Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project

Annual Report 2001 - 2002

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**Colville Confederated Tribes
Lake Roosevelt Rainbow Trout
Habitat/Passage Improvement Project
2002 Annual Report**

Traditional Fishing on the San Poil River

**Lake Roosevelt Rainbow Trout
Habitat/Passage Improvement Project**

Annual Report

October 1, 2001 – September 30, 2002

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Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project

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2002 Annual Report
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ABSTRACT

Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project

The construction of Chief Joseph and Grand Coulee Dams completely and irrevocably blocked anadromous fish migrations to the Upper Columbia River. Historically this area hosted vast numbers of salmon returning to their natal waters to reproduce and die. For the native peoples of the region, salmon and steelhead were a principle food source, providing physical nourishment and spiritual sustenance, and contributing to the religious practices and the cultural basis of tribal communities. The decaying remains of spawned-out salmon carcasses contributed untold amounts of nutrients into the aquatic, aerial, and terrestrial ecosystems of tributary habitats in the upper basin.

Near the present site of Kettle Falls, Washington, the second largest Indian fishery in the state existed for thousands of years. Returning salmon were caught in nets and baskets or speared on their migration to the headwater of the Columbia River in British Columbia. Catch estimates at Kettle Falls range from 600,000 in 1940 to two (2) million around the turn of the century (UCUT, Report #2).

The loss of anadromous fish limited the opportunities for fisheries management and enhancement exclusively to those actions addressed to resident fish. The Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project is a mitigation project intended to enhance resident fish populations and to partially mitigate for anadromous fish losses caused by hydropower system impacts. This substitution of resident fish for anadromous fish losses is considered in-place and out-of-kind mitigation.

Upstream migration and passage barriers limit the amount of spawning and rearing habitat that might otherwise be utilized by rainbow trout. The results of even limited stream surveys and habitat inventories indicated that a potential for increased natural production exists. However, the lack of any comprehensive enhancement measures prompted the Upper Columbia United Tribes Fisheries Center (UCUT), Colville Confederated Tribes (CCT), Spokane Tribe of Indians (STI) and Washington Department of Fish and Wildlife (WDFW) to develop and propose a comprehensive fishery management plan for Lake Roosevelt. The Rainbow Trout Habitat/Passage Improvement Project (LRHIP) was designed with goals directed towards increasing natural production while maintaining genetic integrity among current tributary stocks.

The initial phase of the Lake Roosevelt Habitat Improvement Project (Phase I, baseline data collection: 1990-91) was focused on the assessment of limiting factors, including the quality and quantity of available spawning gravel, identification of passage barriers, and assessment of other constraints. After the initial assessment of stream parameters, five streams meeting specific criteria were selected for habitat/passage improvement projects (Phase II, implementation -1992-1995). Four of these projects were on the Colville Indian Reservation South Nanamkin, North Nanamkin, Louie and Iron Creeks and one Blue Creek was on the Spokane Indian Reservation. At the completion of project habitat improvements, the final phase (Phase III, monitoring-1996-2000) began. This phase assessed the changes and determined the success achieved through the improvements.

Data analysis showed that passage improvements are successful for increasing habitat availability and use. The results of in-stream habitat improvements were inconclusive. Project streams, to the last monitoring date, have shown increases in fish density following implementation of the improvements.

In 2000 Bridge Creek, on the Colville Reservation was selected for the next phase of improvements. Data collection, including baseline stream survey and population data collection, was carried out during 2001 in preparation for the design and implementation of stream habitat/passage improvements. Agencies cooperating on the project include the Colville Confederated Tribes (CCT), Natural Resource Conservation Service (NRCS, Ferry County District), Ferry County Conservation District, and Ferry County. The Bonneville Power Administration (BPA) provided project funding support and program integration assistance.

A stock of redband rainbow trout, were discovered in 2001 in an isolated section of Bridge Creek above a set of waterfalls. DNA microsatellite analysis was conducted at the University of Idaho and indicated that very little if any hybridization. The targeted species in the genetic analysis was red band/rainbow trout (*Oncorhynchus mykiss* spp.). The sub-contract is with Madison Powell and Joyce Faler at the Center for Salmonid and Freshwater Species at Risk at the University of Idaho/HFCES. DNA analysis used mitochondrial and nuclear RFLP markers along with two microsatellite loci. Sample populations were screened for detectable levels of introgressive hybridization arising from possible admixtures of hatchery rainbow trout with native red band trout. Both nuclear and mitochondrial RFLPs have been used successfully to assess genetic diversity and hybridization among and between *O. mykiss* subspecies and between *O. clarki* (Wishard et al. 1984; Wilson Thomas and Bechenback 1985; Williams and Jaworski 1995, Williams, et al. 1996; Williams, Leay and Currens 1997; Powell and Faler 1999; McCusker, Parkinson, and Taylor 2000; Campbell, Dillon, and Powell 2002).

Fish trapping and electro-shock population studies are continuing on several San Poil River tributaries. A baseline horizontal habitat survey was completed on Thirty-Mile Creek in 2002, and a survey is planned for a new stream each year. BPA funding problems postponed the implementation of the geo-hydrologically engineered stabilization and passage improvements on Bridge Creek. Implementation of the improvements is scheduled for the late summer of 2003.

During 2002 the lower and middle sections of the San Poil Sub-basin were used to test the Ecosystem Diagnosis and Treatment (EDT) model. An extensive survey of all culverts and man-made and natural barriers was completed as part of the data input into the model. EMAP was incorporated into a strategy of long term monitoring and evaluation. The intention is to use it as a tool for assessing status and trends in landscape processes that form and sustain habitats over space and time, and as an aid in the identification of land use practices causing habitat degradation.

Map 1

Locations of original stream rehabilitation and enhancement projects completed 1993-1995.

Map 2

Location of Bridge Creek in relation to other project streams on the Colville Reservation.

Map 3

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INTRODUCTION

HISTORICAL BACKGROUND

Since the loss of anadromous salmonids above Grand Coulee Dam, fishery enhancement measures have been limited on the reservoir and surrounding area. A few short-term fisheries surveys were conducted on the reservoir associated with the introduction of fish species by the Washington Department of Fish and Wildlife (WDFW), Spokane Tribe of Indians (STI), and the Confederated Tribes of the Colville Reservation (CCT). Studies have shown that existing spawning habitat in Lake Roosevelt tributary streams may be inadequate to sustain a rainbow trout (*Oncorhynchus mykiss*) fishery in Lake Roosevelt (Scholz et. al., 1988).

Upstream migration passage barriers limit the amount of spawning and rearing habitat that might otherwise be utilized by rainbow trout. Limited stream surveys and habitat inventories indicate that a potential for increased natural production exists. The lack of any comprehensive enhancement measures prompted the Upper Columbia United Tribes Fisheries Center (UCUT), Colville Confederated Tribes (CCT), Spokane Tribe of Indians (STI) and Washington Department of Fish and Wildlife (WDFW) to develop a comprehensive fishery management plan for Lake Roosevelt (Scholz et. al., 1988). The Rainbow Trout Habitat/Passage Improvement Project (LRHIP) was designed with goals directed towards increasing natural production while maintaining genetic integrity among current tributary stocks.

The plan was amended, to the Columbia River Basin Fish and Wildlife Program by the Northwest Power Planning Council (NPPC) in 1987 (NPPC, 1987). Program Measures 903 (g) (1)(c)(d)(e) directed Bonneville Power Administration (BPA) to fund "improvement of spawning and rearing habitat in order to facilitate passage to spawning tributaries to increase natural production of rainbow trout" and "evaluate the effectiveness of the above measures by conducting a monitoring program".

