NORTH FORK JOHN DAY RIVER BASIN ANADROMOUS FISH HABITAT ENHANCEMENT PROJECT

Annual Report for April 2008 – March 2009

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ABSTRACT

The Confederated Tribes of the Umatilla Indian Reservation North Fork John Day Anadromous Fish Enhancement Project continued to develop and implement habitat improvements during 2008 using guidance from the John Day Subbasin Plan, Mid-Columbia Steelhead Recovery plan, and other plans or management documents which prioritized restoration efforts. Cooperative efforts between private landowners and public entities such as the North Fork John Day Watershed Council, Umatilla National Forest, Wallowa-Whitman National Forest, and Grant Soil and Water Conservation District prioritized, designed, and implemented specific habitat restoration efforts. During 2008 the project strengthened three stock watering ponds, one stock watering pond was constructed, one upland stock watering well developed, channel surveys and permitting completed for three culvert replacements, and native vegetation planted on two sites. The project also controlled noxious weeds and collected monitoring data where applicable. Contributions to other cooperative projects included financial and material support to a riparian fencing project and monitoring data collection for Cooperative projects with the North Fork John Day Watershed Council. One grant application was funded during 2008 to support an upland stock watering site and cross fencing.

ACKNOWLEDGMENTS

The Confederated Tribes of the Umatilla Indian Reservation wish to thank the Bonneville Power Administration for funding the project and its personnel John Baugher, Nancy Weintraub and others for their assistance. We would also like to give thanks to the North Fork John Day Watershed Council for providing a forum for tribal input and promoting the Confederated Tribes of the Umatilla Indian Reservation's the Project habitat recovery efforts; the Umatilla National Forest and its employees (Fishery Biologists Kathy Ramsey and Kristie Groves, Hydrologists Caty Clifton and Ed Farren, Range Managers Tom Thompson and Brad Lathrop) for assistance with cooperative restoration efforts and providing information, the Natural Resources Conservation Service's Chet Hadley, Colleen Winchester, and Lorraine Vogt, and Oregon Department of Fish and Wildlife's Jeff Neal, Tim Unterwegner and Josh McCormick. Thanks also to Confederated Tribes of the Umatilla Indian Reservation staff, whose cooperation and contributions are evident in this report. Special thanks to Delbert Jones, James Bill and Randy Bonifer in assisting with monitoring efforts and implementing and maintaining improvements, to Brandi Weaskus, Julie Burke Celeste Reeves, and Michelle Thompson for administrative support, and Gary James and Jim Webster for support and guidance. We would like to acknowledge cooperating landowners, Steve Berrey, Gene and Julia Engblom, Richard and Dorothy Allstott, Bill Neal, Sheri Helms, Robin, Mary Lou, Andy and Bill Fletcher, and Forrest Rhinehart who supported our efforts by providing their properties for habitat enhancements.

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INTRODUCTION

The Confederated Tribes of the Umatilla Indian Reservation's North Fork John Day River Habitat project (the project) has undertaken the task of protecting and enhancing habitat in the North Fork John Day (NFJD) basin to improve natural production of indigenous species in support of the Confederated Tribes of the Umatilla Indian Reservation's (CTUIR) First Foods. Our efforts are expected to increase juvenile and adult freshwater survival resulting in greater numbers of Endangered Species Act listed Mid-Columbia River Summer Steelhead trout (*Oncorhynchus mykiss*) and Bull trout (*Salvelinus confluentus*) in addition to Spring Chinook salmon (*Oncorhynchus tshawytscha*) and redband trout (*Oncorhynchus mykiss gairdnerii)*. Progress toward this goal can be difficult to ascertain due to existing habitat conditions across the basin, depressed aquatic populations relative to historic conditions, and habitat use at specific locations relative to population dynamics across the basin. In place of a baseline representing historic conditions or a particular state of a depressed population the relative productivity of less disturbed areas can be useful. Significant portions of the NFJD Mid-Columbia Steelhead trout (Carmichael, R.W., 2006), spring Chinook salmon, and Bull trout populations reside in the NFJD Wilderness area and other protected areas that are relatively unaltered or minimally altered; thus, habitat conditions throughout these populations could provide a suitable surrogate for identifying changes in life history strategies in other parts of the basin. Restoring degraded habitats and monitoring subsequent changes in habitat use and species should provide an estimate of our effect upon these species.

Restoration efforts benefiting these species and habitats primarily occur outside undisturbed or minimally disturbed areas, that is, lands managed by private or public entities. As such, cooperative partners are necessary to develop and implement effective restoration efforts within in-stream, riparian, and floodplain habitats. These efforts not only benefit threatened and non-threatened wildlife but protect or restore larger scale natural processes with sufficiently large processes and prioritize efforts according to needs, available funding and technical feasibility. Collaborative efforts reduce the burden upon a single entity and improve restoration efforts by providing additional scrutiny, cost share opportunities, and educational opportunities about the value of singular and cooperative habitat restoration efforts. Deficits in habitat are identified through review of priority area strategies outlined in the Columbia BM RC&DA (2005), Carmichael, R.W., 2006, forest and basin plans, and other documents created to direct program implementation or recovery efforts. From these designations, specific restoration projects are developed during discussions with landowners.

To date, the project has constructed approximately 30.4 Km of riparian fencing, 29 off-stream water developments, and reactivated two wells; enhanced approximately 20 Km stream, 850 acres of riparian and floodplain habitat, and 850 acres of upland habitat on private and public properties. Appendix I & II show projects sites where maintenance or restoration efforts were completed during 2008 on private and public lands. Private landowners who have entered into a Riparian Conservation Agreements with the project include Forrest Rhinehart (Upper Camas Creek), Robin, Mary Lou, William, and Andy Fletcher (Lower Camas Creek), Gene and Julia Engblom (Owens Creek), Richard and Dorothy Allstott (Snipe Creek), Steve Berry (Deer Creek), and Billy Neal and Sheri Helms (NF John Day). Cooperative partners with whom the project hasn't entered into a Riparian Conservation Agreement have included the North Fork John Day Watershed Council (NFJDWC) on which the project holds a dedicated seat, the Umatilla National Forest (UNF), Wallowa Whitman National Forest, Grant Soil and Water Conservation District, National Resource Conservation Service (NRCS), and the Farm Services Agency (FSA) among others. Conversations with these and other groups or agencies are proving useful for identifying additional restoration opportunities and dispersing information regarding the benefits of cooperative restoration efforts to develop trust with small rural communities within the NFJD Basin. For example, the NFJDWC has proven invaluable for reaching out to the 1200 people residing within the basin that would otherwise be reluctant to cooperate with a tribal or government entity.

Bonneville Power Administration (BPA) initially approved the project in 2000 with on-the-ground actions following in 2001 to provide partial mitigation for the loss of native salmon and steelhead resulting from the construction of dams on the Columbia River. Additional habitat restoration funds are secured through entities such as the FSA, NRCS, Oregon Watershed Enhancement Board (OWEB), Oregon Department of Fish and Wildlife (ODFW), U.S. Bureau of Reclamation (BOR), the U.S. Army Corps of Engineer (Corps) and other private or public. In an effort to reduce costs associated with overhead the UNF (North Fork John Day Ranger District) provides office and storage space for the project and the project shares vehicles and equipment with:

(1) BPA Project #198710001 – CTUIR's Umatilla River Basin Anadromous Fish Habitat Enhancement Project
(2) BPA Project #199604601 – CTUIR's Walla Walla Basin Habitat Enhancement Project
(3) BPA Project #199608300 – CTUIR's Grande Ronde Basin Habitat Enhancement Project

This annual report covers work accomplished under the project by the project from April 1, 2008 through March 31, 2009.

SITE DESCRIPTION

The NFJD River (Figure 1.) is the largest tributary to the John Day River flowing westerly for 180 kilometers to join the mainstem John Day River near Kimberly, Oregon. The NFJD River's basin covers 47,885 square kilometers consisting of 37% private, 62% federal, and 1% state lands. The NFJD has been designated as a Wild and Scenic River from Camas Creek upstream to the head waters including one portion classified as "Wild," two as "Scenic," and two as "Recreational." These segments are primarily managed by the UNF and WNF. State Scenic Waterways designated by the State of Oregon, stretch from Monument, OR upstream to the NFJD Wilderness boundary and from the confluence with the North Fork John Day River upstream to the Crawford Creek Bridge on the Middle Fork John Day River. The Middle Fork John Day River (MFJD) (Figure I) flowing into the NFJD is generally considered and primarily managed as a separate system by ODFW, the Confederated Tribes of the Warm Springs Reservation of Oregon, and The Nature Conservancy.

