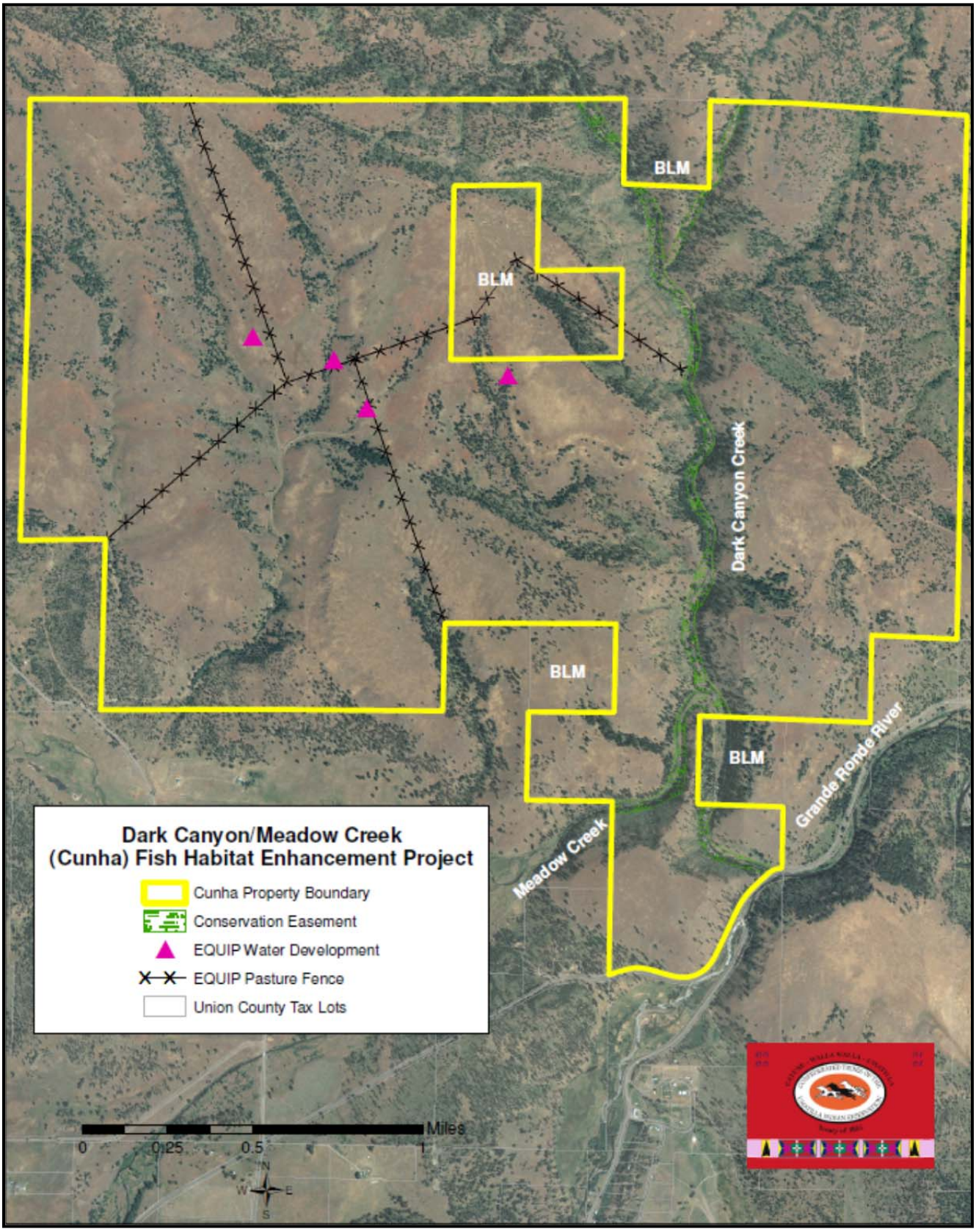
4. **Project Contact(s):**

   Technical Contact:
   Allen Childs, Project Leader
   LaGrande Field Office
   Ag Service Center, Rm. 4
   10507 North McAlister Road
   Island City, Oregon 97850
   allenchilds@ctuir.com
   541.429.7940 (office & fax)
   541.969.3142 (mobile)