The interagency team of the Colville Confederated Tribes (CCT), Spokane Tribe of Indians (STI), Washington Department of Wildlife (WDW), and the Upper Columbia United Tribes (UCUT) selected the streams for habitat evaluation and improvements.

DESCRIPTION OF STUDY AREA

Lake Franklin D. Roosevelt reaches upstream from the Grand Coulee Dam, 151 miles to the Canadian border. Approximately 494 miles of shoreline exist where sixty-five (65) tributary streams contribute their flow and biomass to the fishery in the lake. Ferry, Stevens, Spokane, Lincoln, Grant and Okanogan Counties border the shoreline and study areas. The area lies within the Okanogan Highland geological district. The land habitat

surrounding this lake is diverse, habitats range from coniferous forest, lush lowlands to semi-arid shrub steppe. The areas climate is greatly affected by the annual rainfall

regimes (10 inches/year at low elevations to 35 at the highest elevations) as well as the warming micro-climatic effects of Lake Roosevelt. Annual temperatures range from winter lows of -40 degrees F. to summer highs of 100 + degrees F.

Historically this area hosted vast numbers of salmon returning to their natal waters to reproduce and die. For the native peoples of the region, salmon and steelhead were a principle food source, providing physical nourishment and spiritual sustenance, and contributing to the religious practices and the cultural basis of tribal communities. The decaying remains of spawned-out salmon carcasses contributed untold amounts of nutrients into the aquatic, aerial, and terrestrial ecosystems of tributary habitats in the upper basin.

Near the present site of Kettle Falls, Washington, the second largest Indian fishery in the state existed for thousands of years. Returning salmon were caught in nets, baskets or speared on their migration to the headwater of the Columbia River in British Columbia. Other smaller, but important, fishery sites existed south of Kettle Falls at Rickey Rapids and at the Little Spokane Falls. Catch estimates at Kettle Falls range from 600,000 in 1940 to two (2) million around the turn of the century (UCUT, Report #2).

Annual gatherings at the various fishing sites brought together many bands of native people for fishing, socializing and religious activities. The rumble of the great Kettle Falls could be heard from as far away as 10 miles (UCUT, Rep #2). The roar of the falls was silenced forever in 1943 when the backwaters of Grand Coulee Dam inundated the falls. Lost forever to the native people of the area and all other region residents were: 1.) Diverse salmon runs, 2.) Basis of the local economy, 3.) Nutrient contribution to the upper Columbia basin, 4.) Icon for important religious ceremonies, and 5.) Cultural identity linked to the vast salmon runs.

SCOPE OF PROJECT

GOAL

Increase the quality and quantity of spawning and rearing habitat available to adfluvial rainbow trout in selected streams that drain into Lake Roosevelt by eliminating migration barriers, improving riparian conditions, and improving instream habitat. Projects that will remove passage barriers, reduce sediment loading, improve or protect existing riparian vegetation, provide habitat diversity and protect the genetic integrity of rainbow trout within the system will be prioritized for implementation. Protecting and improving the habitat of the stocks indigenous to Lake Roosevelt will achieve this goal. Ultimately, this will increase the contribution of adfluvial rainbow trout to Lake Roosevelt's fishery.

OBJECTIVES

1. Improve/create passage for rainbow trout in Bridge Creek.
2. Create passage where manmade barriers now exist in the Lake Roosevelt Watershed.
3. Monitor and evaluate habitat/passage improvements
4. Identify future habitat/passage improvement opportunities in the “blocked areas” above Chief Joseph and Grand Coulee Dams

The Lake Roosevelt Rainbow Trout Habitat/Passage Improvement Project is a resident fish substitution project to mitigate for anadromous fish losses above Chief Joseph and Grand Coulee Dams. Specific over-all program objectives include: Increase habitat availability to optimize parr production consistent with achieving harvestable levels of adfluvial rainbow trout; Manage adfluvial rainbow trout populations as self-sustaining populations; Identify future habitat/passage improvement opportunities in the “blocked areas” above Chief Joseph and Grand Coulee Dams; Monitor and evaluate habitat/passage improvements.

As in the past the current Project includes three phases: Phase I- Develop base-line information of existing conditions and strategies/opportunities for enhancement; Phase II- Implementation of selected actions/strategies described in Phase I; and Phase III- Monitor and evaluate the impacts of implementation actions.

MONITORING METHODOLOGY

Juvenile Population Estimates

Juvenile population enumeration began in September and continued through October on Bridge Creek for pre-implementation estimates. Juvenile rainbow trout populations are estimated in the stream by conducting electro-shocking surveys in randomly selected sections consisting of 10% of each habitat type found in a given valley segment. Population estimates utilize the two (2)-pass methodology of Saber-LeCren (Everhart 1975). A Smith-Root model B backpack elector-fisher was used to capture fish. A minimum of two (2) electro-fishing passes will be made for each section. Block-nets will be placed at the upstream and downstream boundaries to prevent immigration and emigration. Fish captured in the first pass are held in buckets until after the second pass is completed then the fish are enumerated, measured to the nearest millimeter and weighed to the nearest gram. Once fully recovered they are returned to the stream.

Adult Adfluvial Rainbow Trout Enumeration

Adult adfluvial rainbow trout enumeration was conducted for the second year prior to the implementation phase. During 2002 adult adfluvial rainbow trout enumeration on Bridge Creek began in mid-February and continued through early June. In 2002 upstream migratory traps were placed in five (5) streams at pre-selected sites. Trapping was conducted on Bridge Creek, Twenty Five Mile Creek, Thirty Mile Creek, Bear Creek, and North Nanamkin Creek when creel studies indicated that adult migration had begun in the San Poil River. The previous biologist Charles Jones indicated that an unknown number of adult adfluvial rainbow trout had migrated up tributaries prior to the beginning of trapping in mid-March. To increase accuracy of enumeration trapping was begun earlier in 2002.

The trap design consists of 1-inch round aluminum tubing resembling a picket fence. The panels are placed across the stream at an angle. The angle of the panels, lead the fish to a holding structure located in an upstream pool. Panels are placed on the upstream end of riffle areas at a point where the stream constricts to minimize the number of panels required.

Fish captured are anesthetized before handling to reduce stress and injury to the fish as data is collected. Gaseous CO₂ from a compressed gas cylinder is lightly bubbled through the holding tank through a diffusion stone to anesthetize the captured fish (Nielson and Johnson, 1983). Traps are checked twice daily during the spawning periods. Once the fish have been captured, they were placed in a plastic container and CO₂ gas passed through the water for a few moments until fish had calmed, then they were weighed to the nearest gram, condition noted, sex determined, and lengths measured to the nearest millimeter. Data was recorded and scales samples taken to assess the age for growth analysis. DNA samples were collected on selected fish. A small fin clip was placed in a 99% ethanol solution for preservation and selected samples are sent to the University of Idaho for DNA analysis. The fish were then placed in another plastic container containing fresh water until they recover from the CO₂, then released unharmed upstream of the trap site where they could continue their migration to spawn. The trapping continued on all selected streams on a daily basis until the run ceased.