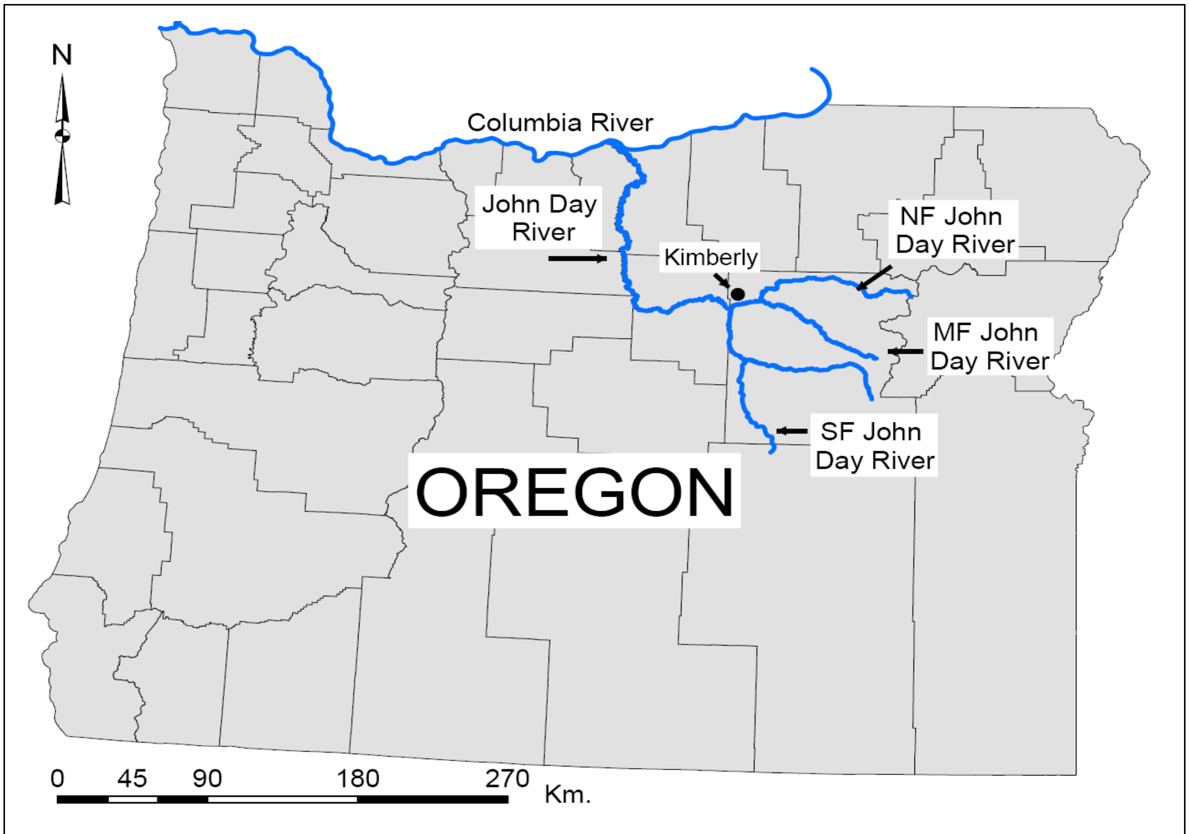

Figure I. Regional map showing the John Day Basin.

The NFJD contains fifteen 5th Field HUC's (Figure II) of which five, the Upper and Lower Camas Creek, Desolation Creek, Granite Creek, and North Fork/Potamas Creek units are considered 'priority' areas for the purpose of concentrating the projects restoration efforts. The project currently maintains six Riparian Conservation Agreements with landowners on the NFJD, Deer, Camas, Owens, and Snipe Creeks (Figure III, Appendix I).

Diverse land forms and geology range from 558 meters at the mouth to 2530 meters in elevation in the headwaters and consist of Columbia River Basalts, oceanic crust, volcanic materials, historic river and lake deposits, and recent river and landslide deposits. The North Fork

John Day basin has a continental climate influenced by maritime weather patterns in the higher elevation areas which are characterized by low winter and high summer temperatures, low to moderate average annual precipitation and dry summers. Climate ranges from sub-humid in the upper elevations to semi-arid in the lower elevations with 0.33 to 0.5 meters annually contributing 60% of the flow in the lower John Day River, primarily through November and March. Mean annual temperatures are 3° C in the upper sub-basin and 14° C in the lower sub-basin and range from <-18º C in the winter to over 38° C during the summer. The average frost-free period is 50 days in the upper sub-basin and 200 days in the lower sub-basin. The Blue Mountains in the basin's higher elevations produce a range of microclimates unlike the lower basins typical warmer and more stable patterns.

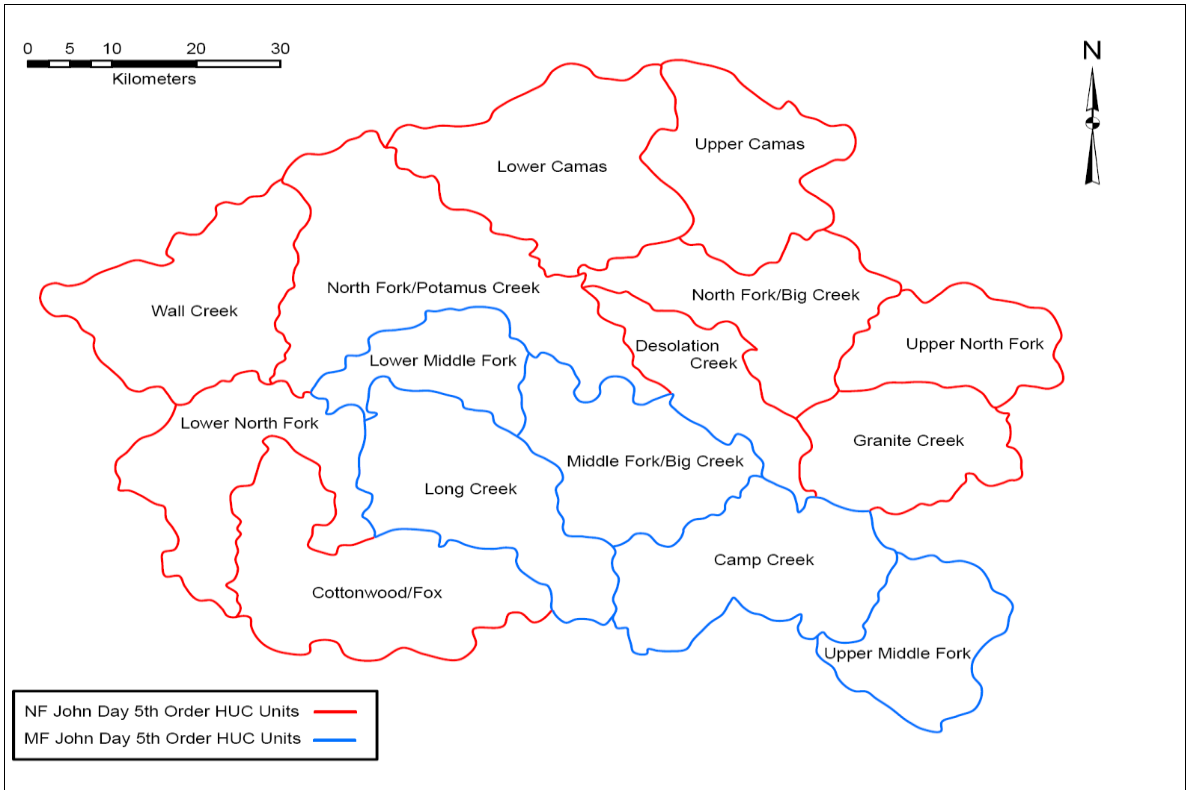

Figure II. NFJD 5th field HUC's

Historically, the John Day River was one of the most significant anadromous fish producers in the Columbia River Basin (CRITFC 1995) due to its stability, strong summer stream flows, high water quality, and heavy riparian cover. Riparian areas were densely populated with aspen, poplar, willow, and cottonwood and beaver were abundant. Large spring and fall Chinook salmon migrations and numerous beaver sightings indicated the John Day River contained extensive in-stream habitat diversity. Resident trout species include westslope cutthroat, interior redband and bull trout gave way as habitat changed in response to land management objectives. These changes favored introduced species such as brook trout (*Salvelinus fontinalis*), smallmouth bass (*Micropterus dolomieui*), and redside shiner (*Richardsonius balteatus*) in places historically dominated by salmonids. The NFJD currently supports strong native runs of spring Chinook salmon and summer steelhead in the Columbia River Basin with minimal influence from hatchery stocks. Narum et al. 2008 confirmed the John Day River's status as a viable refuge for wild stocks with limited anthropogenic influence.