   Administrative Contact:
   Julie Burke, DNR Administrative Manager
   PO Box 638
   Pendleton, Oregon 97801
   julieburke@ctuir.com
   541.429.7292 (office & fax)

5. **Project Location:**
   The proposed project is located near Starkey, Oregon in the Upper Grande Ronde Subbasin. The project legal description is: Township 3 South, Range 35 East, portions of Sections 24, 25, and 36, Willamette Meridian, Union County Tax Lot 500. The project encompasses approximately 3.5 miles of Dark Canyon Creek and 0.5 miles of Meadow Creek beginning at the confluence of Meadow Creek with the mainstem Grande Ronde River upstream along Meadow Creek to McCoy Meadows and along Dark Canyon to the Wallowa-Whitman National Forest Boundary. The project area includes private land and two BLM tracts, one along Dark Canyon at the upper reaches of the project area and along the lower reach of Meadow Creek. See Figure 1.

Figure 1 Project Vicinity Map



6. Project Objectives:

The following identifies project specific objectives and references to specific objectives identified in the Grande Ronde Subbasin Plan:

a. **Protect Habitat:** Develop riparian conservation easement along 3.5 miles of Dark Canyon and 0.5 miles of Meadow Creek. Conservation strategy includes CTUIR-BPA riparian conservation easement and NRCS/FSA CREP Easement. BLM tracts within the project area are currently fenced and excluded from grazing.

Subbasin Plan Reference: Habitat Protection. (page 258):
• Protect high quality habitat, restore degraded habitats, and provide connectivity between functioning habitats.
• Manage for healthy ecosystems to support aquatic resources and native species

b. **Enhance Instream Structural Diversity and Complexity:** Install/construct large wood complexes and limited rock structures to facilitate development of riffle, run, pool, glide habitat representation and provide instream diversity, mimicking natural recruitment of wood and rock, respective of channel types.

Subbasin Plan Reference: Channel Conditions (page 260):
•Maintain existing LWD by promoting BMP's for forestry practices. Add LWD where deficient and appropriate to meet identified short term deficiencies.
• Reconnect channels with floodplain or historic channels where appropriate and feasible. •Install in-channel structures (LWD, boulders).

c. **Enhance Floodplain Connectivity:** Remove and/or breach segments of old railroad grade currently confining floodplain function and riparian/wetland habitat along Meadow Creek.

Subbasin Plan Reference: Channel Conditions (page 260):
• Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.

d. **Enhance Riparian Habitat Condition:** In conjunction with planned upland infrastructure developments through FSA-EQUIP and CTUIR-PCSRF funding (upland range pasture fence installation and water developments) and establishment of term riparian conservation easement, remove livestock utilization from riparian habitat along Dark Canyon Creek and Meadow Creek, enhance hydrologic connectivity where feasible, and increase riparian hydrophytic plant communities through artificial (planting/seeding) and natural recruitment.

Subbasin Plan Reference: Riparian Conditions (page 262):
• Improve the density, condition and species composition of riparian vegetation through planting, seeding, improved grazing and forest management practices.
Subbasin Plan Reference: Sediment Conditions (page 261):
• Manage grazing in riparian areas following grazing plans designed to improve riparian condition; could include exclusion, partial season use, development of off-site water, herding.
• Reestablish riparian vegetation by planting trees, shrubs, sedges (native species preferred)
• Stabilize active erosion sites, where appropriate, through integrated use of wood structures (limited use of rock if necessary) and vegetation reestablishment.
• Encourage landowner participation in riparian management incentive programs, e.g. CREP, WRP, EQIP.
• Promote/implement development of grazing plans to improve upland vegetative condition.

