ABSTRACT

The Umatilla River Basin Anadromous Fish Habitat Enhancement Project continued to identify impacted stream reaches throughout the Umatilla River Basin for habitat improvements during the 2000 project period. Public outreach efforts, biological and physical monitoring, and continued development of a Umatilla River Basin Watershed Assessment assisted the project in fostering public cooperation, targeting habitat deficiencies and determining habitat recovery measures.

Habitat enhancement projects continued to be maintained on 44 private properties, four riparian easements and one in-stream enhancement agreement were secured, two new projects implemented and two existing projects improved to enhance anadromous fish habitat and natural fisheries production capabilities in the Umatilla River Basin. New project locations included sites on the mid Umatilla River and Buckaroo Creek. Improvements were implemented at existing project sites on the upper Umatilla River and Wildhorse Creek. A stream bank stabilization project was implemented at approximately River Mile 37.4 Umatilla River to stabilize 760 feet of eroding stream bank and improve in-stream habitat diversity. Habitat enhancements at this site included construction of six rock barbs with one large conifer root wad incorporated into each barb, stinging approximately 10,000 native willow cuttings, planting 195 tubling willows and 1,800 basin wildrye grass plugs, and seeding 40 pounds of native grass seed. Staff time to assist in development of a subcontract and fence materials were provided to establish eight spring sites for off-stream watering and to protect wetlands within the Buckaroo Creek Watershed. A gravel bar was moved and incorporated into an adjacent point bar to reduce stream energy and stream channel confinement within the existing project area at River Mile 85 Umatilla River. Approximately 10,000 native willow cuttings were stung and trenched into the stream channel margins and stream banks, and 360 basin wildrye grass plugs planted and 190 pounds of native grass seed broadcast on terraces between River Mile 10 and 12.5 within the existing Wildhorse Creek Project Area. Approximately 70 pounds of native grasses were seeded in the existing McKay Creek Project Area at approximately River Mile 21.5. Financial and in-kind cost share assistance was provided by the Confederated Tribes of the Umatilla Indian Reservation, U.S. Bureau of Indian Affairs, U.S. Department of Agriculture, U.S. Fish and Wildlife Service, National Fish and Wildlife Federation and the Umatilla National Forest for the enhancements at River Mile 37.4 Umatilla River and within the Buckaroo Creek Watershed.

Monitoring continued to quantify effects of habitat enhancements in the upper basin. Maximum, minimum and average daily stream temperatures were collected from June through September at 22 sites. Suspended sediment samples were obtained at three gage stations to arrive at daily sediment load estimates. Photographs were taken at 94 existing and two newly established photo points to document habitat recovery.

Umatilla Basin Watershed Assessment efforts were continued under a subcontract with Washington State University. This endeavor involves compiling existing information, identifying data gaps, determining habitat-limiting factors and recommending actions to improve anadromous fisheries habitat. This watershed assessment document and working databases will be completed in fiscal year 2002 and made available to assist project personnel with sub-watershed prioritization of habitat needs.

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INTRODUCTION

The Umatilla River Basin Anadromous Fish Habitat Enhancement Project is funded with Bonneville Power Administration (BPA) funds and is consistent with the 1994 Northwest Power Planning Council's (NPPC) Columbia River Basin Fish and Wildlife Program, Section 7.6 – 7.8, which targets the improvement of water quality and restoration of riparian areas, and specifically the holding, spawning and rearing habitats of anadromous salmonids. This project is also compatible with the Habitat Strategies section of the 2000 NPPC Columbia River Basin Fish and Wildlife Program, in that emphasis in the basin will depend "heavily on protection of, and improvements to, inland habitat as the most effective means of restoring and sustaining fish and wildlife populations". Funding of this project provides partial mitigation for losses of salmon and steelhead (*Oncorhynchus spp.*) populations in the Columbia River Basin from the construction and operation of hydroelectric dams. This Umatilla River Basin Anadromous Fish Habitat Enhancement Project Annual Report covers work accomplished by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) from February 1, 2000 through January 31, 2001 as part of the Umatilla Basin Fisheries Restoration Program.

Significant effort and funds have been directed at restoration of anadromous fish in the Umatilla River Basin. This habitat project is one element in the comprehensive Umatilla Basin Fisheries Restoration Program which also includes artificial production, adult and juvenile passage improvements (ladders, screens, and trap and haul), instream flow enhancement, and monitoring and evaluation. Emphasis on watershed-wide habitat is needed for protection and enhancement of the natural production capabilities in the basin.

The primary problems continuing to impact water quality and limit available habitat and natural fisheries production capabilities in the Umatilla River Basin include: non-point source pollution due to poor cropland tillage and rotation practices, livestock overgrazing riparian and upland areas, over-appropriation of instream flows to irrigators, and stream channelization, constriction, and floodplain modification from agricultural and road/railroad building and maintenance activities.

The project focused on implementing cooperative instream and riparian habitat improvements on private lands on the Umatilla Indian Reservation (hereafter referred to as Reservation) from April 1, 1988 to March 31, 1992. These efforts resulted in enhancement of 7.45 river miles on lower Boston Canyon Creek, lower Meacham Creek and the upper Umatilla River in the vicinity of Gibbon, Oregon. In 1993, the project shifted emphasis and began to identify upland and riparian watershed-wide causative factors limiting anadromous fisheries habitat and natural fisheries production capabilities throughout the Umatilla River Basin. Riparian and instream enhancement projects continued and were expanded to include tributaries outside of Reservation Boundaries. An additional 8.65 river miles of fisheries habitat improvement projects have been implemented on private properties, both on and off the Reservation, since shifting to a more comprehensive approach. Additional projects have included habitat enhancements in the mid Umatilla River, upper Umatilla River, Meacham Creek, Mission Creek, Wildhorse Creek, Greasewood Creek, West Fork of Greasewood Creek, Spring Hollow Creek, Buckaroo Creek, Squaw Creek , McKay Creek, Moonshine Creek and Cottonwood Creek drainages. A total of 49 easements have been secured with private landowners since initial 1988 implementation efforts.