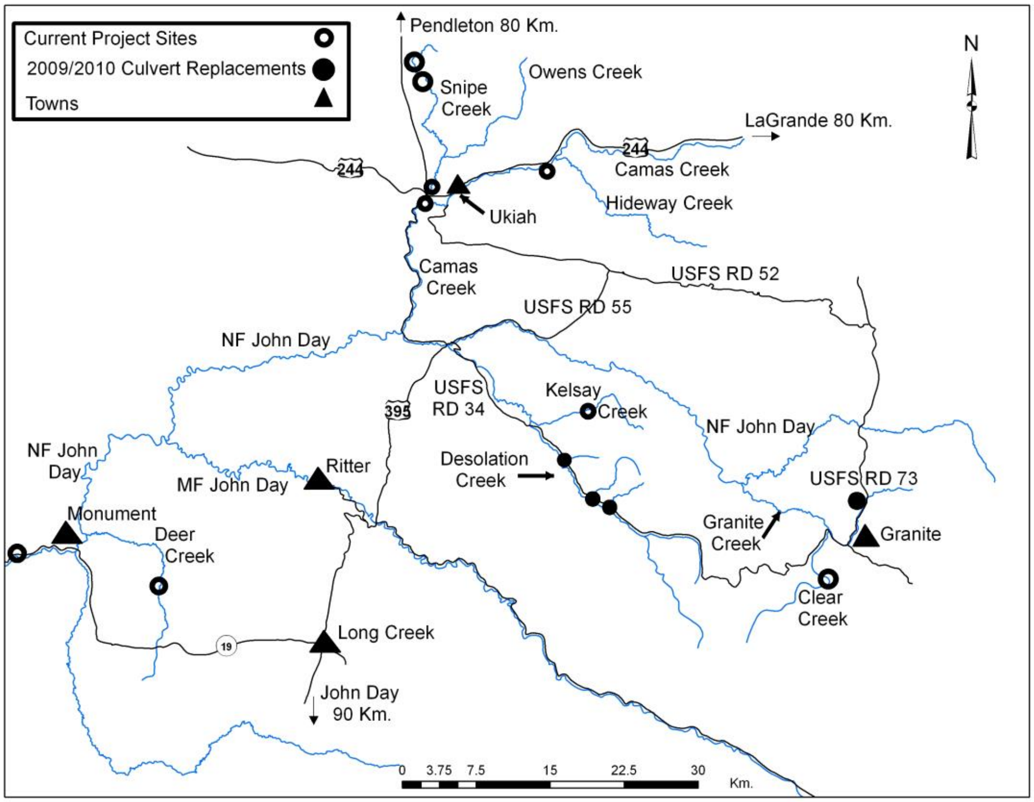

Figure III. Project Site Locations.

The NFJD steelhead population currently occupies ten major spawning areas (including Upper and Lower Camas, Owens, Granite, and Desolation Creek) and five Minor Spawning areas distributed throughout the basin (Carmichael, R.W., 2006). Surveys indicate approximately 1,400 kilometers of the NFJD (StreamNet, 2008) and its tributaries are currently used for spawning and rearing, with index surveys showing consistent use over time. Index area spawning surveys from 1965 to 2005 on NFJD tributaries indicate returning adult steelhead in natural production areas ranged between 369 spawners in 1990 to 10,235 spawners in 1965 (Carmichael, R.W., 2006). While these numbers are somewhat variable over time, current populations appear to be substantially less productive then historic populations (Columbia BM RC&DA 2005) and show a long term decreasing trend. Declines in the basin's summer steelhead population warranted a threatened listing under the ESA in 1999 (The North and Middle Forks John Day River Local Advisory Committee 2002).

Surveys indicate approximately 300 kilometers (approximately 57% of total stream kilometers; (StreamNet, 2008) of the NFJD and its tributaries provide spawning and rearing habitat for Spring Chinook salmon with relatively consistent use over time. However, due to run and spawn timing specific areas may not be used consistently in response to limiting factors. For instance, Granite Creek has shown a long term decline in use for unknown reasons, habitat use in Camas Creek is opportunistic and responds to available flows and water temperatures, and returning adults of the MFJD population died prematurely during 2007; likely due to elevated water temperatures (Unterwagner 2007).

Limiting habitat factors identified in the NFJD basin (Table 1) and designated in Carmichael (2006), Columbia BM RC&DA (2005), and various management plans include water quality (temperature, modified flows, nutrient input), in-stream habitat (structure, cover, sediment loading, channel morphology and processes,), and riparian health. Most streams in the NFJD basin are considered to be in relatively good condition, with the exception of elevated late summer water temperatures that exceed Oregon Department of Environmental Quality standards. In general, most indicators of channel condition within the NFJD suggest the basin is “functioning at risk”.

Historic and current land use practices or threats (Table I) within the have reduced river stability, decreased high quality summer stream flows and water quality, reduced heavy riparian and floodplain cover, and compromised physical and biological processes related to these associations and structures. The loss of abundant riparian and flood plain vegetation, once robust beaver populations, and large spring and fall Chinook salmon migrations suggest the NFJD has lost a significant amount of in-stream habitat diversity and may now have an altered hydrologic cycle. Changes in the hydrologic cycle attributed to altered riparian and floodplain areas and stream morphology and processes can be indicated by increased runoff, altered peak flow regimes, reduced ground water recharge and soil moisture storage, and low late-season flow and elevated water temperatures. Historic and current land management strategies, in combination with possible changes in the hydrologic cycle, have contributed to stream channel instability (i.e., channel widening and downcutting) in some portions of the NFJD. Additionally, wildlife habitat has become increasingly fragmented, simplified in structure, and infringed upon or dominated by non-native plants (ICBEMP 2000).

Major Limiting Factors	Threats
Floodplain & Channel Structure In-Stream Habitat Sediment Routing Water quality	Riparian Disturbance Stream Channelization & Relocation Grazing Forest practices Roads Irrigation Withdrawals Mining & Dredging

Table I. Limiting factors and threats within the North Fork John Day Basin.

Changes in habitat have also resulted from a century of fire suppression activities and fire exclusion from the forest ecosystem resulting in greater forest stand densities than historic natural conditions. Dense stands are more susceptible to insect infestation, disease, and catastrophic stand replacement fires. Juniper encroachment into native grasslands resulting from altered an altered fire regime have served to increases evapotranspiration and reduce stream flows. Roads created to facilitate logging operations and fire suppression have increased in-stream sedimentation from road erosion and disturbed areas during logging operations. Culverts and other structures associated with road construction have fragmented existing in-stream and riparian, floodplain, and wetland habitats.

Altered native habitat conditions also facilitate the spread of non-native and highly adaptable species. Nonetheless, habitat conditions on public lands and some private lands are generally considered to be improving through cooperative efforts between public and private landowners, tribal programs, federal, and state agencies, and groups such as Soil and Water Conservation Districts and Watershed Councils.

2008 ACCOMPLISHMENTS

A description of individual Work Elements to which efforts were directed during 2008 include;

WE 114- Identify, Prioritize and Select Habitat Project Areas
In an effort to identify and prioritize new habitat restoration efforts, project personnel obtained background information from numerous sources (county records, previous contacts, sub-basin and recovery plans, and consultation with landowners) and coordinated with basin shareholders. These efforts resulted in the submission of three grant applications supporting cooperative restoration efforts. Including; 1) to OWEB between the NFJDWC and CTUIR to support an upland stock watering development and cross fencing (WE 34), awarded October 2008, 2) to OWEB between the NFJDWC and CTUIR for culvert replacements in the Desolation and Granite Creek Watersheds (unsuccessful), 3) to OWEB between the NFJDWC, UNF, and CTUIR to construct 2.75 miles of riparian fencing on Kelsay Creek (a tributary of Desolation Creek) during 2008 (WE 40) awarded October 2008. CTUIR contributed Letters of Support, cost share, or in-kind support to grant applications supporting cooperative efforts to construct riparian fencing on Meadowbrook Creek, a watershed assessment on Fox Creek, a pushup dam removal and irrigation diversion relocation on the Lower North Fork John Day site (LNFJD), and passage barrier removals on Sponge and Bruin Creeks. Conversations with five landowners did not result in suitable restoration projects, however, discussions continue with several. Additional restoration opportunities have been identified in cooperation with the UNF, WNF, and NFJDWC during 2009 and beyond when funding becomes available. Thus far several culvert replacements have been identified and preliminary design efforts will begin during 2009 with implementation in 2011.