7. Project Description

Introduction - The project proposes a coordinated approach to address management challenges on a private cattle ranch and habitat limiting factors associated with priority ESA fish habitat in the Upper Grande Ronde Subbasin for Threatened Snake River ESU summer steelhead and spring-summer Chinook. The project includes assisting the private landowner with upland infrastructure development to offset a reduction in access to pastures and water resources for habitat conservation purposes along Meadow Creek and Dark Canyon Creek. The upland portion of the project, consisting of 3.4 miles of pasture cross fence and four spring developments, has been funded through non-BPA sources and schedule for completion in late 2010.

This proposal focuses on securing BPA funding for instream habitat enhancement activities, including instream structural additions (large wood complexes and rock clusters) and removal/breaching portions of an old railroad grade adjacent to Meadow Creek. Following completion of "active" instream habitat actions, riparian habitat along Dark Canyon and Meadow Creek will be enrolled in the FSA CREP program which will provide funding for planting, seeding, and riparian conservation easement boundary fencing.

Funding secured for instream habitat implementation through this proposal will be administered by the CTUIR under its' existing BPA-Accord contract. BPA-Remand funds will be entirely "pass through expenses" and be applied directly to on the ground actions.

Habitat Limiting Factors and Existing Conditions

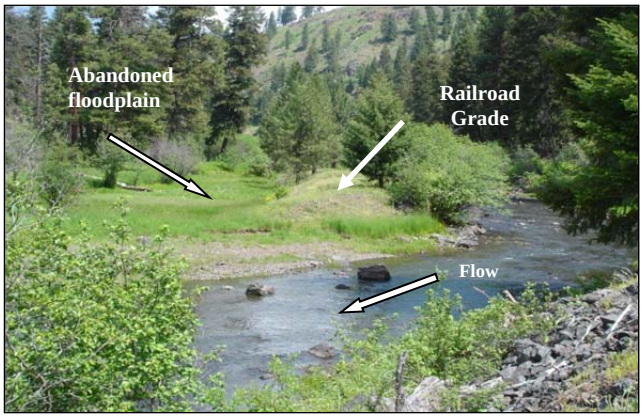
Habitat assessments and field surveys were initiated by CTUIR staff in June 2009 and consisted of a walk through survey along the Dark Canyon and Meadow Creek project reach to inventory large wood and qualitatively assess riparian, instream, and morphological condition. Baseline channel morphology and habitat surveys are currently underway with channel cross sections, longitudinal profile, and channel substrate survey scheduled for completed by early spring 2010. Following is a summary of habitat limiting factors identified during our initial project assessment and survey effort.

Generally, the upper reaches of Dark Canyon Creek are in fair condition compared with the lower reaches of both Dark Canyon and Meadow Creek with a more intact and mature riparian plant community, higher occurrence of large woody debris, and generally greater habitat complexity. The lower 2 miles of Dark Canyon Creek illustrates a long history of riparian logging, extensive livestock grazing, and a general lack of large wood within the floodplain. Instream habitat conditions degrade from upstream to downstream reaches with poor habitat complexity, lack of large pool habitat, and excessive streambank erosion. Meadow Creek within the project area provides limited habitat complexity with poor availability of large pool habitat and a constrained floodplain created by an old railroad grade. Following is a summary of specific habitat limiting factors with additional discussion.

Dark Canyon Creek illustrating channel incision, streambank erosion, and poor riparian conditions

Habitat Conditions/Habitat Complexity – Channel instability associated with removal of streamside cover, logging in riparian areas, historic splash dam logging, and railroad grade construction has resulted in modification of natural channel processes, altered width/depth ratio's, elevated erosion, and simplified habitat. Field surveys along Dark Canyon Creek indicated an average of 13 pieces of large wood/per mile with the upper 1.5 miles providing higher quality riparian habitat and wood recruitment compared to the lower 1.5 miles which contained only 3 pieces of wood greater than 12 inches in diameter. Future wood recruitment potential in the upper and middle reaches of Dark Canyon is generally good with mid-seral stands of Douglas-fir, spruce, and ponderosa pine compared to the lower. Riparian shrub and tree cover is notably lacking, though the upper reaches of the Dark Canyon Creek contain scattered, mature cottonwoods.