The project represents a continuation and evolution of existing efforts to improve natural production in the Umatilla River Basin. A watershed analysis is currently being developed to assist the project with prioritization of fisheries habitat needs and streamlining of project funds. The project complements fish passage and artificial production projects in the basin by integrating existing on-

the-ground management programs on private and public lands with restoration activities to better justify expenditure of funds and time. Biological and physical surveys, summaries of existing survey information and follow up surveys are coordinated with CTUIR's Umatilla Basin Natural Production Monitoring and Evaluation (UBNPME) Project. Remedial measures will be implemented to reduce or eliminate detrimental land use activities where possible. Continued operations and maintenance of existing enhancement projects are included under this integrated approach.

The restoration of anadromous fisheries resources in the Umatilla River Basin has been a coordinated effort between CTUIR, state and federal agencies, and the local community. Examples include the Umatilla River Basin Anadromous Fish Habitat Enhancement Project, the Umatilla River Subbasin Fish Habitat Improvement Project, the Umatilla Basin Project, the Umatilla Basin Watershed Council, the Umatilla River Subbasin Salmon and Steelhead Production Plan and development of the Umatilla Hatchery and associated artificial production plans. This coordination has continued and expanded through scoping groups, comprised of local land owners, sportsman clubs, special interest groups and resource agencies, formed to identify issues and develop creative solutions to land use problems in the basin.

DESCRIPTION OF PROJECT AREAS

The following CTUIR Habitat Enhancement Project Table illustrates enhancement project locations, number of stream miles enhanced, and number of landowner agreements secured in each drainage:

FIGURE 1. CTUIR HABITAT ENHANCEMENT PROJECT TABLE

STREAM	RIVER MILE LOCATIONS	NO. OF STREAM MILES ENHANCED	NO. OF LANDOWNER AGREEMENTS
Mid Umatilla River	37.3 – 37.4	0.1	1
Mid Umatilla River	43.0 – 46.5	3.0 miles to be improved in 2001	2
Upper Umatilla River	63.5	0.05 miles to be improved in 2001	1
Upper Umatilla River	78.5 – 85.0	3.2 (an additional 0.2 miles will be improved at RM 83 in 2001)	11
Lower Meacham Creek	0 - 4.5	4.5	15
Boston Canyon Creek	0 – 0.3	0.3	1
Wildhorse Creek	10.0 – 12.5	2.0	4
Greasewood Creek	0 – 1.5	1.5	2
West Fork of Greasewood Creek	0 – 0.3	0.3	2
Spring Hollow Creek	3.4 – 4.0	0.6	1
Mission Creek	2.9 – 3.3	0.4	1
Buckaroo Creek	1.0 – 2.6	1.6	6
Squaw Creek	0 (Tribal Property)	1.2	0 (Tribal Property)
McKay Creek	2	0.4	2
Moonshine Creek	@ 1.1	Passage Site	0
Cottonwood Creek	@ 1.3	Passage Site	0
Mission Creek	@ 1.3	Passage Site	0
TOTAL		16.1	49

The Umatilla River has a drainage basin of 2,290 square miles and is a tributary to the Columbia

River at RM 289. The principle aquifer is quaternary alluvium composed of unconsolidated sand and gravel, and some silt. Alluvium may reach a depth of up to 12 feet (Gonthier and Harris, 1977).

Meacham Creek is a major tributary to the Umatilla River, entering at RM 79. It drains approximately 165 square miles and produces 145,000 acre-feet annually at RM 5 near the top of the project area.

Boston Canyon Creek, entering Meacham Creek at RM 2.1, is the largest tributary to Meacham Creek within Reservation Boundaries. It contributes over 4,000 acre-feet annually to Meacham Creek from a drainage basin of approximately 5.5 square miles. It runs over and through large alluvial deposits as it enters the Meacham Creek floodplain.

Elevations in the upper Umatilla River, Meacham Creek and Boston Canyon Creek project areas range from 1,760 to 2,000 feet above sea level, giving the area an unusually long growing season. Stream gradient averages less than two percent. Flooding in project areas usually occurs in late winter and spring as a result of a rain on snow event. The flood peaks tend to be high and the volumes large, but the duration of damaging stages seldom last more than a day or two (U.S. Army Corps of Engineers, 1975).

The upper Umatilla River, Meacham Creek and Boston Canyon Creek project areas lie in a big game winter grazing zone as outlined by the CTUIR Land Development Code (1983). The primary land use is livestock grazing from May to November. Timber harvest is permissible under a conditional use permit. Major portions of these areas have been disconnected from their floodplains. Intensive land uses within floodplains have resulted in dramatic changes in waterway characteristics. Current and historical land use practices, including road and railroad construction and maintenance activities, overgrazing of riparian and upland areas and extensive timber harvests, have led to stream channelization, diking within floodplains, streambank riprapping and elimination of riparian vegetation. These practices have impacted fish habitat by altering natural channel form and function. Loss of stream channel meander from channelization and diking has accelerated runoff velocity due to an increase in surface gradient.

(insert information about the mid Umatilla River here)

Wildhorse Creek is a 34 mile intermittent tributary to the Umatilla River, entering at RM 55 in the city of Pendleton, Oregon. It drains approximately 190 square miles and produces 14,000 acre-feet annually at the mouth. The highest point on the drainage divide of the basin is at an altitude of about 3,800 feet (Gonthier and Harris, 1977). A steep headwater topography of 15 to 35 percent contributes to rapid runoff rates. The slope in the lower and mid reaches varies from 0 to 3 percent (USDA, Soil Conservation Service, 1988).