WE 99 - Education and Outreach
A tour was given to NFJDWC coordinator candidates during May of 2008 and all NFJDWC meetings save one have been attended. This includes participating in meetings to hire a council coordinator, meet with landowners, and project coordination. Educational opportunities related to the 2009 SOW were not identified and as such, coordination efforts between the Ukiah School and the project were not pursued. While this milestone was not included in the 2009 SOW, the project shall participate in future educational opportunities as they are identified.

WE 186 - Maintain Project Area Water Developments
Water developments were maintained throughout 2008 and we will continue to coordinate with landowners regarding maintenance. A sediment tolerant pump for the LNFJD site has been purchased and will be installed during 2009.

WE 26- Investigate Existing Project Areas for Livestock Trespass
Livestock trespass was investigated and rectified throughout the grazing season. Trespass occurred on several occasions.

WE 186- Maintain Project Area Fences
Fence inspections throughout 2008 did not identify damage that wasn't immediately repaired. Repairs were needed in response to fallen trees.

WE 22- Maintain Vegetation Within Existing Project Areas With Herbicides
A contract for noxious weed control efforts awarded in May 2008 used herbicides on Upper Camas Creek, Owens Creek, Snipe Creek, Deer Creek, and the NF John Day sites. Significant progress has been made on the Deer Creek, NF John Day, and Snipe Creek sites which will allow the project to concentrate on reseeding selected areas with native grasses. Spot treatments by project personnel during future monitoring and maintenance activities will supplement the contractor's efforts during monitoring and maintenance activities. A cooperative agreement with the City of Ukiah, NFJDWC, and UNF provided weed control on Lower Camas Creek site using Pacific Coast Salmon Recovery Funds.

WE 157- Collect Data to Monitor Project Effectiveness
Monitoring efforts during 2008 were undertaken to provide a baseline for future efforts since little pre-project data exists. Sampling efforts included longitudinal transects in the channel along with cross section transects reaching 10m on either side of the stream, and photopoints. A summary of the collected data (Appendix III) represents post-implementation project data upon which we will elaborate during 2011.

Pre-implementation data collected on the Upper Camas Creek site included cross sections, flow measurements, and water temperatures. Cross sections and stream discharge estimates on the Upper Camas Creek site were taken to identify parameters such as roughness and water surface levels across different flows. This information shall be used during in-stream design efforts

Data loggers (Onset Computer Corporation, Pendant UA-001-08 (Temperature) and UA-002-08 (Temperature/Light)) sampling water temperature and sunlight (both 1 hr. intervals) were installed to establish a base line for summer temperatures, identify ground water inputs, and identify thermal inputs (sunlight). Data loggers were placed on 13 August and recovered on 2 October to maximize temperature differences between surface and hyporheic/groundwater flows. One logger recording surface temperatures was placed at the bottom of the reach, another at the top, and one above each logger group. Two groups of three loggers and one of four (approximately 10 meters between loggers within each group) were placed along the thalwag in a straight line down the center of the channel. The upper and lower groups were placed in response to natural breaks in channel gradient and the third in response to the bedrock contact Loggers were placed in a protective 3.8cm PVC pipe capped on one end (with holes to allow water movement through the case), covered by rock, and secured by cable and spike to the channel bottom along a 1.3 Km reach of Camas Creek. Substrate throughout the reach primarily consisted of rubble and cobble with the exception of an area adjacent to a bedrock contact which contained large amounts of gravel.

Monitoring in support of cooperative efforts on Kelsay Creek and the LNFJD sites consisted of temperature monitoring or cross sectional profiles and Greenline surveys. The NFJDWC, who acts as the project manager for both these projects, has received the data. The project also participated in spawner surveys for Spring Chinook salmon on Desolation Creek and the Upper North Fork John Day River. Surveys were organized by ODFW who compiled and presented data from across the John Day basin.

WE 34 - Drill Well and Secure Cost Share Funding
An award arrived in October from an OWEB Restoration Grant application submitted in April 2008 supporting an upland well development and cross fencing on Upper Camas Creek. The grant award supports the purchase of a pump assembly and fence construction labor while the project will supply funding for well drilling and materials as cost share using Pacific Coast Salmon Recovery funds and previously obtained materials. In December, the project completed a 310 foot deep well with a 50' water bearing layer and a 200 foot static head producing 75 gallons per minute. Due to the grant awards late arrival and that of winter weather, neither the pump assembly or cross fencing were installed. Once field conditions allow (April – June 2009) the pump assembly and cross fencing will be installed.

WE 186 - Improve 2007 Stock Watering Ponds
Modifications to three stock watering ponds developed in 2007 have been completed. Spillways were expanded to safely pass a projected 100 year event, vertical culverts installed as primary drains, and eight inch pipe installed to completely drain the pond as required by the Water Right. A third impoundment was removed and placed farther uphill to provide long term stability. This included incorporating the original impoundment and site into the new one by re-contouring the areas.

All pond dimensions and designs remain as they were originally constructed in 2007 save one. Impoundment I holds approximately one acre foot of runoff and remains three meters high and wide with a length of 26 meters. Impoundment II retains approximately 2 acre feet of runoff and remains three meters high and wide with a width of 50 meters. The project modified Impoundment III to a height of two meters, a width of three meters, and a length of 30 meters wide to hold approximately one half an acre foot of runoff. Fencing has been placed around all impoundments to protect them from cattle damage and vertical drain outlets have been armored by large rocks. At this time all ponds save one are holding water. Native clays shall be added during 2009 and subsequent years to seal the pond.

WE 35 - Develop Upland Stock Watering Pond
A previously developed stock pond has been modified to improve upland stock watering opportunities in an upland pasture. During the 1960's the landowner had developed a small stock watering pond. When the 2007 stock watering improvements failed to develop a pond as expected, the project worked with the landowner to improve this site. Approximately 25 cubic yards of native clays adjacent to the site were used to expand the existing impoundment to hold less one half an acre foot of runoff. Improvements also include an eight inch pipe to completely drain the pond and a spillway to pass excess runoff. Fencing has been installed to prohibit damage from cattle.

WE 40 - Install Exclosure Fence on Kelsay Creek
A grant application submitted to the Oregon Watershed Enhancement Board in April was approved for funding in October followed by a signed agreement in November. The grant award provides funding for fence construction labor (a three wire New Zealand style fence) secured and administered by the NFJDWC with cost share by the UNF and the project for materials and construction labor. Cost share funding and materials allowed for the completion of 0.8 miles of fence during the summer of 2008. Unfortunately due to the late arrival of the grant award and the onset of winter, the remaining 1.9 miles remaining fence will not be completed until 2009 when weather conditions allow. The Umatilla National Forest and CTUIR have already covered cost overruns brought on by rising fuel and steel prices with current budgets. Coordination for this effort will continue until the fence has been completed and approved.

WE 47 - Plant native Vegetation (Neal)
A total of 660 trees were planted during October in compliance with a WHIP contract closed out in January 2009. Plantings consisted of 275 Black Cottonwood (*Populus balsamifera v.trichocarpa),* 150 Elderberry *(Sambucus cerulean)*, 150 Choke Cherry *(Prunus virginiana)*, and 85 Rose *(Rosa woodsii)* secured through the CTUIR Tribal Native Nursery. The planting list was approved by NRCS and the CTUIR Native Tribal Nursery director. Existing and previously secured materials were used where possible. Project personnel completed this WE inside of a week and survival thus far has been high. NRCS has been invoiced for cost share reimbursement and the contract closed out.

WE 47 - Plant Native Vegetation (Fletcher)
A total of 461 trees during October including 140 Black Cottonwood *(Populus balsamifera v.trichocarpa)*, 90 Choke Cherry *(Prunus virginiana)*, 70 Thinleaf Alder (*Alnus tenuifolia*), 70 Lewis Mockorange *(Philadelphus lewisii)*, 40 Red Osier Dogwood *(Cornus sericea v.sericea)*, 40 Blue Elderberry (*Sambucus cerulean)*, 10 Serviceberry *(Amelanchier alnifolia)*, and 1 Cascara (*Frangula purshiana)* secured through the CTUIR Native Tribal Nurserywere planted in November 2008. Existing and previously secured materials were used where possible. Project personnel completed this WE inside of a week and survival so far has been high.