Meadow Creek within the project area provides poor habitat with a distinct lack of pool habitat and structure. Additionally, the entire length of Meadow Creek within the project area is constrained by the railroad grade located along its length on the left bank and along an approximate 800 foot segment along the right bank. The lower 0.4 miles of Meadow Creek has a wider, historic floodplain while the upper 0.5 miles are located within a confined valley form with limited potential for meander development. Channel classification transitions from a Rosgen "B" channel form to a "C" form but is largely constrained and disconnected from its historic floodplain by the railroad grade.



Meadow Creek at RM 0.2 upstream from confluence with Dark Canyon Creek.

• Sediment – Loss of upland and streamside vegetative cover has increased the rates of erosion. Soils lost from upland areas has overwhelmed hydraulic processes resulting in decreased availability of large pool habitat, spawning areas, riffle food production, and hiding cover. Field observations of Dark Canyon Creek and Meadow Creek within the project indicate locations with chronic streambank erosion and sediment transport to fish bearing streams. Road segments and portions of the historic railroad grade are actively eroding and streambank stability along lower Dark Canyon Creek is generally poor due to unstable channel morphology, lateral channel migration, and poor riparian conditions.

• Riparian Function – Riparian habitat degradation is the most serious habitat problem in the subbasin for fish (McIntosh 1994, ICBEMP 2000). Loss of floodplain connectivity by roads, dikes, and channel incision, and in many streams reduced habitat suitability for beaver, has altered dynamically stable floodplain environments, which has contributed to degradation and limited habitat recovery. This loss leads to secondary effects that are equally harmful and limiting, including increased water temperature, low summer flows, excessive winter runoff, and sedimentation.

• Low Flow – Water resources in many streams have been over-appropriated resulting in limited summer and fall base flow, development of fish passage barriers, and increased summer water temperatures. Water temperature monitoring initiated by the CTUIR in 2009 on Dark Canyon Creek documented 7 day summer maximum temperatures exceeding 23 ºC near the confluence with Meadow Creek 22 ºC at the upstream property boundary (Figure 1). Ongoing monitoring along Meadow Creek at McCoy Meadows reveals summer maximum temperatures exceeding 28 ºC.