Riparian and water storage capabilities in the upper Wildhorse Creek Watershed have been impacted from past timber harvest practices. Mid and low elevation lands are characterized by dryland crop farming, livestock grazing and residential use. Poor land use practices have significantly impacted upland vegetation communities, reduced riparian vegetation, degraded water quality, and diminished water table elevations and instream flows. Lack of conservation farming practices, such as strip cropping, terrace systems and grass waterways, are common problems in mid and lower watershed areas. Overgrazing of livestock and absence of pasture rotation plans have contributed to poor water quality and loss of flood plain function. The communities of Athena and Adams, county and state highway departments and the Union Pacific Railroad have constrained the mainstem stream channel, resulting in downcutting, loss of flood plain function and

water quality impacts.

Greasewood Creek originates approximately 3.25 miles northwest of the town of Helix and flows southeast to enter Wildhorse Creek at RM 9.3, 0.5 miles downstream of Rothrock Road. The West Fork of Greasewood Creek originates 1.75 miles southwest of Helix and enters mainstem Greasewood Creek 1.5 miles upstream of the Wildhorse Creek confluence. The Greasewood Creek Watershed drains approximately 20,452 acres over a 33 square mile area. Annual precipitation ranges from 12 to 15 inches per year with 70% of this moisture being obtained during October through April. Stream flows in mid and upper watershed areas are intermittent during summer and early fall months. However, in the lower watershed, springs provide year-round flows to the Greasewood Creek and West Fork Greasewood Creek project areas. A study conducted by the Natural Resource Conservation Service (NRCS) estimated the ten year peak flow in the upper 9,650 acres of the watershed (upstream of State Highway 334) at 143 cfs (Ray Wilson, personal communication). Elevations in the watershed range from 1,800 feet above sea level in the headwaters to 1,400 feet above sea level at the confluence with Wildhorse Creek. Soils throughout the drainage are predominantly Walla Walla Series, consisting of deep, well-drained silt loams on 1 to 40 percent slopes.

NRCS personnel estimate that 98% of landuse in the Greasewood Creek Watershed is comprised of cropland practices, primarily winter wheat/summer fallow operations (Ray Wilson, personal communication). The deep soils in this drainage are considered to be some of the most productive agricultural soils in the Umatilla River Basin. However, lack of terraces, grass waterways and contour farming practices, failure to return crop residue to the soil and farming in highway right-of-way areas results in extensive erosion of top soils from steep slopes into roadside ditches and waterways. NRCS staff estimate as much as 130 tons/acre of top soil erodes annually from cropland fields in the Greasewood Creek Watershed (Bob Adelman, personal communication).

Spring Hollow Creek originates in sections 29, 26 and 23, T.3N., R.35E. in the northeast corner of the Reservation at elevations ranging from 2,166 feet (West Fork headwaters) to approximately 2,755 feet (East Fork headwaters) and flows northwest to empty into Wildhorse Creek at RM 13.7 at a 1,560 foot elevation upstream of Adams. The Spring Hollow Creek Watershed has a drainage basin of 18 square miles and supplies 1,500 acre-feet annually at its confluence with Wildhorse Creek (Gonthier and Harris, 1977). This system is one of the few streams originating on the Reservation which deliver year-round stream flows. Due to significant spring seepage throughout the drainage, stream temperatures commonly average between 60 and 68 degrees fahrenheit in lower stream reaches during late summer (see stream temperature graph B-7. in Appendix B of this report). Annual precipitation in the upper watershed varies from 18 to 25 inches, while precipitation at lower elevations ranges between 5 and 20 inches annually (USDA, Soil Conservation Service, 1988).

Non-irrigated annual crop farming, typically small grain-pea rotations, is the primary land use in the Spring Hollow Creek Watershed. According to the Soil Survey of Umatilla County Area, Oregon, many of the properties located within this drainage classify as "prime farmlands" because the silt loam soils present have the ability to sustain high crop yields with minimal inputs of energy and economic resources, and farming such soils results in the least damage to the environment (USDA, Soil Conservation Service, 1988). However, failure to leave crop residue, maintain tilth, chisel stubble, contour farm, and construct terraces, diversions and grass waterways in this drainage continue to result in extensive erosion of top soils during wet winter months. Grazing is the second most prevalent land use occurring in the watershed. The majority of grazing occurs within flood plain areas in lower stream reaches. High stocking rates, absence of pasture rotation plans and

failure to restrict grazing during wet periods results in compaction of soils, poor tilth and excessive runoff.

Mission Creek originates in the western slope foothills of the Blue Mountain Range at an elevation of about 3,560 feet and flows northwesterly to empty into the Umatilla River at approximately RM 61.5 at an elevation of about 1,270 feet. This watershed is located entirely within Reservation Boundaries and has a total acreage of approximately 3,100 acres. The Mission Creek Watershed is comprised of the following landuse practices: 1) 2,100 acres of rangeland, 2) 670 acres of winter wheat/summer fallow cropland, 3) 180 acres of Conservation Reserve Program (CRP) land, 4) 140 acres of abandoned cropland and 5) 10 acres of residential property. Average annual precipitation ranges from 16 to 24 inches with most of it falling between October and March as rain. Mission Creek is an intermittent stream with stream flows in the lower reaches and portions of the upper watershed going subsurface by mid-summer.

Conversion of historical, native plant communities to cropland and rangeland combined with realignment and shortening of lower stream channel reaches have altered the hydrologic capabilities of the Mission Creek Watershed, resulting in higher peak runoff rates during storm events, increased channel/streambank erosion and loss of fish and wildlife habitat. Limited portions of the mid watershed sustain year-round stream flows and provide excellent salmonid habitat. Lack of perennial stream flows and insufficient riparian cover are the primary factors limiting anadromous fisheries production in this system.