WE 175 - Stream Channel Surveys
Surveys were originally to be conducted by the project to support culvert replacements on Desolation and Granite Creeks. However, the UNF contracted a number of surveys and these were included. The UNF completed the surveys in late summer and developed culvert designs and specifications in early 2009 for all culverts. Since the Umatilla National Forest did not complete a Collection Agreement before the end of their fiscal year the project could not reimbursement them for this effort. As such, cost share funds allocated for the effort have been or

will be used to complete Cultural Resource Surveys, public outreach, habitat surveys, and assistance with design work.

WE 165 - Culvert Replacement Permits
CTUIR's Cultural Resource Department provided comment on the proposed culvert replacements for Battle, Granite, Sponge, and Bruin Creeks expected in 2009/10. Their recommendation for monitoring during implementation was passed to the Umatilla National Forest for consideration and completion of their NEPA documentation. Discussions between the project lead and the Umatilla National Forest resulted in CTUIR's monitoring of implementation efforts with their findings to be passed on to BPA, SHIPO, and the Umatilla National Forest during 2009 and 2010.

Several programmatic agreements and Biological Opinions precluding the need for individual permits include; US Army Corps of Engineers (Regional General Permit to cover culverts replacements under Aquatic Restoration Biological Opinions), US Fish and Wildlife Service, and the National Marine Fishery Service Biological Opinions.

Approved NEPA Documentation arrived in April 2009 and was forwarded on to BPA, Ecotrust, and the NFJDWC. Documentation covered culvert replacements on Battle, Granite, Sponge, Bruin, and Ten Cent Creeks for implementation during 2009 and beyond.

WE 159- Acquire and Submit Stream Temperature Data to NOAA
Temperature loggers were installed in June of 2008 and removed at the end of September 2008. Recovered files were subsequently passed on to Monument SWCD in early October.

WE 119- Produce Required Project Deliverables and Provide to BPA
SOW and budget were submitted for approval in December 2008. Changes to the budget were in response to in-house and BPA comments.

WE 185 - Periodic Status Reports for BPA
Completed and submitted as required

WE 132- Submit Annual Report for the period April 1, 2006 to March 31, 2007
See North Fork John Day River Anadromous Fish Habitat Enhancement Project, 2007 Annual Report.

WE 165- Produce Environmental Compliance Documentation for Herbicide Applications
Herbicide documentation required by BPA for 2008 and 2009 were submitted in January 2009 including 2008 actual and 2009 proposed application data. Information was subsequently passed on to BPA.

DISCUSSION

Three project sites (Snipe, Owens, Deer Creek) did not require any effort beyond regular communications with the landowner and monitoring efforts. Progress on other sites has been outlined in the 2008 Accomplishments section of this report; however, several aspects of the 2008 SOW require additional comment.

Monitoring data (WE 157) collected during 2008 has not been analyzed due to our inability to identify significant changes or trends with only two years of data. A more complete data analysis shall occur after three to five years of data has been collected; sampling frequency and methods will likely change to reflect stable channel and riparian conditions. Data collected throughout July and August 2008 followed protocols established prior to and during 2007. However, in several cases additional transects were added to fill in gaps identified in the 2007 data and 1/10 acre plots were moved to a 5 year rotational schedule to coincide with topographic surveys. The growth of woody vegetation over the past year did not appear to justify the effort required to collect data with other demands on the projects time. These plots will be treated as 'permanent growth plots' and reflect the periodic rotational sampling schedule used by numerous agencies and groups.

Explicit pre project monitoring data protocols have not been outlined and at this time and currently depend upon the nature of an individual restoration effort. During consecutive performance periods the project will need to identify specific protocols and modeling programs to catalog existing conditions and collect information necessary to base restoration effort designs upon and improve the effectiveness of restoration efforts. Pre project data collected during 2009 on the upper Camas Creek site consisted of discharge measurements, cross sections, and temperature monitoring. Discharge estimates and cross sectional transects shall be used to identify existing stream parameters on which to base effective habitat restoration designs while temperatures were collected in an effort to identify potentially useful inputs to the channel from ground water and hyporheic flows.

Time series temperature data appeared to reflect the influence of groundwater or hyporheic inputs (subsurface inputs) into Camas Creek at all three sites. Since heat is a naturally occurring tracer in stream systems, subsurface inputs can often be identified through changes in signal amplitude (lower variance) relative to surface water temperatures and a slower response to changes in surface water temperatures. The degree to which subsurface flows differ from surface water temperatures, in part, depend upon seasonal trends whereby subsurface inputs to a stream channel are often cooler (Summer) or warmer (Winter) then surface flows, the influence of advective heat transfer from groundwater, the extent of hyporheic cycling, heterogeneity within the streambed, and geomorphic controls. Our inability to quantify these changes in the frequency domain prohibits our ability to gain a clearer understanding of influencing factors at this time. However, given the methods used (WE 157) and existing time domain data, inferences can be made with a measure of confidence. Substrate and surface water temperatures at all sites displayed regular diurnal temperature cycles (Figure IV) and appeared to display longer term forcing events one would expect to see in response to passing weather fronts. Prior to developing statistical measures noted in Table II we detrended the raw data in an effort to minimize the influence of long term trends existing beyond the extent of our data.

Substrate temperatures at the lower site mimicked the behavior of surface temperatures (Figure IV). However, reduced signal amplitudes and variance present in the logger 1 & 2 data relative to that of surface temperatures suggests some level of influence from subsurface flows (Figure IV, Table II). Deeper hyporheic cycles one may expect at riffle tails could explain this behavior due to their length of exposure to moderating flows. Loggers 3 & 4 located farther up the riffle do not reflect this influence to the extent of the lower two sites (Figure IV, Table II). A slight delay or shift in the response time of substrate temperatures (Figure IV) relative to surface water temperatures also suggests an influence from subsurface flows. However, our sampling frequency (1 sample/hr.) could disguise such shifts near or below this rate.

Data from the middle site appeared to reflect the presence of bedrock and alluvial overburden through dampened signal amplitude and delayed response to surface water temperatures (Figure IV). Loggers 6 and 7 displayed the greatest amount of influence as indicated by more attenuated amplitudes, the appearance of a delay in response to changing surface water temperatures, and sample variance relative to surface waters. Logger 5 indicated a weaker influence from subsurface flows based upon these same metrics. Data from logger 7 presents the strongest case for groundwater or hyporheic influence. The logger was placed just below the initial bedrock contact and appears to contain the least amount of alluvial overburden of all the sites. Less overburden could be expected to decrease hydrodynamic dispersion and increase signal strength.

Substrate temperatures from the upper site maintained lower values of sample variance then that of surface waters (Table II). Minimum surface temperatures (Figure IV) appeared to match those of the substrate which can indicate the presence of very shallow hyporheic flows.

Geomorphic and hyporheic conditions have been studied using a variety of methods including the installation of piezometers to measure hydrologic head or temperature (Hauer 2000; Geist 2000; Curry and Noakes 1995) and have identified the influence of groundwater and hyporheic flows upon spawning behavior. While the project would benefit from using one or more of these methods, temporal and logistical constraints tied to obtaining, installing, and recovering equipment precluded their use in 2008. The chosen method could not distinguish different flows at depth or at the substrate surface in part due to the coarseness of measure and our inability to identify and quantify the vertical and horizontal movement of individual flows. Additionally, fluid movement through bedrock can be difficult to identify unless a specific fracture or migration corridor has been instrumented and overburden serves to disperse flows making a signal harder to detect. While these factors are not completely mitigated through the use of piezometers or similar devises, this equipment does allow for more accurate and precise placement and measure through the use of nested designs or having multiple data loggers at a single location. During future efforts the project hopes to implement such measures; however, design efforts are not based solely upon this type of information and an evaluation of the relative costs, benefit, and extent to which such a study should occur must be reconciled for each restoration effort. Restoration efforts on the Upper Camas Creek site must treat conditions within the existing channel and cannot singularly address larger scale issues related to water quality. Thus, improving width to depth ratios, pool frequency, and in-stream structure more conducive to salmonid migration and rearing within the site shall be our end goal. Additional instruments installed during 2009 will provide a better understanding of the site and allow the use subsurface flows when designing refuge for aquatic species.