Juvenile Adfluvial Rainbow Trout Out-migration Enumeration

Out-migrant traps were constructed in January of 1996. The trap design consists of a fyke type net that tapers to a cod end which leads to a live-box. The fyke net was placed perpendicular to the stream. The angle of the net, leads the fish toward the cod end into the livewell. The fyke net was placed at the lower end of a riffle next to a pool where the livewell was anchored down with re-bar. The traps were placed at pre-selected sites in the same streams that adult enumeration was conducted

Trapping juvenile rainbow trout in the five streams will begin mid-April and continue through the end of August. The traps will be checked twice daily during the monitoring period. Fish captured were anesthetized before handling to reduce stress and injury to the fish as data was collected. Gaseous CO₂ from a compressed gas cylinder is lightly bubbled through a diffusion stone in the holding tank to anesthetize the captured fish (Nielson and Johnson, 1983). CO₂ gas is passed through the water for few moments until the fish have calmed, then they are counted, weighed to the nearest gram, and measured to the nearest millimeter. The fish were then be put into another plastic container containing fresh water until they had recovered before being returned to the stream.

Screw Trap Enumeration of Rainbow Trout Juvenile Fish

Migration and enumeration of rainbow trout juveniles in the San Poil River has in the past been monitored using a floating screw type trap near the mouth of the San Poil River. Richard LeCaire's Lake Roosevelt Kokanee Project #199501100 previously conducted the trapping of juvenile rainbow trout in the San Poil River. However, it has not occurred during the past few years due to changes in the project priorities. The screw trap was not used in 2002; however, it will be used in 2003 at the mouth of the West Fork of the San Poil River, by this project as an indicator of adfluvial rainbow trout use of the upper and West Fork of the San Poil River and its' contribution to Lake Roosevelt's fishery.

Spawning Surveys

Spawning ground surveys were conducted from Mid-May through June 2002 to assess rainbow trout spawning activity. Project personnel conducted foot surveys from the mouth of the streams to the upper limit of fish habitat sporadically throughout the spring spawning period (April - June). Redds were counted, marked and precise GPS locations recorded. Redds were marked with a 5/8 inch re-barr hammered into the ground on the bank near each redd. A description of site, date and number was

recorded on a tag, which was attached to the re-barr. Spawning ground surveys were planned to be utilized to develop fish to redd ratios, identify spawning habitat and during Phase III Monitoring to assess the effectiveness of passage improvements and instream habitat utilization by adult adfluvial rainbow trout.

A habitat survey was to be conducted at each located redd. Data collection included substrate classification, available instream cover, stream width and depth, location of redd in relation to riffle and pool structure, temperature, cobble embeddedness, riparian zone vegetation type and quantity, and canopy cover. Data on possible predation aquatic, aerial, and terrestrial was to be collected as well as the location of each located redd in relation to the stream habitat types. A few located redds were to be selected for redd caps to enumerate emerging fry for production estimates. The project's Supervisory Technician suffered a non-industrial knee injury and was out and on light duty for a number of weeks. The lost field time coupled with staffing difficulties with the temporary field technician position and did not allow sufficient time to construct and place the redd caps. Some redds were located during surveys they were marked and located with a Garmin 12X GPS (Global Positioning System).

Fish Passage Structures

Visual observations of the condition of the various passage improvement structures were recorded throughout the monitoring period. Project sites will be visited during periods of peak spawning migration to observe functional status, passage conditions, and the attempts of adult fish to negotiate the modified barriers. Redd counts methodology discussed in objective I will be utilized to identify spawning activity in previously inaccessible areas. A model 2000 Flo-mate flow meter will be used to measure the velocity flow at the discharge end of culverts to determine potential migration barriers.

In-stream structural enhancement will be monitored and evaluated throughout the post-monitoring phase for purposes of documenting functional status, maintenance, and replacement needs.

Some Iron Creek log structures washed out during high water event of 1996-97 causing bank to undercut. Will continue to monitor may need to be repaired.

Gates on South Nanamkin Creek collected debris and altered channel during high water event of 1996-97. Gates removed will not be used again.

Horizontal Stream Survey Channel Morphology Surveys (Horizontal Control Survey)

Transacts were set up every 100 meters. Bankfull width and depth were measured at each transect. Bankfull height is determined and depths from bankfull to streambed are measured every 1/10 of a meter across each transect. The method used comes out of the Timber, Fish and Wildlife (TFW) Monitoring Procedure (Schuett-Hames et. al.1994).

Stream flow discharge and temperature will be measured monthly

beginning March through November. A Flomate 2000 flow meter with a top setting wading rod will be used at each site. Stream widths will be measured and divided into at least 10 to 20 equal cells depending on the width of the stream. Velocities will then be measured at each cell at two (2) thirds of the depth, then discharge can be calculated. The methodology for taking stream flow and temperatures will be consistent with the Timber, Fish and Wildlife (TFW) Monitoring Program (Dave Schuett-Hames et al. 1994).

Habitat Stream Survey was begun during early fall. Stream channel surveys were conducted using Timber,

Fish and Wildlife (TFW) Monitoring Program Methodology (Schuett-Hames et al. 1994). A field crew of two (2) or three (3) people systematically surveyed the habitat of valley segments delineated in the horizontal

survey. Each habitat unit was measured for length and width. Mean depth of riffle units and a minimum and maximum depth for pool units and tail-out depth, substrate diversity, cobble embeddedness and channel gradient were measured. Woody debris were counted and categorized as logs or root wads at each recorded habitat unit. Function of the debris was assessed as well as a determination of an adequate or inadequate amount of debris present. The riparian condition was estimated by determining the canopy closure every 300 meters within the habitat units.

Canopy closure measurements were taken with a densiometer from the center of the stream looking up stream, down stream, left bank and right bank. This measurement provides an indirect measure of shading the stream receives by adjacent riparian vegetation. The vegetation along the stream bank was categorized by visual estimates of the serial or successional stage of the plant communities at each recorded

habitat unit. Type of dominant vegetation whether deciduous, coniferous or mixed, and land use, was documented. Data was recorded on standardized Timber, Fish and Wildlife (TFW) forms and entered into Excel for computerized database storage. Habitat surveys are used to assess habitat conditions and define impacts in stream reaches due to land use practices.

RESULTS

Objectives:

1. Improve/create passage for rainbow trout in Bridge Creek.

Tasks

- a. Design/engineer new channel and stabilization of lateral cutting.
 1. Published RFP in several papers and distributed information packages to interested contractors.
 2. Developed decision matrix and selected Entrix as design firm for design of Bridge Creek improvements.
 3. Conducted field visits and planning with Entrix specialists in hydrology, geology, engineering, fish habitat and biology
 4. Survey of lower Bridge Ck conducted under Entrix sub-contract.
- b. Re-create original stream channel and floodplain and connection to wetland and the San Poil River.
 1. Reviewed in field preliminary alternatives and approaches for optimal design incorporating fish habitat, flood control and current functioning processes
 2. Laid out two alternative channels and reviewed with NRCS, Dept., Ferry County Conservation District, & landowner Bob Jennot.
- c. NEPA compliance.
 1. Initiated stakeholder scoping.
 2. Conducted field visit with Ferry County, Ferry County Conservation Dist, NRCS, and landowner.
 3. Review of preliminary alternatives by stakeholders.
 4. Consulted with Tribal and BPA archeologist agreed to wait until design work completed to determine scope of archeological survey necessary.
- d. Baseline adult fish trapping in spring before implementation.
 1. Repaired traps during first quarter in preparation of upcoming trapping season.
 2. Trapped fish on Bridge Ck and several streams. Weirs and out-migrant traps placed in streams end of March.