Buckaroo Creek is an intermittent stream, originating in the vicinity of Deadmans Pass in the Blue Mountains at an elevation of approximately 3,600 feet. This 15 square mile drainage area is located entirely within Reservation Boundaries and flows northeasterly to enter the Umatilla River at Thorn Hollow (approximately RM 73.2) at an elevation of about 1,600 feet. This tributary has an annual stream discharge of 4,000 acre-feet and an average daily discharge of 10 cfs at the mouth (Gonthier and Harris, 1977). Soils within the watershed tend to be a mixture of moderately deep, well drained silt loams and shallow, well drained Gwin cobbly silt loams. Forage tends to be limited by the high content of rock fragments and shallow depth to bedrock in the Gwin soils (USDA, Soil Conservation Service, 1988).

Livestock grazing is the primary land use in the Buckaroo Creek Watershed. This drainage is located within Bureau of Indian Affairs (BIA) Range Unit Six. This system continues to be overgrazed due to high stocking rates and extended grazing seasons. The CTUIR is currently coordinating with the BIA in development of a long-term range management plan to address these concerns. Historical land uses in the watershed included timber harvest and sheep grazing. Impacts from these long ago and current events include increased runoff rates, elevated stream temperatures (see stream temperature graphs B-14. and B-15. in Appendix B of this report), and diminished riparian and upland native vegetation communities.

The Squaw Creek Watershed is located approximately 18 miles east of Pendleton, Oregon. Squaw Creek originates in the western flank of the Blue Mountains in the vicinity of Emigrant Springs and flows approximately 12 miles northward to empty into the Umatilla River at approximately RM 76.7. Elevations range from approximately 4,200 feet in the headwaters to 1,670 feet at the mouth (U.S. Soil Conservation Service, 1991). This drainage has a total area of 24,198 acres with 18,398 acres (including approximately 608 acres owned by the Boise Cascade Corporation) lying within Reservation Boundaries. Approximately 1,800 acres lie within Umatilla National Forest Boundaries and an additional 4,000 acres lies on private property outside of Reservation Boundaries (including approximately 2,628 acres owned by the Boise Cascade Corporation).

Squaw Creek is an intermittent tributary with an annual stream discharge of 2,000 acre-feet (Gonthier and Harris, 1977). Average precipitation ranges from about 24 inches near the village of Meacham to 13 inches at the confluence with the Umatilla River (U.S. Soil Conservation Service, 1991). Stream gradient ranges from eight percent in the upper watershed to one percent at the mouth.

The riparian area has distinct storage and transport zones, but no well defined depositional zone, and presence of young, shrub seedlings is sparse. Soils within the watershed are highly variable. The stream bed on the lower five to six miles of Squaw Creek transports materials up to six inches in diameter, and the channel and stream banks are extremely unstable. Extensive areas of bed load and scour are apparent (U.S. Soil Conservation Service, 1991).

Land use practices in the Squaw Creek Watershed have primarily consisted of seasonal (May 1 through October 1) livestock grazing and timber harvest. This drainage is popular for recreational and subsistence hunting, and emphasis of these activities will likely increase with recent tribal land acquisitions.

The headwaters of McKay Creek are located within the Blue Mountains, and the drainage divide at its highest point near Kamela, Oregon is at an altitude of about 4,500 feet (Gonthier and Harris, 1977). Mckay Creek flows westward 38 miles to empty into the Umatilla River at approximately RM 51. This stream enters the southernmost portion of the Reservation at RM 23 and exits the West Reservation Boundary at RM 15. McKay Creek drains into the McKay Creek National Wildlife Refuge, which encompasses McKay Creek Reservoir, at approximately RM 10. McKay Creek exits the 1,200 surface acre reservoir (71,500 acre-feet) at Mckay Dam, an earth-fill structure with a reinforced concrete upstream slope, located at approximately RM 6 (U.S. Bureau of Reclamation, 2000). Average annual discharge (based on a period of record from 1930 to 1985) upstream of the reservoir is 103 cfs (Alexander et al., 1987).

Historically, it is likely that the McKay Creek Drainage supported abundant summer steelhead populations. Physical stream characteristics within the watershed are representative of preferred steelhead habitat. However, construction of 165-foot high McKay Dam from 1923 through 1927 would have permanently obstructed all anadromous fish passage. Today, Mckay Creek Reservoir, managed by the U.S. Bureau of Reclamation, provides habitat to various species of waterfowl, non-native warmwater fish and rainbow trout. Rainbow trout also occur within and upstream of McKay Reservoir.

Primary land uses within the Mckay Creek Watershed include, 1) home-site development, 2) livestock grazing of rangeland areas and irrigated pastures, 3) production of non-irrigated small grain crops, 4) production of irrigated crops, such as alfalfa hay and small grains, 5) timber harvesting in upper watershed areas, and 6) outdoor recreational opportunities, including fishing, hunting, boating and water skiing.

Development of homes, farm buildings and roads within the floodplain have resulted in straightened and confined stream channels throughout the mid and lower watershed. These construction activities along with McKay Creek Dam operations and water releases have increased stream velocities, increased in-stream gravel movement, and significantly reduced available fish and wildlife habitat in main stem McKay Creek. Failure to implement proper stocking rates, pasture rotation and deferred grazing plans, and restrictive grazing during wet periods throughout the drainage has compacted top soils, resulted in poor soil tilth and excessive runoff, impacted upland

and riparian native vegetation communities and degraded water quality. Cropland management practices, which conserve soil moisture and reduce wind and water erosion of soil surface layers, are not frequently utilized in lower watershed areas and need to be more widespread. Increased use of soil conservation practices, such as stubble-mulch tillage, limited seedbed preparation tillage, early fall seedings, contour farming, windbreak establishments and grass waterways, would improve riparian and upland conditions. Areas within the upper McKay Creek Watershed have been extensively logged, likely resulting in reduced ground water storage, decreased soil permeability and increased soil erosion rates.