Lessons learned during this performance period primarily related to organizing projects and securing the appropriate agreements with cooperating partners. The project shall begin planning for outyear restoration efforts with cooperating partners. This includes undertaking restoration efforts that shall occur across a three to four period rather than attempting to complete multiple steps or phases in one or two years. The Ten Cent Creek culvert surveys outlined in the 2009 Statement of Work provides such an example. The project shall complete culvert design surveys and provide them to the UNF for design and implementation at a later date. Additionally, the UNF recently completed National Environmental Policy Act documentation for this effort. Having such projects partially completed should enhance our ability to react as cooperative partners and funding opportunities become available.

Increased funding has also enhanced our ability to support the NFJDWC by providing technical and financial support for projects on private and public lands. The new NFJDWC coordinator shall improve the NFJDWC's ability to develop and implement restoration efforts in the future. The project has cooperated or will cooperate with the NFJDWC on eight restoration efforts in the past several and next few years, contributed letters of support or cost share on several others, and supported the recent council support grant application. Several large projects shall be pursued with private landowners around Ukiah, OR. during 2009 and should landowners agree to work with the project we expect to partner with the NFJDWC during these efforts.

The project will continue to develop and implement restoration efforts in our 'priority' basins (Camas, Desolation, and Granite Creek) and on the NFJD and Deer Creek near Monument, Oregon. Projects outside these areas shall be considered on a case by case basis and depend on benefit to wildlife and available cost-share funds. The project will continue to support 'whole system or ridge to ridge' recovery practices, to address in-stream, riparian, floodplain, and upland components in a single project or in cooperation with agencies or groups addressing basin-wide restoration. This approach will provide a greater long term benefit then singular projects over a broad area.

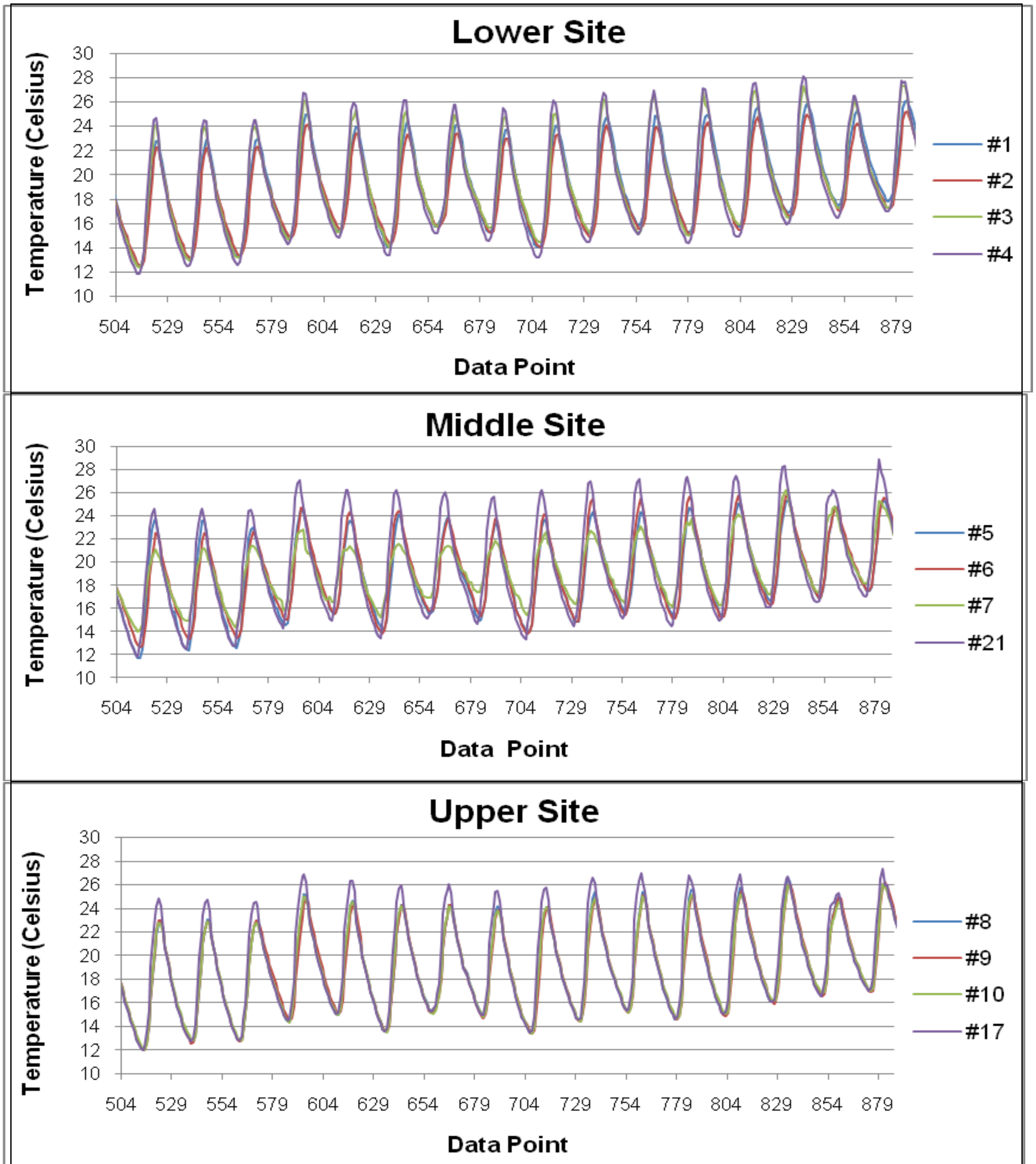

Figure IV. A sample of the detrended temperature data collected at 1 hour intervals at the Upper Camas Creek site from 0000 hours on 13 August 2008 to 2300 hours on 1 October 2008. Data displayed here data covers the period of 9 September 2008 (0000 hours) to 18 September 2008 (2300 hours). Lower data logger identification numbers indicate greater distance downstream from loggers collecting surface water temperatures (Loggers 4, 21, 17).

Lower Site	1	2	3	4	Surface
Mean	19.164	19.197	19.621	19.725	19.708
Sample Variance	12.082	10.35	12.358	13.122	16.105
Range	16.262	15.871	16.322	17.348	18.667
Confidence Level (95.0%)	0.197	0.182	0.199	0.205	0.227
Middle Site	**5**	**6**	**7**	**Surface**	
Mean	19.396	19.551	19.506	20.056	
Sample Variance	12.075	10.683	8.83	15.81	
Range	16.743	15.831	15.994	19.317	
Confidence Level (95.0%)	0.197	0.185	0.168	0.225	
Upper Site	**8**	**9**	**10**	**Surface**	
Mean	19.554	19.48	19.465	19.965	
Sample Variance	12.771	12.312	11.883	14.795	
Range	16.694	16.38	16.222	17.771	
Confidence Level (95.0%)	0.202	0.199	0.195	0.218	

Table II. Descriptive statistics for detrended data on the Upper Camas Creek site beginning 0000 hours on 13 August 2008 to 2300 hours on 1 October 2008.

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APPENDIX I

Sites maintained (Riparian Conservation Agreement exists) during 2008 by the CTUIR's NFJD Habitat Project. (Modified from Shaw, 2007)

Stream	Location	Stream Km/Acres	Upland Acres	Fence Km	Water Gaps	Water Developments	Native Plantings
Camas Creek (Upper Camas Creek GA)	T5S R32E, Section 2 S1/2,		0	0	0	0	0
Camas Creek (Upper Camas Creek GA)	T5S R32E, Section 11 S1/2, Section 14	0	250	0	0	1	0
Camas Creek (Lower Camas Creek GA)	T5S R31E, Section 15 S½, Section 14 SW¼, SW¼	1.6/388	0	3.2	0	0	Approx. 16,000
Camas Creek (Lower Camas Creek GA)	T5S R31E, Section 15 S½, Section 14 SW¼, SW¼, Section 22 N½, Section 23 N1/2	0	600	0	0	5	0
Owens Creek (Lower Camas Creek GA)	T5S R31E, Section 10, Section 15	0.5/5.2		1.0	1	1	1800
Snipe Creek (Lower Camas Creek)	T4S R31E, Section 3, Section 4, T3S R31E, Section 32	1.3/34.4		2.3	2	2	Approx. 7500
Snipe Creek (Lower Camas Creek GA)	T4S R31E, Section 3, Section 10	2.2/54		4.4	5	4	0
Deer Creek (Cottonwood Creek GA)	T8S R28E, Section 33, Section 34 T9S R28E, Section 3, Section 4	0.8/22 3.4/90.2		8.4	5	4	0
Deer Creek (Cottonwood Creek GA)	T8S, R28E, Sec. 32, Section 33 T9S, R28E, Sec. 4	0.3/9 3.5/98		7.6	6	11	7500
Lower NFJD (LNF John Day GA)	T9, R27E, Section 7	0.8/7.3		0.8	0	1	Approx. 4880

APPENDIX II

Restoration efforts undertaken by the project and cooperative partners during 2008 where a Riparian Conservation Agreement did not exist.