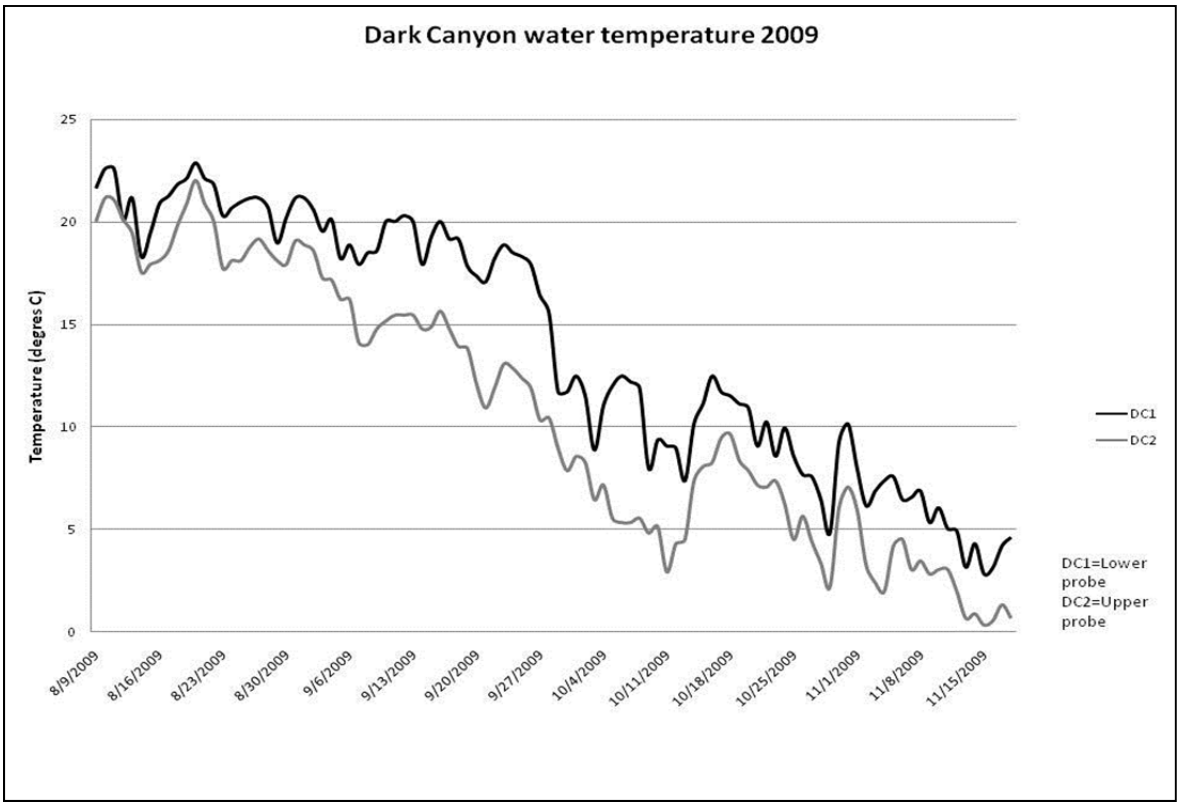
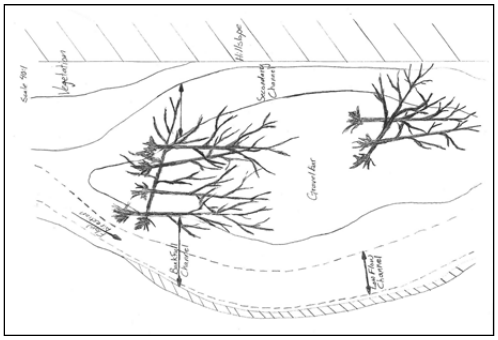


Figure 2: Water temperature (ºC) for Dark Canyon Cr at the upper property boundary (DC2) compared to the lower property boundary (DC1) for the same dates/times during 2009.

Specific Actions – Project activities funded under this BPA-Biop Remand proposal include: Instream habitat enhancement (installation of large wood and rock) and floodplain improvements associated with breaching and/or removal of railroad grade segments along Meadow Creek. Figure 3 illustrates locations of planned actions. Following is a description of planned treatments.

1. **Large Wood Additions** – Approximately 18 sites along Dark Canyon Creek and 9 sites along Meadow Creek have been identified for wood placement. An estimated 150 pieces of large wood will be added to existing pools, or placed in a manner to create pool habitat and provide habitat complexity. Wood material utilized in the Dark Canyon portion of the project will be collected from adjacent uplands, focusing primarily on dead and down material that is available onsite. Previous logging activities and difficult access to the area limits our ability to haul wood material from off-site areas. The largest material available will be utilized but will generally be limited to 12-16 inch dbh and greater than 20 feet in length. Individual trees with rootwads (where available) and dead/down logs will be placed in log jam configurations or in clusters to mimic natural recruitment and log jam formation, similar to the natural log jam located in Dark Canyon Creek illustrated above. The plan view to the left illustrates application of log jams on center channel gravel bars and side channels to trap sediment, facilitate riparian vegetation establishment, and provide complexity.