McKay Dam was originally constructed to furnish a supplementary supply of water to Stanfield and Westland Irrigation Districts in the lower Umatilla River Basin (U.S. Bureau of Reclamation,2000). The Congressional Act of March 11, 1976 (90 Stat. 205, Public Law 94-288) reauthorized McKay Dam and Reservoir for the purposes of irrigation, flood control, fish and wildlife resources, recreation, and safety of dams (U.S. Bureau of Reclamation, 2000). The Act of October 28, 1988 (102 Stat. 2791, Public Law 100-557) was authorized for the purposes of mitigating losses to anadromous fishery resources and continuing water service to irrigation districts (U.S. Bureau of Reclamation,2000). This cooperative local, state, tribal and federal water exchange effort, known as the Umatilla Basin Project, has served to resolve potential conflict between fishery and irrigation needs in the Umatilla River Basin. The project delivers Columbia River water to three irrigation districts in exchange for leaving in-stream flows in the Umatilla River for anadromous fish passage and rearing. In addition, a large portion of space in Mckay Reservoir is devoted to in-stream flow augmentation (Heirs, 1996). While upper McKay Creek is inaccessible to anadromous fish, habitat enhancements in the McKay Creek Watershed are directed at improving water quality conditions for salmon and steelhead downstream in the Umatilla River.

Moonshine Creek is located entirely within Reservation Boundaries and originates in the vicinity of Emigrant Hill at an elevation of approximately 3,720 feet. This stream flows northwesterly to empty into the Umatilla River at approximately RM 67.2 at an elevation of about 1,400 feet. Moonshine Creek drains a total of approximately 5.5 square miles and contributes 2,480 acre-feet annually at RM 1.1 (a drainage area of 4.62 square miles) near the top of the passage improvement site (just upstream of Umatilla County Road 900 Box Culvert). Summer stream temperatures in the lower portion of this Umatilla River tributary generally range from 50 to 79 degrees fahrenheit (Shaw and Sexton, 1999 and stream temperature graph B-13. in Appendix B of this report.). A habitat survey conducted from the mouth to the stream forks (RM 4.4) in late August and early September of 1995 noted that 58% of the stream channel was dry and salmonid habitat was marginal (Contor et al., 1996). Other physical features characterized during this survey indicate that Moonshine Creek is primarily a single channel confined by high terraces, stream channel gradient averages 2.7%, the average wetted width to depth ratio is 8.9:1 in slow water habitat and 20.0:1 in riffles, the dominant riparian vegetation (51%) is comprised of various grasses, 27 surface springs occur in the lower 4.4 stream miles, and beaver dams are common in the lower watershed (Contor et al., 1996). Annual precipitation varies from 15 to 25 inches throughout the watershed (USDA, Soil Conservation Service, 1988).

The Cottonwood Creek Watershed is located on the Reservation immediately west of Moonshine Creek. Cottonwood Creek originates on Emigrant Hill in the western slope foothills of the Blue Mountain Range at elevations ranging from 3,400 feet (West Fork headwaters) to approximately 3,480 (East Fork headwaters) and flows northwest to enter the Umatilla River at approximately RM 65 at a 1,330 foot elevation. This stream drains an area of approximately 5 square miles and has an average annual discharge of 1,940 acre-feet at RM 1.3 (a drainage area of 4.01 square miles) near the top of the passage improvement site (just upstream of Umatilla County Road 900 Box Culvert).

Stream temperatures, recorded between June 20 and August 1, 1995, varied from 51 to 80.6 degrees fahrenheit (Contor et al., 1996). A habitat inventory conducted from the mouth to the stream forks (RM 4.1) during the summer of 1995 noted that 49.2 percent of the stream channel was dry and salmonid habitat was marginal (Contor et al., 1996). Other physical features documented during this survey indicate that 7 percent of Cottonwood Creek is comprised of secondary (braided) channels, high terraces and hill slopes are the most common landform, stream channel gradient averages 3.3 percent, the average wetted width to depth ratio is 8.9:1 in slow water areas and 20.8:1 in riffles, the dominant riparian vegetation (53 pecent) is comprised of various grasses, 23 surface springs were identified throughout the watershed, and beaver dams are common in lower stream reaches (Contor et al., 1996).

Soils throughout the Moonshine and Cottonwood Creek drainages are highly variable. Soils consist of deep and shallow, well-drained loams, including silt loams, silty clay loams, cobbly loams and gravelly silty clay loams. Slopes in these dranages range from 0 to 70 percent, have rapid runoff rates and potential water erosion hazard is high (USDA, Soil Conservation Service, 1988).

Vegetation found within the upper watersheds of these drainages includes elk sedge, pinegrass, mallow ninebark, princes pine and myrtle pachystima in the understory, and Douglas fir, ponderosa pine, grand fir and western larch in the overstory. Historically, these areas likely supported extensive communities of native grasses, such as bluebunch wheatgrass, sandberg bluegrass and Idaho fescue. Remnant populations of these grasses still occur, but have largely been out-competed by cheat grass and medusa head.

Primary land use practices in the Moonshine and Cottonwood Creek drainages include home-site development, livestock grazing (pastures and BIA Range Units Three and Six) and production of non-irrigated small grain crops. Several dwellings have been constructed within floodplains in the lower watersheds of these systems. These structures along with road developments have prevented lateral stream channel movement and disconnected portions of the streams from their floodplains. Road culverts, impeding fish passage in these watersheds, were addressed during the project period, and those improvements have been further described within this report. Decades of season – long grazing and poor livestock distribution has resulted in over utilization of native perennial grasses and establishment of nuisance annual grasses (primarily cheat grass and medusa head). Overgrazing has also contributed to reduced riparian canopy cover, eroding stream banks, exposed soil surfaces and increased runoff rates. The majority of farming in the Moonshine and Cottonwood Creek watersheds is a grain – fallow cropping system. Soil conservation practices need to be more widely applied to reduce runoff and control erosion in the lower watersheds. Conservation measures applicable to these watersheds include early fall seeding, stubble-mulch tillage and construction of terraces, grass filter strips and grass waterways.