Stream	Location	Stream Km/Acres	Upland Acres	Fence Km	Water Gaps	Water Developments	Native Plantings
Kelsay Creek (Desolation Creek GA)	T7S R33E, Section 29	1.2/50	0	1.2	0	0	0

APPENDIX III

Results from cross section surveys extended 10 meters onto either bank.

Lower Camas Creek Untreated							
0 - Left	32% Water	28% Gravel	24% Grass	16% Tree Mat			
0 - Right	38% Tree Mat	32% Water	30% Grass				
70.5- Left	50% Grass	34% Tree Mat	16% Water				
70.5 - Right	37% Cobble	33% Grass	16% Water	14% Tree Mat			
Lower Camas Creek Treated							
39.6 Left	56% Cobble	35% Grass	8% Water	1% Tree Mat			
39.6 - Right	80% Grass	12% Gravel	8% Hawthorn				
150 - Left	58% Grass	20% Sage	11% Tree Mat	10% Water	1% Cut Bank		
150 - Right	42% Grass	25% Cobble	18% Gravel	15% Water			
245 - Left	35% Grass	25% Water	21% Cobble	14% Tree Mat	5% Gravel		
245 - Right	25% Tree Mat	22% Water	20% Grass	15% Gravel	8% Spring Channel	5% Dirt	5% Cobble
Lower Snipe Creek Untreated							
5.6 Left	100% Grass						
5.6 Right	80% Grass	20% Rush					
12 Left	100% Grass						
12 Right	75% Rush	25% Grass					
Lower Snipe Creek Treated							
32 - Left	100%Grass						
32 - Right	100%Grass						
64 - Left	100%Grass						
64 - Right	100%Grass						
Upper Snipe Creek Untreated							
Water Gap #2 Left	90% Grass	10% Mud					
Water Gap #2 Right	100% Grass						
Water Gap #3 Left	100% Grass						
Water Gap #3 Right	20% Grass	20% Snowberry	15% Spruce	15%Alder	15% Woody Debris	15% Rose	
Water Gap #4 / 17 - Left	45% Sand	40% Grass	15% Low Veg.				
Water Gap #4 / 17 - Right	80% Ponderosa Pine	10% Grand Fir	5% Grass	5% Wild Rose			
Water Gap #4 / 32 - Left	100% Grass						
Water Gap #4 / 32 - Right	75% Grass	25% Grand Fir					
Upper Snipe Creek Treated							
29 - Left	60% Grass	30% Snowberry	10% Alder				
29 - Right	70% Grass	20% Snowberry	10% Alder				
91 - Left	40%Grass	40% Snowberry	15% Sedge	5% Grand Fir			
91 - Right	55% Snowberry	30% Grass	10% Grand Fir	5% Douglas Fir			
Owens Creek Treated							

0 - Left	100% Grass						
0 - Right	99% Grass	1% Willow					
1 - Left	100% Grass						
1 - Right	100% Grass						
2 - Left	100% Grass						
2 - Right	100% Grass						
Deer Creek Untreated							
9 - Left	93% Grass	7% Water					
9 - Right	50% Dirt/Dry Grass	42% Grass	7% Water	1% Willow			
Deer Creek Treated							
Below Untreated #8 - Left	76% Grass	17% Sage Brush	7% Water				
Below Untreated #8 - Right	50% Dry Grass	31% Willow	12% G. Horsetail	7% Water			
Above Untreated #28 - Left	38% Sage Brush	32% Dry Grass	22% Grass	8% Water			
Above Untreated #28 - Right	50% Golden Rod	40% Grass	8% Water	2% Willow			

Codes/metrics used for longitudinal and cross sectional transects.

Bank Stability
No vegetation, stable, no erosion - 1
No vegetation, unstable, actively eroding - 2
Vegetation, stable, no erosion - 3
Vegetation, unstable, actively eroding - 4
Substrate
Organics
Silt
Sand
Gravel = 6mm - 6.4cm
Cobble = 6.4cm - 15.3cm
Rubble = 15.3cm - 30.6cm
Boulder = 30.6cm - 91.5cm
Bedrock = > 91.5cm
Wood Class
1 - Absent
2 - Wood present
3 - Wood present, some cover
4 - Wood present, med. To large, good cover
5 - Large wood, large jams

Results from longitudinal habitat survey results for restoration sites and averaged across all measured habitats in a transect.

	Depth	Width	Length	% Slope	Flood Prone Width	Bank Full Width	Right Bank Stability	Left Bank Stability	% Organics	% Silt	% Sand	% Gravel	% Cobble	% Rubble	% Boulder	% Bedrock	% Shade Left	% Shade Center	% Shade Right	Wood Class	Species
Lower Camas Creek Untreated																					
Riffle	12cm	20.3m	28.15m	1.5	> 100m	36.5m	1	1	12.5		2.5	65	20	0	0	0	0	0	0	1	-
Glide	43cm	6.15m	45.55	<0.05	> 100m	18.75m	1	1	12.5	0	0	65	20	2.5	0	0	0	0	0	1	-
Back Water	12cm	2.6m	4m	0	> 100m	28.5m	1	1	5	95	0	0	0	0	0	0	0	0	0	1	Z
Lower Camas Creek Treated																					
Riffle	15cm	10m	28.6m	2.4	> 100m	25.5	2.5	2	17.8	0	2.1	46.7	32.6	0.8	0	0	0	0	0	2	Z/ST
Glide	32.5cm	8.9m	71.8	< 0.05	> 100m	28.3m	2.2	2.4	20	5	0	30	43.75	1.25	0	0	0	0	0	1	-
Scour Pool	41.5cm	4.1m	9.65	< 0.05	> 100m	12.6m	1	1	30	0	5	35	30	0	0	0	0	0	0	1	-
Back Water	16cm	2.8m	21.4m	< 0.05	> 100m	4.15m	2	3	37.5	7.5	17.5	30	7.5	0	0	0	0	0	0	1	-
SC	24cm	4m	>40m		> 100m	6.4	3	3	70	30	0	0	0	0	0	0	80	80	80	1	Z/ST
IP	4cm	6.3m	72m	0.2	> 100m	23.1m	1	1	5	5	0	50	40	0	0	0	0	0	0	1	Z
Lower Snipe Creek Untreated																					
Lower Water Gap - Glide	5cm	1.2m	3.93m	<0.05	11.8m	2.7m	2.3	2.3	5	79	7	14	0	0	0	0	8.3	3.3	5	1	Z
Upper Water Gap - Riffle	2cm	.65m	5.5m	-	20.7m	3.2m	2	2	0	10	90	0	0	0	0	0	0	0	5	1	
Upper Water Gap - Glide	10cm	1.4m	9.6m	-	20.7m	3.2m	2	4	5	95	0	0	0	0	0	0	10	0	0	1	Z
Lower Snipe Creek Treated																					
Glide	18.3cm	.8m	7.4m	<0.05	7.4m	1.9m	2.8	3.4	31.4	56.4	10.7	1.4	0	0	0	0	1.4	0	0	1	Z
Riffle Pool	12.3cm	.6m	10.1m	1.4	6.9m	2.2m	3.3	2.7	40	45	15	0	0	0	0	0	0	0	0	1	-
Riffle	6cm	.385m	4.5m	1.6	10.2m	2.4m	3	4	35	60	5	0	0	0	0	0	0	0	0	1	-
Scour Pool	50cm	1.6m	85m	<0.05	8.9m	2.3m	3	3	0	70	30	0	0	0	0	0	0	0	0	1	-
Upper Snipe Creek Untreated																					
Water Gap #2 - Glide	15.7cm	1.6m	4.67m	-	> 40m	2.8m	2.8	2.8	2.5	56.25	21.25	17.5	2.5	0	0	0	57.5	60	60	1.2	Z/St.
Water Gap #2 - Riffle Pool	8cm.	1.5m	1.7m	-	> 40m	2.1m	2	2	0	50	50	0	0	0	0	0	100	100	100	1	-
Water Gap #2 - Riffle	4cm	.8m	3.1m	-	> 40m	2.2m	2	2	5	5	20	65	5	0	0	0	0	0	0	1	Z/St.
Water Gap #3 - Glide	10cm	1.4m	22.7m	-	23m	2m	3.2	3.4	6	24.5	31.3	26.5	9.7	2	0	0	38	28	26	1.2	Z/St.
Water Gap #3 - Riffle Pool	7.2m	1.3m	26.8m	-	24m	3m	3.8	3.5	6.25	5	28.75	30	18.75	11.25	0	0	65	67.5	70	1.2	Z/St.
Water Gap #4 Riffle	5.7cm	1.2m	3.66m	-	19.9m	2.9m	2.3	3.6	18.4	8.3	31.7	20	20	1.6	0	0	80	60	60	3	Z/St.
Water Gap #4 Glide	11.7cm	1.1m	3.03m	-	18.6m	2.6m	2.6	3	6.7	30	26.7	23.3	10	3.3	0	0	56.7	73.3	66.7	1.6	Z/St.