Wood placement sites identified along Meadow Creek were strategically located in areas containing the highest potential to form large, complex pool habitat (existing pools with gravel substrate) and in areas that can potentially provide thermal refuge in association with complex pool habitat (confluence of Dark Canyon Creek and side channels associated with existing abandoned floodplain caused by the railroad grade). The project will focus on creating large pool habitat in 5 primary areas (two in the upper project reach, the segment at the confluence of Dark Canyon, and two sites in the lower project reach, including a backwater habitat area associated within an existing side channel at the lower section of the railroad grade and along an outside meander pool downstream from the BLM parcel. Wood placement in Meadow Creek will require construction of engineered log jams (12 structures) that include large diameter materials (>24 inch dbh and 35 feet in length), racking and/or anchor logs that are excavated and back-filled into the floodplain, and rock ballast. No steel pins or cable will be utilized. The objective of these structures is to provide a hardened structure to direct the stream channel thalweg and energy to scour and maintain pool depth and provide in channel diversity. Large wood additions will contribute to floodplain stability by increasing roughness, slowing water velocities, and trapping sediment. Also, large wood will increase pool habitat quality and provide thermal and predatory refuge for aquatic species.

2. Rock Placement Along Meadow Creek – Historic splash dam logging (and associated clearing of in-channel obstructions such as log jams and rock) as well as logging riparian habitat has reduced the availability diverse habitat. The majority of the reach provides riffle habitat with limited pools and pocket pools that lack depth. In conjunction with installation of log jams at selected pool sections, sponsors propose re-installing large boulders that have are available

along the 0.5 mile project reach in clusters and individually in riffles and existing pools to increase complexity and enhance availability of pocket and step-pool habitat. Includes approximately 20 sites. With the availability of rock material within the project reach, costs of installing rock material would be minimal.

3. Railroad Grade Removal – Approximately 0.15 miles of railroad grade will be excavated and removed and an additional 0.10 miles contoured to the adjacent hillslope and/or scarified.