A map of the mid Umatilla River, upper Umatilla River, Meacham Creek, Boston Canyon Creek, Wildhorse Creek, Greasewood Creek, West Fork of Greasewood Creek, Spring Hollow Creek, Mission Creek, Buckaroo Creek, Squaw Creek, McKay Creek, Moonshine Creek and Cottonwood Creek project areas is illustrated in Figure 2 on the following page.

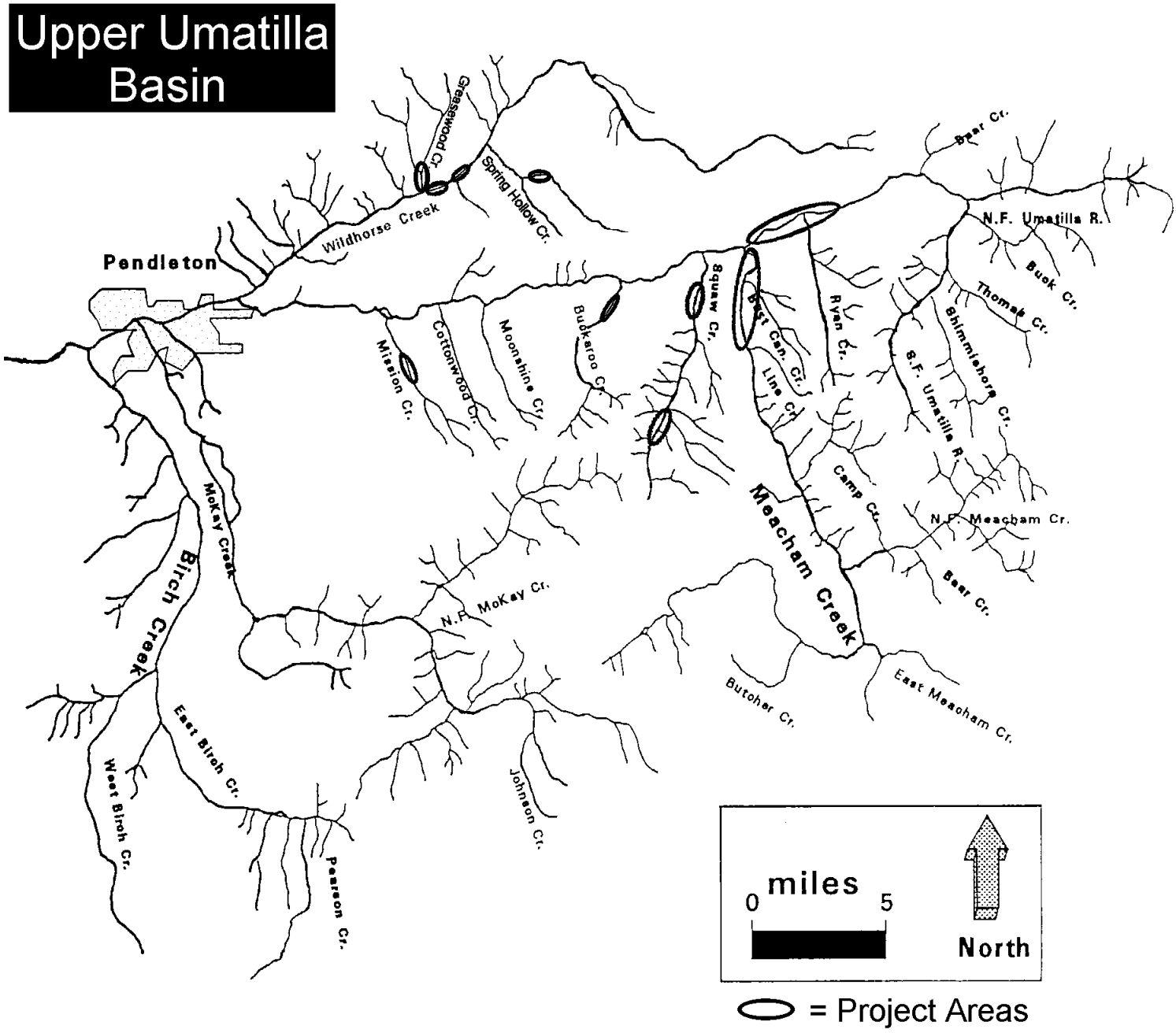


Figure 2. CTUIR Anadromous Fish Habitat Enhancement Project Vicinity Map

METHODS AND MATERIALS

Objective I. **Maintain and Continue Implementation of Habitat Enhancement Projects throughout the Umatilla River Watershed.**

1. Pre-construction Preparation:

a. Assess Maintenance Needs

The physical condition of habitat improvements are annually evaluated in existing project areas, following spring high flow events, to determine effectiveness and prescribe any maintenance to occur during the project funding period.

b. Project Cost Share

Cost share funds are obtained and combined with BPA funds for financial assistance. These efforts effectively forge partnerships between resource agencies and the public and allow BPA funds to go further.

c. Clearances and Land Owner Agreements

Various clearances and landowner agreements must be obtained before CTUIR can initiate habitat improvements on private properties.

The BIA requires a land survey of designated project area boundaries and the acquisition of right-of-way agreements on private-owned, Indian Allotments (trust lands), prior to pursuit of riparian easements.

Riparian Conservation Agreements restrict landowners from certain land use activities, such as grazing, removal of vegetation and use of weed or insect control measures, within enhanced riparian corridor areas. The term of the agreements is generally 15 years, and the landowner accepts the costs of all habitat improvements and CTUIR's maintenance of these improvements as consideration for participating in project recovery efforts. An attempt is made to address landowner needs (such as livestock water gaps, stream crossing sites, etc.) and incorporate these needs into the final agreement. Riparian easements protect habitat improvements and ensure an early recovery period within project areas.