Table 1

Stream	# Males	Average Length	Average Weight		# Females	Average Length	Average Weight
Bridge Creek	5	526.5	785.0		12	560.9	1147.1
Bear Creek	6	467.0	966.2		10	493.3	1148.1
30-Mile Creek	12	453.3	981.3		25	479.5	1181.4
23-Mile Creek	2	482.5	1098.5		2	455.5	1009.5
North Nanamkin	16	459.0	1061.8		38	741.5	953.9
Total	51				87		

Table 2

Stream	Max Weight	Min Weight	Max Length	Min Length
Bridge Creek	1521	522	550	352
Bear Creek	1835	472	550	393
30-Mile Creek	1473	466	560	348
23-Mile Creek	1250	921	520	451
North Nanamkin	2072	810	562	415

- e. Electroshock/population estimates in area to be affected.
 1. Conducted pre-implementation electroshock population estimates on Bridge Ck. Collected data on length, gender, species, scales taken and samples for the DNA analysis collected.
- f. Spawning (Redd) survey.
 1. Conducted redd surveys on streams where traps were located.
 2. Redd locations mapped with GIS files created from GPS data.
- g. Redd habitat assessment.
 1. Conducted limited habitat assessment at each redd location
- h. Redd production, emerging fry enumeration (redd cap).
 1. Unable to build redd caps in time for fry enumeration.
 2. Researched the construction of redd caps and success rates.
 3. Consulted with another biologist that had built redd caps and ordered special netting that will need to be constructed by net company.
- i. Collection of red band rainbow trout hatchery brood stock.
 1. Protocol for brood stock collection developed by Hatchery Manager Dan Fairbanks. Samples collected for DNA analysis from 100 fish collected for brood stock.
- j. Document physical habitat parameters.
 1. Created database and begun inputting data from 2001 field season.
 2. Placed & monitored staff gauges in San Poil River.
 Rise in water depth was recorded in inches at water gauges placed in Bridge Creek and San Poil River. The San Poil gauge washed away on April 14th as flows peaked and required replacement as soon as it was safe to do so.

Graph 1

2002 Peak Flows (In Inches)

3. Modified habitat data collection parameters from TFW.
4. Reviewed with Environmental Trust Water Quality Standard revisions that would include fish habitat indicators, macro-invertebrates and sediment sampling will be added to data collected by Tribal Environmental Trust

Department (ETD). Exchanged and set up networking of existing databases. Initiated metadata files for documentation of data sources.

Other physical and chemical data collected by Colville Environmental Trust Department and parameters monitored by Project include:

Table 3

Dissolved Oxygen	Temperature	Turbidity	pH	Conductivity	Ammonia	Nitrate
Suspended Solids	Nitrite	Lead	Zinc	Phosphate	Copper	Iron
Alkalinity	Sulfate	Hardness	Fecal Coliform	Total Dissolved Solids		

k. Flow rate data collection.

1. Monitored data collected at 75-sites across Colville Reservation by Tribal Environmental Trust Department.

Map 4

- I. Temperature data collection.
 1. Pulled temp data loggers and downloaded information from 2001.
 2. Deployed temperature data loggers in 10 streams (9-Mile Creek, 21-Mile Creek, 23-Mile Creek, 30-Mile Creek, Bear Creek, Bridge Creek, upper Coyote Creek, Kartar Creek, West Fork San Poil River and West Fork Hall Creek).

Temperatures demonstrate a high diurnal variance of 10-12° C in most streams. Indicating ambient air conditions have considerable influence over stream temperatures and that canopy cover could have significant effects on lowering stream temperatures.

Map 5

Graph 2

Table 4

Average	Maximum Temp	Minimum Temp	Average High Temp
12.57	24.01	-1.51	16

Graph 3

Table 5

Average	Maximum Temp	Minimum Temp	Average High Temp
9.63	23.63	-2.44	18

Graph 4

Coyote Creek Temperatures 2002

Table 6

Average	Maximum Temp	Minimum Temp	Average High Temp
7.49	17.9	-0.61	14

Kartar Creek Temperatures 2002

The temperature monitor malfunctioned, no data available.

Graph 5

Nine Mile Creek Temperatures 2002

Table 7

Average	Maximum Temp	Minimum Temp	Average High Temp
7.93	17.14	-0.61	15

Graph 6

Twenty One Mile Creek 2002

Table 8

Average	Maximum Temp	Minimum Temp	Average High Temp
9.87	31.52	-0.61	16

Graph 7

Twenty Three Mile Creek 2002

Table 9

Average	Maximum Temp	Minimum Temp	Average High Temp
9.02	19.42	-0.61	17

Graph 8

Table 10

Average	Maximum Temp	Minimum Temp	Average High Temp
8.80	15.23	-0.16	13

Graph 9

Table 11

Average	Maximum Temp	Minimum Temp	Average High Temp
6.27	18.28	-1.06	14

Graph 10

Table 12

Average	Maximum Temp	Minimum Temp	Average High Temp
9.91	33.17	-0.61	16

- m. Temperature loggers remained in streams from March through end of fourth quarter.
2. Plant cuttings/plants/conifers.
 - a. This task is for post implementation.
3. Acquire off site solar water pump unit.
 - a. Made contact with NRCS discussed their support in installation of off site watering trough, and riparian plantings.
 - b. NRCS claims not to remember promise of support for the project.
 - c. Determined owner needs and priorities held meeting with owner and NRCS.
 - d. Located original letter of support from NRCS and sent copy to Ferry County NRCS Office. NRCS stating only able to offer technical support at this time.
4. Build riparian area fence.
 - a. Contacted Ferry County Conservation District about financial support of Bridge Creek riparian fence.
5. GPS or digitize all information on Tribal GIS system.
 - a. GIS files created for temperature data sites & barriers.
 - b. GPS of temp collection sites for all department projects including bull trout surveys, EWU data sites on LR (>500 pts), State and Tribal net pens, Creel sites for LR from State, STOI, and CCT, created map for Lake Roosevelt Managers.
 - c. All EDT data incorporated into expanded GIS files by delineated reaches. Created GIS files of barriers, reaches including slope and confinement data on test section of lower and mid San Poil River.

Map 6

6. Develop contract(s) for bids/implementation.
 - a. Put out request for bids for design work. Reviewed bids and developed decision matrix for selection of engineering firm to design Bridge Ck improvements.
 - b. Processed Entrix sub-contract and received Tribal approval of Entrix sub-contract.
 - c. Developed request for bids on implementation of five sites for reduction of sediment delivery to San Poil Tributaries and the San Poil River. (Funded with EPA 319 Clean Water Grant)
7. DNA analysis for determination of specific stock presence.
 - a. Sent 100 tissue samples to Idaho U for DNA analysis. Specimens taken from Bridge, Hall, West Fork Hall, and Barnaby Creeks from several locations each stream.
 - b. Received preliminary report on red band stock. Appear to have some stocks that are un-hybridized in isolated areas above barriers such as waterfalls. Generally appears that stocks in lower part of streams are showing varying degrees of hybridization with planted coastal rainbow trout. Received final report from Idaho Univ. on red band trout. Stock is extremely pure, no indication of hybridization in Bridge Creek above the two waterfalls or in the West Fork of Hall Creek. Slight hybridization of lower Hall Creek and Barnaby Creek seen.