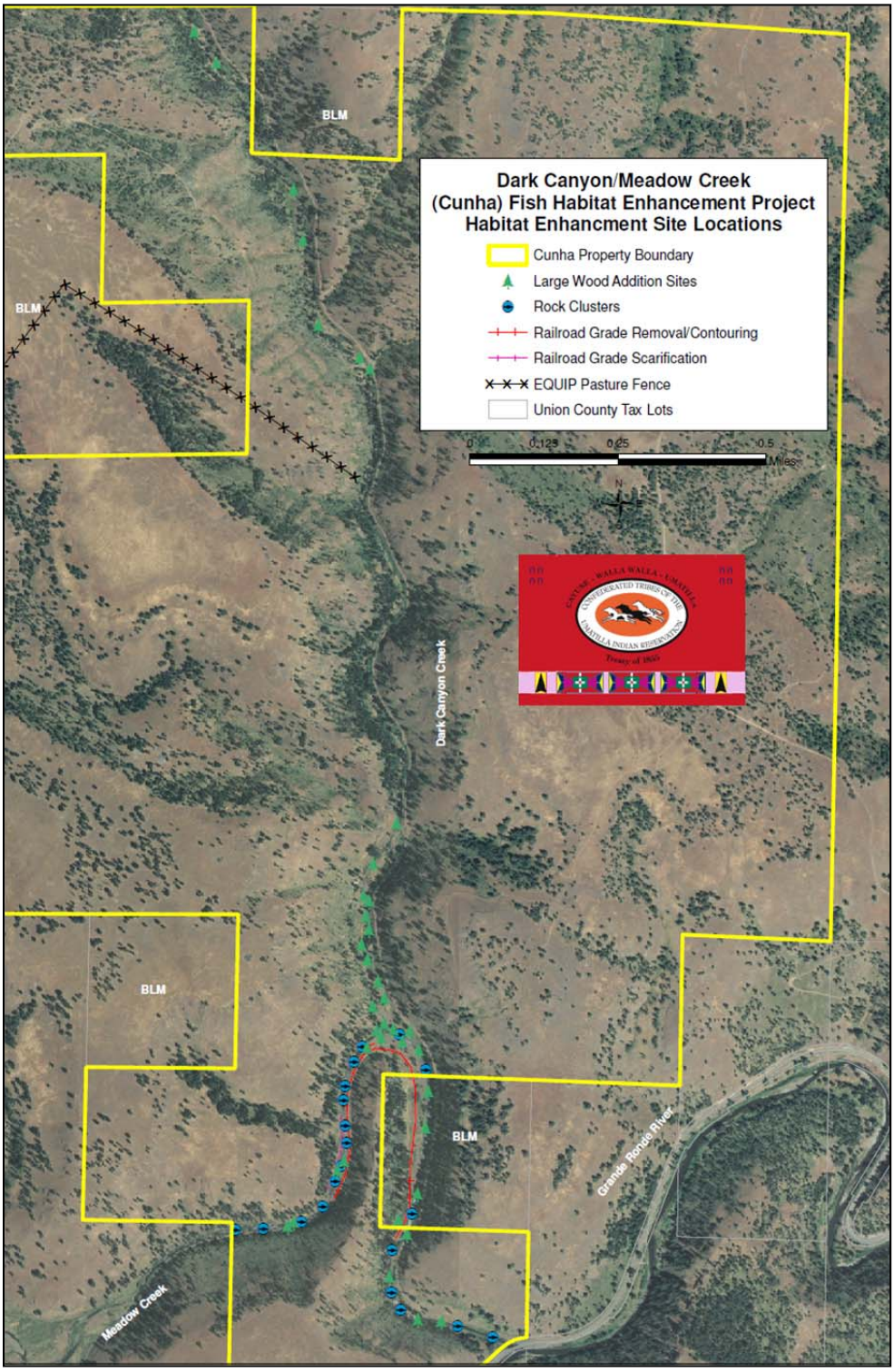
Railroad grade segments located upstream from the confluence of Dark Canyon Creek on the right bank of Meadow Creek will be pulled back (excavated) approximately 30 feet from the bankfull channel of Meadow Creek and contoured into the adjacent hillside. An ATV route along the hillslope edge of the grade will be maintained for management purposes. Additionally, approximately 800 feet of railroad grade located along the right bank of Meadow Creek will be bench-cut and scarified to facilitate seedbed preparation and natural regeneration.

Upper Meadow Creek railroad grade along right bank.

The lower 0.15 miles of railroad grade along Meadow Creek isolates floodplain habitat and limits development of meander pools and high quality habitat. Sponsors propose to excavate, haul, and contour this reach to restore floodplain connectivity and the associated morphological benefits that create complex instream habitat.

Lower Meadow Creek Railroad Grade. Segment planned from removal to activate abandoned floodplain along right bank

Figure 3 Habitat Enhancement Site Locations



Benefits – Approximately 4 miles of summer steelhead spawning and rearing habitat will be protected and enhanced under a 15 year conservation easement. Project benefits also extend to spring Chinook with suitable rearing habitat in both Meadow Creek and Dark Canyon. Expected project results include increased availability of large pool habitat associated with installation of large wood and rock complexes, recovery of riparian vegetation, including conifers, hydrophytic trees and shrubs, and macrophytes through a combination of active (planting) and passive (protection and elimination of livestock grazing), and improved floodplain connectivity along 0.25 miles of lower Meadow Creek by removing artificial channel confinement (railroad grade) and restoration of channel morphology processes that promote habitat complexity and function. Additionally, the project could potentially lead to improved trends in water quality (long-term) with a decrease in diurnal water temperature variations and decreased summer maximum water temperatures with improving trends in channel morphology (decreased width:depth) and riparian vegetation.

In addition to expected direct effects, the project will complement completed and ongoing habitat enhancement activities in the Meadow Creek watershed. For example, the project is located immediately downstream of the McCoy Meadows complex where restoration work has been ongoing since the 1980's and on National Forest system lands in Dark Canyon where the Forest Service has obliterated roads and completed instream habitat activities.