Access, Implementation and Maintenance Agreements are obtained for projects strictly involving in-stream habitat enhancements. These agreements typically have a five-year term. As with the Riparian Conservation Agreements, the landowner accepts the costs of all habitat improvements and CTUIR's maintenance of these improvements as consideration for participating in project recovery efforts. The purpose of these projects is to improve stream bank stability and increase in-stream habitat diversity. The five-year term provides a period in which to monitor project recovery and perform any necessary maintenance to in-stream structures.

Other necessary clearances may include obtainment of permits from Umatilla County to construct habitat improvements within county road right-of-way areas or burning permits to burn noxious weeds within existing project areas. Considerable effort and coordination is

required to secure clearances and landowner agreements.

d. Fill and Removal Permits

Instream work activities on the Reservation require a CTUIR Tribal Stream Zone Alteration Permit and a U.S. Army Corps of Engineer's (COE) 404 Fill/Removal Permit. Instream work activities off of the Reservation generally require a General Authorization for Fish Habitat Enhancement Permit from the Oregon Division of State Lands (ODSL) in conjunction with a COE 404 Fill/Removal Permit. Applications for these permits should be completed and returned to the respective agencies a minimum of 90 days prior to anticipated instream work. Permitted instream work activities in the Umatilla River Basin are restricted to specific instream work periods. These instream work periods are based upon when migrating and spawning salmonids are least likely to be impacted by fill and removal activities. Work windows vary throughout the basin.

e. Endangered Species Act Requirements

The Columbia River population of bull trout (*Salvelinus confluentus*) and mid Columbia Evolutionary Significant Unit of summer steelhead (*Oncorhynchus mykiss*) are listed as threatened species under the federal Endangered Species Act (ESA). Any proposed instream work activities in areas within the Umatilla Basin, currently supporting these species or providing critical habitat for them, require ESA, Section 7 consultation when federal funding is utilized. Upon receiving a completed 404 Fill/Removal permit application, COE initiates Section 7 consultation proceedings with the appropriate federal agencies. The U.S. Fish and Wildlife Service (USFWS) is consulted for potential resident fish species (such as bull trout) impacts. The National Marine Fisheries Service (NMFS) is consulted for potential anadromous fish species (such as summer steelhead) impacts. Instream work in critical bull trout and summer steelhead habitat areas generally requires the project proponent to develop Biological Assessments (BA's) to determine the extent of impact, if any, from proposed habitat enhancements. BA's are reviewed by USFWS and NMFS, during consultation proceedings, and assist in determining if an instream project will occur, as proposed, or if modification is necessary to limit potential impacts. Consultation proceedings can considerably delay obtainment of instream permits.

f. Cultural/Archeological Monitoring

The project coordinates with CTUIR's Cultural Resource Protection Program (CRPP) at proposed habitat enhancement sites involving ground disturbance (high tensile fence construction, structures keyed into streambanks, etc.), prior to project implementation to obtain cultural clearances. CRPP Staff conduct file and literature searches, pedestrian surveys and/or archeological excavations to determine if cultural resources potentially eligible for inclusion to the National Register of Historic Places are present at proposed enhancement sites. Final reports, documenting their findings, are prepared and submitted to the BIA Umatilla Agency Real Property Management Office (for implementation efforts on the Reservation) and to the State Historic Preservation Office (for implementation efforts, both on and off the Reservation). CRPP Staff may also conduct on-site monitoring of projects during implementation at culturally sensitive locations. All cultural clearances are obtained in compliance with Section 106 of the National Historic Preservation Act.

g. Design and Layout

Design and layout of proposed projects consists of coordinating with the CTUIR Hydrologist to develop hydraulic designs, determining the quantity and type of materials required to build or repair fence and instream structures, and developing heavy equipment access sites, haul roads and boulder storage sites. Proposed fence lines, instream structure sites and stream bank areas are staked and flagged to provide assistance to subcontractors.

h. Contracts

Proposed implementation activities, requiring rental of operated heavy construction equipment, construction of fencing, and purchase and transport of rock or root wads, are advertised and pre-bid tours provided to potential subcontractors. Subcontracts are awarded to the lowest bidder.

Prior to commencement of a subcontract, the subcontractor meets with CTUIR Habitat Enhancement Project Personnel to discuss subcontract terms, work performance requirements, a work progress schedule, petroleum spill plans, and fire prevention and suppression plans. Notices to proceed are issued in writing to the subcontractor.

The subcontractor provides and maintains an inspection system acceptable to the CTUIR, covering the services under the subcontract. Complete records of all inspection work performed by the subcontractor are maintained and made available to the CTUIR during subcontract performance and for as long afterwards as the subcontract deems necessary.

Equipment is inspected at the work site at the time of delivery. All equipment must be in good working condition, free from excessive leaks in hydraulic, fuel and power systems and clean enough to allow close inspection of these systems. Any equipment that does not meet subcontract specifications and requirements is rejected.

CTUIR Habitat Enhancement Project Personnel monitor the subcontractor's progress and photo document various stages of project implementation.

i. Transect and Photo Point Establishment

Permanent transects are established at channel cross sections, prior to project implementation, to obtain baseline data regarding channel morphology and riparian vegetation. These measurements are repeated at three to five year intervals.

Permanent photo points are established prior to project implementation in conjunction with permanent transects. Standardized photos are taken each spring and autumn to provide a visual record of changes in channel morphology and riparian recovery.

2. Maintain and Implement Habitat Enhancements:

a. Instream and Stream Bank Improvements

Stream bank revetments, log and boulder weirs, log and boulder deflectors, rock veins and

grade control/sediment retention structures previously placed into the Umatilla River, Meacham Creek, Wildhorse Creek, Greasewood Creek, the West Fork of Greasewood Creek and Spring Hollow Creek project areas are repaired annually as needed. These structures are designed to increase instream habitat diversity, increase pool frequency, stabilize stream banks and stream channels, and recruit and deposit sediments onto stream banks to provide substrate for revegetation.