Water Gap #4 Riffle Pool	7.5cm	1.15m	12.6m		17.2m	1.6m	3	3	15	5	17.5	20	25	12.5	5	0	25	60	55	1.5	Z/St.
Upper Snipe Creek Treated																					
Riffle Pool	7cm	.9m	11.5m	-	11.1m	1.7m	2.5	2.5	12.5	13.75	17.5	27.5	18.75	10	0	0	87.5	87.5	92.5	1.8	Z
Glide	10.5cm.	1.2m	4.48m	-	11.8m	1.5m	2.8	2.7	13.3	39.2	15	14.2	15	2.5	0.8	0	90	70	90	1.5	Z
Riffle	4cm.	.8m	5.56m	-	14m	2m	3	3	13.5	6.5	40	40	0	0	0	0	100	90	100	2.3	-
AL	8cm.	1.4m	8.3/10.2	-	6.6m	3.6m	3	3		55	40	5					100	100	100	4	
Scour Pool	14cm.	1.7m	3m	-	16m	4.1m	3	3	0	20	15	55	10	0	0	0	100	100	100	3	
PP	13cm.	1.2m	2.1m	-	23.7m	2m	4	3	0	5	45	40	10	0	0	0	100	100	100	2	
Deer Creek Untreated																					
Glide	12.6cm	1.3m	3.8	0.5	10.5m	2.46m	3	3	65	0	0	18.4	15	1.6	0	0	100	40	100	1	Z
Riffle Pool	9.5cm	1.35m	2.7m	0.3	10.5m	2.55	3	3	70	0	0	10	20	0	0	0	100	35	100	2	Z
Riffle	7cm	.9m	3.1m	1.9m	9.3m	2.2m	3	3	30	0	0	20	50	0	0	0	100	10	80	1	-
Deer Creek Treated																					
Below Water Gap - Glide	16.7cm	1.7m	7.5m	0.04	20.1m	2.08m	3	3	43.4	25	0	8.3	10	13.3	0	0	100	33	100	1	Z
Below Water Gap - Riffle	8.33cm	1.2m	6.83m	1.3	19.33m	1.53m	3	3	43.4	0	0	23.3	30	3.3	0	0	100	47	100	1	-
Above Water Gap - Riffle	9.5cm	.8m	11.2m	2.5	10.4m	11.5m	3	3	14.1	0	0	47.6	33..5	4.8	0	0	100	75	100	1.5	-
Above Water Gap - Dry Channel	-	1.5m	7.05m	1.4	19.15m	1.5m	3	3	40	15	0	27.5	10	7.5	0	0	80	40	80	1	-
Above Water Gap - Glide	13cm	.9m	0.5	0.5	> 40m	1.25m	3	3	10	90	0	0	0	0	0	0	100	90	100	1	-
Above Water Gap - Riffle Pool	29cm	3m	2.6	2.6	10.2m	3m	3	3	0	90	0	10	0	0	0	0	100	0	100	1	Z

Results from cross section habitat surveys for restoration sites. Data was averaged where multiple habitat types existed within a reach.

	Habitat Type	Land Use	Right Bank Stability	Left Bank Stability	Wet Width	Bank Full Width	Flood Prone Width	% Organics	% Silt	% Sand	% Gravel	% Cobble	% Rubble	% Boulder	% Bedrock	% Shade Right	% Shade Center	% Shade Left	Wood Class
Lower Camas Creek Untreated																			
0	Riffle	Riparian	2	2	19.4m	32.1m	> 100	25	0	0	50	25	0	0	0	0	0	0	1
70.5	Glide	Riparian	1	2	9.6	20	> 101	5	0	0	80	15	0	0	0	0	0	0	1
Lower Camas Creek Treated																			
39.6	Glide	Riparian	4	1	6.4m	32.8m	> 100	10	0	0	50	40	0	0	0	0	0	0	1
150	Glide	Riparian	1	3	8.4m	35m	> 100	40	0	0	40	20	0	0	0	0	0	0	1
245	Glide	Riparian	1	1	15.6m	35.1m	> 100	20	0	0	50	30	0	0	0	0	0	0	1
Lower Snipe Creek Untreated																			
5.6	Glide	Water Gap	2	3	2.6m	3.3m	11.4m	0	100	0	0	0	0	0	0	0	0	0	1
12	Riffle	Water Gap	2	2	.65m	3.2m	20.7m	0	10	90	0	0	0	0	0	0	0	0	1

Lower Snipe Creek Treated																			
32	Glide	Riparian	1	1	.95m	.95m	9.7m	10	90	0	0	0	0	0	0	20	0	20	1
64	Riffle Pool	Riparian	1	1	1.25m	1.57m	9.6m	50	50	0	0	0	0	0	0	30	0	30	1
Upper Snipe Creek Untreated																			
Water Gap #2	Glide	Heavy Grazing	2	2	1.5m	3m	> 40m	15	85	0	0	0	0	0	0	40	10	0	1
Water Gap #3-13	Riffle	Heavy Grazing	3	4	1.1m	5.1m	26.6m	5	0	5	10	20	60	0	0	100	100	100	1
Water Gap #3-26	Riffle Pool	Heavy Grazing	3	2	1.4m	3.4m	25m	0	10	20	30	10	30	0	0	100	100	100	1
Water Gap #4-17	Glide	Heavy Grazing	1	1	1m	3.8m	32.9m	0	70	10	0	0	20	0	0	30	100		1
Water Gap #4-32	Riffle	Heavy Grazing	1	2	1.5m	2m	19.3m	30	0	0	10	30	30	0	0	100	80	30	2
Upper Snipe Creek Treated																			
29	Riffle Pool	Riparian	3	3	.6m	.9m	20.1m	0	0	0	100	0	0	0	0	100	100	100	1
91	Glide	Riparian	3	3	1.2m	1.4m	4.3m	5	40	0	25	30	0	0	0	100	80	100	1
Owens Creek Untreated																			
0	Glide	Riparian	3	4	6.5	9.4	40	90	0	0	10	0	0	0	0	0	0	0	1
1	Riffle	Riparian	4	3	1.2	5.5	40.5	20	0	0	10	0	0	0	0	0	0	0	1
2	Glide	Water Gap	4	3	1.1	3.9	48	60	0	0	10	0	0	0	0	0	0	0	1
Owens Creek Treated																			
0	Glide	Riparian	3	4	6.5m	9.4m	40m	90	0	0	10	0	0	0	0	0	0	0	1
1	Riffle	Riparian	4	3	1.2m	5.5m	40.5m	20	0	0	80	0	0	0	0	0	0	0	1
2	Glide	Riparian	4	3	1.1m	39m	48m	60	0	0	35	5	0	0	0	0	0	0	1
Deer Creek Untreated																			
9	Riffle Pool	Water Gap	3	3	1.3m	2.6m	10.8m	90	0	0	10	0	0	0	0	100	10	100	1
Deer Creek Treated																			
Below Untreated #8	Riffle	Riparian	3	3	1.3m	2.1m	10.2m	5	0	0	5	10	80	0	0	100	40	100	1
Above Untreated #28	Glide	Riparian	3	3	.9m	1.5m	17m	90	0	0	10	0	0	0	0	100	10	100	1