Some hybridization also appears to have occurred with remnant summer steelhead stocks that once flourished in these waters. Adfluvial stocks appear to be a hybrid of steelhead, native redband trout, and planted coastal rainbow trout. Behavior patterns closely resemble steelhead fry. Like steelhead the adfluvial trout stay in stream for one to years prior to migrating to the estuary of Lake Roosevelt, returning at 3-4-years of age and up to 6-years-of-age. Age classes determined from scales collected over several years. (See final report Appendix A)

1. Create passage where manmade barriers now exist in the Lake Roosevelt Watershed.

Tasks

- a. Research federal, state and county agencies for previous inventories of culverts and/or fish barriers.
 1. Reviewed old F&W projects and surveys, located old photos, and surveys by USGS, DOT, and Ferry County Roads.
 2. Obtained photos of Bridge Creek from 1946 and about every ten years through 2001. Obtained a copy of the 1915 survey that shows Bridge Creek at its' confluence with the San Poil River.

1946 and 1991 Comparison

San Poil River in 1909, today the river is wider and not as deep.
Conifers are replacing abundant cottonwoods that once lined the riverbanks.

3. Started collecting data from all known sources regarding habitat, fish, impacts, water quality monitoring, flood plain mapping, flow data, USGS gauging sites, & verbal historic records.
 4. Obtained San Poil Sub-basin Flood Management Plan Draft. I consulted with Jack Orsborne regarding his San Poil hydrologic report and his determination of maximum flows and the event frequency calculations.
- b. Design systematic inventory system for culverts/barriers/habitat limitations, assessing status of landscape processes that form and sustain habitats over space and time, and identification of land uses causing habitat degradation.
1. Started survey of culvert barriers starting with main culverts on San Poil Highway.
 2. Assessed hydrology and process currently at work in the Bridge Creek watershed.
 3. Reviewed GIS slope changes to determine probable locations of falls then field verified & GPS.
 4. Review of available monitoring and data base systems.
 5. Reviewed historical and current land uses.
 6. Started Intensive survey of all barriers within the San Poil Sub-basin under EDT protocol.
 7. Identified all culverts with GIS data then field verified locations and conditions.
 8. Continued working on EDT as evaluation tool. Have some concerns regarding its ability to differentiate multiple types of impacts, and integration of multiple resident species not addressed.
- c. Design decision matrix for prioritization of optimal habitat improvement project selection. Prioritization will be based a number of factors including the use of techniques that have a high probability of success, a low variability of success reported from similar projects, response time, and expected duration of the restoration action.
1. Reviewed old F&W projects and conducted literature search on existing approaches to habitat assessment. Reviewed currently proposed quantifiable indicators for the assessment and monitoring of various land use impacts. Reviewed types of habitat improvements had been done during past projects.
 2. Reviewed EMAP criteria for inclusion in selection process
 3. Started working with the EDT model with Mobrand Consultants. Contacted WA F&W biologists for data available on areas off the Reservation on the ceded North Half within the San Poil Sub-basin. Attended AFS conference and exchanged ideas on successful treatments in habitat restoration.
 4. Began input of data into EDT matrix for test section continue working with Mobrand on technical problems of model.

- d. Design long term monitoring plan for determining effectiveness of specific habitat improvements to tributaries in increasing adfluvial rainbow trout populations utilizing Lake Roosevelt's estuarine habitats.
 1. Researched monitoring indicators with the research done for the decision matrix.
 2. Discussed long term monitoring of Lake Roosevelt with LR Managers Pane (WAFW, STOI, CCT, and EWU).
 3. Researched and reviewed information available on the EMAP process and current status. Should blend well as long-term trend monitoring following initial EDT status assessment.
- e. Continue inventory of passage barriers (GPS, photos, and Limitation Assessments) in the San Poil River Subbasin.
 1. Started survey of culvert barriers, GPS, photographed barriers along San Poil Hwy & documented barrier type.
 2. Second quarter continued with culvert survey extending further up channels. Field verification of GIS information & GPS.
 3. Third quarter continued passage barrier assessment GPS of culverts continued up each watershed of the designed systematic inventory system.
 4. Electroshock/population estimates in areas under consideration to be affected with future improvements. All reaches defined within EDT parameters, reaches marked at each trib and 0 reaches at barriers in San Poil watershed and placed into GIS and Excel files.
 5. Revised EDT reaches to consolidate multiple culverts into single barriers and reduce the number of reaches at request of Mobrand.
- e. Inventory passage barriers in the Lake Roosevelt Sub-basin with implementation of improvement projects.
 1. Task scheduled for 2003.
- f. Baseline horizontal survey and habitat survey of Thirty Mile Creek.
 1. Task completed will do Twenty-Three Mile Creek in 2003.

The 31.97 square miles of the Thirty Mile Creek Watershed is within the San Poil Sub-basin, the annual rainfall is 10-15 inches/year at the lower elevations increasing to 15-20 inches/year at the falls. Continuously increasing with elevation the headwaters receive up to 30 inches/year. All land is in Tribal Trust status with the exception of 0.69 square miles of Fee lands 0.48 square miles in the lower elevations below 2000 feet and 0.20 square miles at the 2000-4000 foot elevation and a small 0.18 square mile section in Allotment status in the lowest elevation at the confluence with the San Poil. The elevation ranges from 1720-feet at the confluence of Thirty Mile Creek and the San Poil River to 5490-feet at the summit. Frequent fire regimes in the past controlled the succession and climax species. Fire suppression during the past century has converted forests from open Ponderosa Pine to a higher density of Douglas fir. Timber harvest,

roads, mining, agricultural and grazing practices have contributed to negative impacts within the watershed.

An assessment of the culverts indicates several are passage barriers and old culvert failures at the Old Keno Mine Road have caused a artificial widening of the stream. From frequent fording by Tribal Forestry staff during the planning stages of proposed Thirty Mile Timber Sale planned for 2003. I am working with the Forestry Department in replacing inadequate and barrier culverts on all roads to be used in the timber sale. One major culvert at the lower reaches of Thirty Mile Creek about one-third of a mile upstream of the confluence with the San Poil River is a barrier and outside of the sale area. I will look into funding for replacing this culvert.

Table 13

Thirty Mile Creek Watershed in San Poil Sub-basin Ownership Status by Elevation Zone

Ownership Status	Elevation Zone	Acres	Square Miles
Trust	Under 2000 feet	7,768.59	12.14
Trust	2000-4000 feet	28,465.19	44.48
Trust	Over 4000 feet	9,038.79	14.12
Total in Trust Status	All Elevation Zones	45,272.57	70.74
Fee	Under 2000 feet	1035.79	1.62
Fee	2000-4000 feet	130.71	0.20
Total in Fee Status	All Elevation Zones	1166.50	1.82
Allotment	Under 2000 feet	112.37	0.18
Total in Allotment Status	All Elevation Zones	112.37	0.18
Total All Ownerships	All Elevation Zones	46551.44	72.74