Project Maintenance – CTUIR staff will maintain the project. Extensive maintenance of instream habitat enhancement structures and railroad grade removal is not anticipated. Maintenance associated with the term conservation easement includes annual fence inspection and repair and maintenance of planted materials consisting of managing competing vegetation and protection devices to minimize depredation.

Permits – CTUIR staff will complete all environmental compliance needs in cooperation with BPA. ESA consultations with NOAA Fisheries and USFWS will be completed through BPA's environmental compliance program. A cultural resource survey, currently underway, will be completed by CTUIR cultural resource staff with SHPO consultation completed through BPA. A DSL/Corps permit application is under development by CTUIR staff. The WWNF LaGrande Ranger District will complete ESA consultation and NEPA requirements for the BLM portions of the project area.

Monitoring Plan – The following monitoring plan has been developed to evaluate project objectives:

a) **Protect Habitat:** Photo points have been established in 2009 to provide pre-implementation qualitative data on vegetation and channel conditions. These photo points will be repeated immediately post implementation then every 3 years thereafter until the riparian lease has expired.

b) **Enhance Instream Structural Diversity and Complexity:** A baseline assessment of existing conditions has been initiated by the CTUIR. A longitudinal profile and channel cross sections will provide an overview of morphological features and habitat complexity in associated with the large wood inventory completed in 2009. Channel morphology surveys will be repeated in subsequent years post implementation to monitor changes in channel morphology and habitat complexity.

c) **Enhance Floodplain Connectivity:** This objective will be monitored through the establishment of photo points, as detailed in a) above.

d) **Enhance Riparian Habitat Condition:** Vegetation surveys (such as a shrub intercept or 'green-line' survey) will be undertaken during 2010 and repeated 3 and 5 years post project. In addition planting efforts implemented under the CREP program will be monitoring through stocking surveys.

e) **Water Quality** - In addition to the monitoring efforts listed above water quality (temperature) will be recorded for the duration of the riparian lease. Temperature data was collected during 2009 (Figure 1) and will be used in an EPT (extensive post treatment) monitoring design. It is anticipated that the analysis of these data would consist of summary statistics for each year/probe location with addition tests for differences in mean maximum weekly water temperatures between probe locations and between years done using either a paired t-test and/or a mixed model repeated measures analysis (providing these data meet the assumptions of these tests).

Work Dates – Project implementation is scheduled to be completed during summer 2010. Specific dates for various project aspects include:

- Permitting/ Consultation - February 15-July 1, 2010.
- Construction - July 1-31, 2010
- Monitoring – Initiated in 2009 and will continue through 2024.

8. Project Budget

Actions funded under the CTUIR-BPA Accord Agreement include: planning/design, permitting, subcontracting, administration/inspection, and monitoring/evaluation. Additionally, CTUIR staff will assist the landowner in preparing for CREP enrollment, assist in the development of fencing and planting plans, and administer fencing and planting subcontracts on behalf of the landowner.

Dark Canyon-Meadow Creek (Cunha) Fish Habitat Enhancement Project			
Work Item	**Description**	**Detail**	**Cost Estimate**
Item 1	Mobilization	Lump Sum	$5,000.00
Item 2	Dark Canyon Wood Placement	18 sites, 5 pieces/site, 1.3 miles total, 200 series track-hoe: 120 hours @ $140/hr	$16,800.00
Item 3	Meadow Creek Log Structures	12 Engineered log jams: $3500 each	$42,000.00
Item 4	Meadow Creek Rock Placement	0.5 miles, 20 sites, 200 series track-hoe: 40 hours @ $140/hr)	$5,600.00
Item 5	Meadow Creek Railroad Grade (Contouring)	0.10 miles, 200 series track-hoe: 60 hours @$140/hour	$8,400.00
Item 6	Meadow Creek Railroad Grade (Removal)	0.15 miles, 3500 cubic yards @ $4/yard	$14,000.00
		TOTAL	**$91,800**