Map 7

- g. Install culverts/bridges/passage improvements.
 - 1. Task scheduled for 2003.
- h. GPS or digitize all information on Tribal GIS system.
 - 1. Started GIS shapefiles for GPS of culverts. Entered all data collected during 2001 field season. Built data bases for statistical analysis of population data, horizontal survey, and habitat survey
 - 2. All GPS points placed into GIS shp files for ArcView.
 - 3. All files are projected in UTM, NAD83 datum, zone 11, in meter units.
 - 4. Streams, barriers, reaches, falls, and gradient, all entered into Tribal GIS system. Data shared with STOI, WDFW, and Al Schultz (EWU).
 - 5. Recorded San Poil River assessment and survey information into database for EDT modeling use.
- i. Survey the main stem of the San Poil River for opportunities to reconnect side channels and other isolated habitats.
 - 1. Survey of San Poil main stem documented braided channel and side channels as well as inlets, wetlands, and other isolated habitats and specialized habitat areas. Some old oxbows also exist. Some areas may have potential for development of usable habitat will continue task during 2003.
- j. Consult with Okanogan County on their Bridge Creek Road improvements currently in the planning stages.
 - 1. Consulted with Ferry County Roads Manager Keith Muggoch on County's plans for roadwork in vicinity of Bridge Ck.
 - 2. Held second consultation with Ferry County Roads Manager on possible effects of planned roadwork on channel changes. Keith and I met at Bridge Creek and reviewed potential concerns. Currently the plan is for possibly raising the elevation of Bridge Creek Road. Counties major concern is with possible flooding of road by new channel. He will not consider moving the current location of the bottomless culvert installed by Ferry County in 2001. Some talk by Entrix of taking the stream across the road and reconnecting to the San Poil north of Bridge Creek Road. This would involve considerable cost for the bridge or large culvert and increases risks associated with stream crossings. Keith Muggoch is very much against this. Since the original channel was to the south of Bridge Creek Road as demonstrated in 1915 USGS Survey and multiple aerial photos of the area I decided to direct the engineers from Entrix to keep the new channel as close as possible to the original location. One area of concern is about 500-feet downstream of the culvert the original channel came within about 50-feet of the Bridge Creek Road. This site could pose flooding problems I have direct engineers to design this area to drain to the south away from the road to prevent flood risk to Bridge Creek Road.

- k. Acquire any necessary training.
 - 1. During the quarter I took an ArcView 8.1 class to transition from 3x. Attended AFS conference for exchange of current projects, ideas, and concepts.
- l. DNA analysis for determination of specific stock presence at selected sites.
 - 1. First quarter sent off 100 samples of redband trout from Bridge Creek, Barnaby Creek, Hall Creek, and N. Fork Hall Creek for DNA analysis under a sub-contract with Madison Powell and Joyce Faler at the Center for Salmonid and Freshwater Species at Risk at the University of Idaho/HFCES. DNA analysis used mitochondrial and nuclear RFLP markers along with two microsatellite loci. Sample populations were screened for detectable levels of introgressive hybridization arising from possible admixtures of hatchery rainbow trout with native redband trout. Both nuclear and mitochondrial RFLPs have been used successfully to assess genetic diversity and hybridization among and between *O. mykiss* subspecies and between *O. clarki* (Wishard et al. 1984; Wilson Thomas and Bechenback 1985; Williams and Jaworski 1995, Williams, et al. 1996; Williams, Leay and Currens 1997; Powell and Faler 1999; McCusker, Parkinson, and Taylor 2000; Campbell, Dillon, and Powell 2002).
 - 2. Received preliminary report on red band stock. Appear to have some stocks that are un-hybridized in isolated areas above barriers such as waterfalls. Generally appears that stocks in lower part of streams are showing varying degrees of hybridization with planted coastal rainbow trout.
 - 3. Received final report from Idaho Univ. on red band trout. Stock is extremely pure, no indication of hybridization in Bridge Creek above the two waterfalls as is the West Fork of Hall Creek. Slight hybridization of lower Hall Creek and Barnaby Creek seen. (See final report appendix A)
- m. Consult with Washington State, Trans-boundary Gas Group, and EPA on Upper Columbia Main Stem TMDLs for total dissolved gas and temperature standards.
 - 1. During second quarter met with CRITFC, DOE, Nez Perce Tribe, and EPA on TMDL development.
 - 2. Between April and June I attended a Trans-boundary Gas Group meeting and three meetings on TMDLs with EPA, Nez Perce Tribe, Spokane Tribe, CRITFC and WA Dept of Ecology. Consulted with Tetra Tech EPA contracted on impact of TMDLs on Tribal resources.

3. Monitor and evaluate habitat/passage improvements by monitoring increased use by adfluvial rainbow trout derived from habitat/passage improvements.

Tasks

- a. Trap adult fish in spring for two years after implementation.
 1. This is for 2003 post implementation on Bridge Creek all other streams have been monitored from 1996-2000.
 2. Trapped fish on Bridge Ck and several streams. Weirs and out-migrant traps placed in streams end of March and removed weirs end of May migratory traps left in place till mid-July.

Table 14

Stream	# Males	Average Length	Average Weight		# Females	Average Length	Average Weight
Bridge Creek	5	526.5	785.0		12	560.9	1147.1
Bear Creek	6	467.0	966.2		10	493.3	1148.1
30-Mile Creek	12	453.3	981.3		25	479.5	1181.4
23-Mile Creek	2	482.5	1098.5		2	455.5	1009.5
North Nanamkin	16	459.0	1061.8		38	741.5	953.9
Total	51				87		

Table 15

Stream	Max Weight	Min Weight	Max Length	Min Length
Bridge Creek	1521	522	550	352
Bear Creek	1835	472	550	393
30-Mile Creek	1473	466	560	348
23-Mile Creek	1250	921	520	451
North Nanamkin	2072	810	562	415

- b. Electroshock/population estimates annually for two years after implementation.
 1. Task scheduled for 2003.
- c. Spawning (redd) survey in affected area annually for two years post implementation.
 1. Task scheduled for 2003.
- d. Survey habitat after improvements and then in accordance with the new long term monitoring plan being developed.
 1. Task scheduled for 2003.
- e. Conduct Rove Creel on San Poil River
 1. Started rove creek on San Poil River the first week of January adfluvial rainbow started migrating up San Poil and showed up in creel last week of January. Staging continued in San Poil until end of February before heading up tributaries. Traps placed out into streams the first of March.

- f. Trap adult fish with screw trap in San Poil River.
 - 1. Unable to use screw trap flows raised too fast unsafe conditions prevented use until too late in year to collect desired data. Task scheduled again for 2003.

4. Identify future habitat/passage improvement opportunities in the “blocked areas” above Chief Joseph and Grand Coulee Dams

- 1. Thirty Mile Culvert plus several culverts on the San Poil Highway have been identified for future passage improvements.

Thirty Mile Creek Summary 2002 Habitat Horizontal Survey By Segment

Thirty Mile Creek Segment 1 Data Summary				(All data is in Meters)				
Riffle Length	772.4		Riffle Width	122.6	# Riffles	45	Avg. Riffle Width	2.7
Pool Length	166.9		Pool Width	130.6	#Pools	40	Avg. Pool Width	3.3
Cascade Length	6.8		Cascade Width	3.0	# Cascades	1	Avg. Pool Depth	0.43
Total Length	946.1		Total Width	256.2	# Beaver Dams	1	Avg. Tailout Depth	0.2
Riffle Area	94696.2 sq. meters					Width/Depth Ratio Pools		7.6 sq. meters
Pool Area	21797.1 sq. meters							
Pool/Riffle Ratio	0.2 sq meters pool/sq. meters riffle			Large Woody Debris for Entire Segment:				
Bankfull Data			Large Woody Debris < 10 inches		63			
Avg. Bankfull Width		*6.16	Large Woody Debris >10 inches		22			
Avg. Bankfull Depth		2.64	* Average width at bankfull is skewed by the data at the first point at the confluence with the San Poil River. If point is removed average width is 5.19, depth 2.33, and width to depth ratio of 2.2					
Avg. Bankfull Width/Depth Ratio		2.3						
Avg. Canopy Closure		69.1						

Thirty Mile Creek Segment 2 Data Summary (All data is in Meters)								
Riffle Length	1377.3		Riffle Width	331.9	# Riffles	135	Avg. Riffle Width	2.5
Pool Length	462.8		Pool Width	439.8	#Pools	134	Avg. Pool Width	3.3
Cascade Length	0		Cascade Width	0	# Cascades	0	Avg. Pool Depth	0.43
Total Length	1840.1		Total Width	771.7	# Beaver Dams	0	Avg. Tailout Depth	0.17
Riffle Area	457125.9 sq. meters					Width/Depth Ratio Pools		7.6 sq. meters
Pool Area	203539.4 sq. meters							
Pool/Riffle Ratio	0.4 sq meters pool/sq. meters riffle			Large Woody Debris for Entire Segment:				Reference Point
Bankfull Data				Large Woody Debris < 10 inches			180	0-6
Avg. Bankfull Width		5.4		Large Woody Debris >10 inches			22	0-6
Avg. Bankfull Depth		0.32		Large Woody Debris < 10 inches			163	7-13
Avg. Bankfull Width/Depth Ratio		16.8		Large Woody Debris >10 inches			134	7-13
				Large Woody Debris < 10 inches			185	14-19
Avg. Canopy Closure		78.2		Large Woody Debris >10 inches			105	14-19

Thirty Mile Creek Segment 3 Data Summary (All data is in Meters)									
Riffle Length	110.9		Riffle Width	24.1	# Riffles	16	Avg. Riffle Width	1.5	
Pool Length	405.2		Pool Width	77.2	#Pools	28	Avg. Pool Width	2.8	
Cascade Length	0		Cascade Width	0	# Cascades	0	Avg. Pool Depth	0..6	
Total Length	516.1		Total Width	101.3	# Beaver Dams	13	Avg. Tailout Depth	0.12	
Riffle Area	2672.7 sq. meters					Width/Depth Ratio Pools		4.6 sq. meters	
Pool Area	31281.4 sq. meters								
Pool/Riffle Ratio	11.7 sq meters pool/sq. meters riffle			Large Woody Debris for Entire Segment:				Reference Point	
Bankfull Data				Large Woody Debris < 10 inches		131	0-6		
Avg. Bankfull Width		7.80		Large Woody Debris >10 inches		37	0-6		
Avg. Bankfull Depth		0.31		Large Woody Debris < 10 inches		140	7-13		
Avg. Bankfull Width/Depth Ratio		20.70		Large Woody Debris >10 inches		84	7-13		
Avg. Canopy Closure		63.6							

RECOMMENDATIONS:

Previous results showed that while the “increased habitat availability has probably improved fish for recruitment to Lake Roosevelt and the San Poil River Basin, some of the data collection methods to detect these changes were not adequate, possibly due to fluctuations in water flow” (LRHI Project 2000 annual report). Alterations in data collection methods and timing were implemented to reduce impacts from water flow variability on future results. Trapping in future years starting in 2003 will be initiated once creel surveys on the San Poil River indicate that adult fish are migrating toward up stream tributaries for spawning. Redd counts will be done earlier, expanded population studies are planned, and additional passage barriers will be assessed for passage improvements in other tributaries. Greater details are available in the 2003 Scope of Work.

Other tasks planned for 2003 continue the EDT assessment on the remaining upper reaches of the San Poil Sub-basin above the test section to the Reservation boundary line. The assessment will be utilizing the designed systematic inventory system for culverts/barriers/habitat limitation. The system uses GIS to initially determine location of all possible stream crossings. A crew is then sent into the field to verify the status of each crossing and to GPS the site.

A tool for assessing status and trends in landscape processes that form and sustain habitats over space and time, and identification of land uses causing habitat degradation had been planned for this year with the EDT assessment. The design of this decision matrix or model was to be used in determining a current ecosystem's status and for the prioritization of optimal habitat improvement project selection. Prioritization should be based a number of factors including the use of techniques that have a high probability of success, a low variability of success reported from similar projects, response time, and expected duration of the restoration action. However the EDT model did not function well for resident fish in the blocked areas. There are no resident fish models developed to run the data with. I believe once the steelhead model is completed although not resident based it should work for the adfluvial rainbow trout and mountain whitefish, although another model for fall spawning salmonids needs to be developed a kokanee model should work for kokanee and brook trout.

Monitoring will include an evaluation with comparative analysis of pre and post implementation of habitat/passage improvements by monitoring fish populations (both juvenile and adult), examining fish passage effectiveness, instream habitat effectiveness on channel morphology, fish habitat and fish habitat utilization and effectiveness of riparian habitat improvement actions.

The long-term monitoring program will evaluate and record the success of specific improvement actions, length of time required to reach specific goals for each action, and duration of improvements on channel morphology fish habitat and fish habitat utilization and effectiveness of riparian habitat improvement actions. Until further funding is available a limited long-term monitoring program has been started. When funding is available I would like to expand the monitoring to include the San Poil Sub-basin within the Reservation boundary lines. Currently it will be limited to those areas that have had improvement actions. A rotational system utilizing an random selection approach similar to EMAP that includes specific habitat perimeters, water quality data,

flow data, macro-invertebrate counts, and fish presence and abundance data could be collected at each site with a repeated rotation this approach should indicate status and over time trends.

The conclusions in the 1999 Annual Report analysis showed that passage improvements are successful for increasing habitat availability and use. Project streams to this date have shown increases in fish density after the implementation of improvements. Some of the streams that were examined in 1990 and 1991 as part of original Phase I of this project have been further altered such that more funding was used for assessment in 2001 and assessment and improvements in 2002.

The 2003 season will continue with temperature data collection on several streams as part of an ongoing assessment for the prioritization and selection of streams for future improvements. Placement of temperature monitors will shift in emphasis to data collection below areas of known impacts such as timber harvest and grazing. Data and recommendations from the original 1990-1991-Baseline Assessment has been reviewed as part of the decision making process. Criteria for stream selection will be based on maximizing adfluvial rainbow trout spawning and rearing habitat while minimizing improvement costs. The annual reports will continue to include an evaluation of current conditions and the effectiveness of the implementation efforts.

Phase I of Bridge Creek improvements should be ready for implementation in 2003 although the design plans by Entrix are not 100% complete. NEPA compliance is on track with public meetings planned in 2003 and newspaper and newsletter articles are also planned. The Tribal archaeologist feels at this time he will be able to complete the planned survey although this may change and we should be prepared to find an outside source to complete the survey. There are several firms in the area that are qualified and have worked with the Tribes before.

The selection of Thirty Mile Creek, the San Poil tributary to the immediate north of Bridge Creek, has been made, for the next improvement project. Several culverts have caused fish passage barriers. A baseline stream survey, habitat data collection and current population assessments were completed during the 2002 field season. Three passage improvements sites are anticipated to open potentially several kilometers of spawning and rearing habitat. Thirty Mile Creek at 27.5 kilometer is the longest tributary to the San Poil River. The 1991 Report stated, "This, stream has the potential of becoming a major producer of adfluvial rainbow trout." The perennial flows in Thirty-Mile Creek offers spawning, rearing, and over-wintering habitat for resident and adfluvial rainbow trout. Sufficient fall flows exist for kokanee use as well. Funding outside BPA will be looked at for part of the improvements on Thirty Mile Creek. Currently the Forestry Department is planning a timber sale to begin in 2004 I will be working with them on the road development to try and replace part of the culverts that are currently barriers.

Twenty-three Mile Creek appears to have great flow potential as well and a stream survey for 2003 is planned to determine fishery problems and potential.

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Appendix A

Genetic Analysis of Redband Trout Populations from the Colville Reservation

Preliminary Report

July 8, 2002

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Summary: Tissue collected from 3 separate sample populations of redband/rainbow trout (*Oncorhynchus mykiss* spp.) and/or their hybrids were examined using mitochondrial and nuclear RFLP markers along with two microsatellite loci. Sample populations were screened for detectable levels of introgressive hybridization arising from possible admixtures of hatchery rainbow trout with native redband trout. Both nuclear and mitochondrial RFLPs have been used successfully to assess genetic diversity and hybridization among and between *O. mykiss* subspecies and between *O. clarki* (Wishard et al. 1984, Wilson Thomas and Bechenbach 1985; Williams, and Jaworski 1995; Williams, et al. 1996; Williams, Leary and Currens 1997; Powell and Faler 1999; McCusker, Parkinson, and Taylor 2000; Campbell, Dillon and Powell 2002). Sample sizes for the Barnaby Creek populations were too small to be informative by themselves but were combined with data generated from samples collected from Barnaby Creek in 2001 by another agency. Two of the populations surveyed (Barnaby and Hall Creeks) indicated non-introgressed redband trout with the loci examined. Data also indicated these sample populations were likely composed of a single spawning population. The remaining population, Bridge Creek, contained a low level of admixture within the first 10 samples. However, This sample population was out of HWE and Fis values were significant and positive indicating a significant heterozygote deficiency. These data suggest this sample population contains individuals from more than a single homogenous spawning population. A may confound the dataset. It is probable that further upstream in the drainage, admixture with introduced rainbow trout is less likely to be detected as evidenced by the remaining 50 samples from this watershed showing no indication of intraspecific introgression.

Methods: Fin samples were stored in 70% ethanol or preservation/lysis buffer until DNA was extracted using methods modified from Sambrook et al., (1989) and Dowling et al. (1990). Total genomic DNA was isolated from each sample and amplified using

the polymerase chain reaction (PCR) and nucleotide primers specific for the mitochondrial cytochrome B (CytB) gene region and the nuclear Ikaros (IK) gene region (Campbell, Dillon and Powell 2002). Primers used for microsatellite analysis (for *Omy77* and *OMM1020*) were obtained from Perkin-Elmer Applied Biosystems and “labeled” with a fluorochrome (HEX) which allows the amplification products to be separated and analyzed using a Perkin-Elmer model 310 automated fragment analyzer and GENESCAN software (Perkin-Elmer ABI).

Amplification products for nuclear and mitochondrial RFLPs were digested with the *Hinf* I and *Taq* I restriction enzymes. Resulting fragments were separated by electrophoresis using 3% agarose/TAE gels. Photographs of gels were converted into computer image files. Restriction fragment length polymorphisms (RFLPs) observed among samples were given alphabetical designations as genotypes or haplotypes. The size of each DNA fragment from each gene region is estimated by comparison to a size standard, pUC-19 marker (Bio-Synthesis). Resulting haplotypes and genotypes were compared to haplotypes and genotypes from previously analyzed populations of redband/rainbow trout from several locations in Oregon (Oregon Basins, Walla Walla River), Idaho (Bruneau Drainage, Pend Orielle Drainage, Big Wood Drainage) and Washington (Columbia Drainage) and to hatchery rainbow trout. GENOTYPER software (Perkin-Elmer ABI) was used with the 310 automated fragment analyzer to generate genotypic data for the 2 microsatellite loci.

Nucleotide diversity and divergence among and within populations was estimated using Nei (1987) equations 10.19, 10.7, 10.20, and 10.21. Nuclear RFLPs were analyzed along with microsatellite loci data using Genetic Data Analysis (GDA) software (Lewis and Zaykin 1999).

No.	Sample Population	n	mean F.L.	Comments
BA1	Barnaby Creek	4	118.8	above culvert
BA2	Barnaby Creek	4	112.0	below culvert
BR1	Bridge Creek	10	no data	below falls boulder
BR2	Bridge Creek	26	125.8	above falls boulder
BR3	Bridge Creek	24	131.7	above Keno
H1	Hall Creek	32	136.3	West Fork
		Total 100		

Results and Discussion: The frequencies of mitochondrial and nuclear RFLPs among the 3 sample populations are arranged in Table 1. Two populations Bridge Barnaby Creek and Hall Creek were fixed at both RFLP loci for redband/rainbow trout alleles/haplotypes. Conversely, Bridge Creek samples showed possible intraspecific hybridization (between redband and rainbow trout) for sample locations lower in the system (BR1 samples). Estimates are based upon genetic distance observed between redband and rainbow trout alleles, genetic distance between haplotypes (see Williams et al. 1996 for an explanation), and rare alleles/haplotypes observed among sample populations.

Results and comments for each sample location are as follows:

BA1 Barnaby Creek – (n=4) Mitochondrial haplotypes all indicate *O. mykiss* maternal origin. Genetic distances within the small sample number (N=4) suggest a non-admixed population. The “trout” examined suggest they are very closely related indicating redband origin or alternatively a complete replacement from a homogenized hatchery origin rainbow trout stock.

BA2 Barnaby Creek – (n=4) Mitochondrial haplotypes all indicate *O. mykiss* maternal origin. Genetic distances within the small sample number (N=4) suggest a non-admixed population. The “trout” examined suggest they are very closely related indicating redband origin or alternatively a complete replacement from a homogenized hatchery origin rainbow trout stock.

Summary: Samples from another 2001 collection of Barnaby Creek (n=16) showed mitochondrial haplotypes of all samples are of *O. mykiss* maternal origin. Only *O. mykiss* nuclear RFLPs and microsatellites were for observed for these individuals as well. Estimates of genetic distance across all samples indicate a non-admixed redband trout population. **Thus, genetic information on this population from two sources indicates only redband trout.**

BR1 Bridge Creek - (n=10) Mitochondrial haplotypes all indicate *O. mykiss* maternal origin. Introgression in this population is likely from a hatchery rainbow trout source. Genetic distance of nuclear alleles was high (>1.38) even within the small sample set. Available nuclear allele data indicate rainbow trout alleles are at least partially of hatchery rainbow origin or that a redband population is further admixed with hatchery rainbow trout.

BR2 Bridge Creek - (n=26) Mitochondrial haplotypes all indicate *O. mykiss* maternal origin. Genetic distances within this sample set suggest a non-admixed population and suggest they are very closely related indicating redband origin or alternatively a complete replacement from a homogenized hatchery origin rainbow trout stock.

BR3 Bridge Creek - (n=24) Mitochondrial haplotypes all indicate *O. mykiss* maternal origin. Genetic distances within this sample set suggest a non-admixed population and suggest they are very closely related indicating redband origin or alternatively a complete replacement from a homogenized hatchery origin rainbow trout stock.

Summary: Overall, 60 samples examined from this location would indicate a low level of admixture. However, Only the first 10 samples show signs of introgression. This could be explained if the first 10 samples comprised a different spawning aggregate from the remaining samples (taken from 2 other locations). Significant, positive Fis values indicate the population is not in Hardy-Weinberg Equilibrium (HWE) at the two microsatellite loci. An observed excess of homozygotes within the Bridge Creek sample set suggests there may indeed be more than a single spawning population represented