Newly proposed in-stream and stream bank project designs are determined and developed jointly by the CTUIR Hydrologist and CTUIR Habitat Enhancement Project Personnel. Project personnel place large woody debris into areas where natural wood recruitment and habitat diversity is low. Placement of large woody debris provides additional instream cover for salmonids and organic material for aquatic organisms to feed upon, and assists in rebuilding streambanks by slowing water velocities and capturing sediments. Hydrological controls (root wad and rock revetments, deflectors, veins, weirs, etc.) are used sparingly and restricted to stream reaches where benefits (grade control, sediment deposition, stream bank stability, growth of riparian vegetation and increased instream habitat) are immediate. More costly bio-engineering approaches are reserved for areas that will not recover in a timely or natural manner.

b. Livestock Exclusion and Riparian Corridor Fencing

Fencing is constructed to exclude livestock from floodplain and riparian areas. Livestock exclusion provides stream bank protection and allows vegetative recovery to occur within project areas.

Fences, gates and cross section fences in existing project areas are repaired by project personnel as needed. Frequent fence inspections are conducted to ensure continued exclusion of livestock and to allow for continued riparian recovery inside of project areas.

c. Revegetation

The CTUIR Habitat Enhancement Project utilizes heavy equipment and hand plants native riparian tree and shrub species along bank revetment structures, sediment retention structures and stream margins to improve bank stability, provide insect drop, shade streams and provide future recruitable large woody debris. Streambanks, terraces and disturbed sites within project areas are seeded with native grasses and/or close equivalents of native grasses to improve bank stability and to capture and retain sediments during high flow events.

Native plants are acclimated to the local climate, provide natural forage for wildlife and are much more resistant to the area's disease and insect problems. Studies have found that exotic species may out-compete and displace native riparian vegetation (Gordon et al., 1993). In addition to historical and present impacts of disturbance on riparian vegetation connectivity and diversity, plantings of exotic riparian vegetation (e.g. Russian olive) and the potential of hybrid poplar monocultures could disrupt riparian processes (Li, 1998). In Europe, plantations of exotic monocultures have replaced the natural diversity of riparian vegetation along stream banks of various watersheds (Cortes et al., 1994). This has changed the trophic structure of affected streams and influenced the input of terrestrial invertebrates that form the bulk of drifting prey for surface feeding fishes in headwater streams. The timing and quality of litter inputs from single species plantings or exotic

species may differ greatly from diverse systems and lead to reduced food resources for aquatic species (Li, 1998). There may also be concerns about pollution of the gene pool of existing plant populations when non-local plants are introduced to a site (Lambert et al., 1995).

Trees and shrubs planted in CTUIR Habitat Enhancement Project Areas are locally obtained, indigenous species grown out as bareroot stock or tublings. Native grass seed and close replicates of native grass seed are currently unavailable locally and continue to be purchased from various grass seed companies.

d. Noxious Weed Control

The CTUIR subcontracts Umatilla County Weed Control to chemically treat noxious weeds three times per year in existing project areas. Only the most invasive noxious weeds, identified as "A" Pest Weeds on Umatilla County's Noxious Weed List, are treated. All chemical applications are consistent with Oregon Revised Statute (ORS).570.505 and Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) Regulations.

When other noxious weed species are identified as detrimental to project success or are of special concern to the landowner, CTUIR Habitat Enhancement Project Personnel treat these weeds as needed.

3. Post-implementation Final Review:

CTUIR Habitat Enhancement Project Personnel visit implementation sites immediately following final construction as indicated by the subcontractor. Subcontracted services are inspected to determine whether they conform with subcontract requirements. If subcontract services are not acceptable, CTUIR may (1) require the subcontractor to perform the services again in conformity with contract requirements, (2) reduce the contract price to reflect the reduced value of services performed, (3) hire another subcontractor to perform the services and charge the original subcontractor any cost incurred by the CTUIR, or (4) terminate the contract for default.

Objective II. Continue Post-project Monitoring and Collect Baseline Data to Identify Habitat Limiting Factors and to Quantify Short and Long-Term Effects of Habitat Enhancement Activities in the Umatilla River Basin.

1. Transect Measurements and Photo Point Monitoring:

Transects and photo points established in the Umatilla River, Meacham Creek, Boston Canyon Creek, Wildhorse Creek, Greasewood Creek, West Fork of Greasewood Creek, Mission Creek, Spring Hollow Creek and Buckaroo Creek project areas during previous project periods continue to be monitored. Transect measurements are repeated at three to five year intervals following project implementation to measure changes in channel morphology and vegetative response to habitat enhancements.

Standardized photos are taken in spring and autumn to provide a visual record of changes in channel morphology and riparian recovery. A photo point notebook, containing 35 mm slides of annual changes, is maintained by the CTUIR Fisheries Habitat Enhancement Project.

2. Fish Habitat Surveys:

The CTUIR UBNPME Staff have conducted habitat surveys in conjunction with biological inventories in Umatilla River Basin Subwatersheds. These surveys have assisted the project in determining relations of anadromous fish habitat and abundance in different types of stream channels from a total basin perspective. CTUIR Habitat Enhancement Project Personnel utilize the summarized data to identify habitat deficient stream reaches within subwatersheds and attempt to focus habitat restoration efforts in these areas. When a recent habitat survey has not been conducted at a proposed enhancement site, project personnel sometimes physically survey the site prior to project implementation. All habitat surveys conducted by CTUIR are consistent with survey methodology developed by the Oregon Department of Fish and Wildlife (ODFW) Aquatic Inventory Program.

3. Biological Inventories:

Fisheries communities are good indicators of long-term effects and broad habitat conditions because they are relatively long-lived and mobile (Karr et al., 1986). However, the fish population at any location is influenced by activities throughout the stream length because fish use different habitats at various life stages and may migrate long distances (Bauer and Burton, 1993).

Project staff coordinate with CTUIR UBNPME Project Personnel to collect pre-project fish community data. Representative samples of fish species and size classes are collected with a backpack electrofisher in proposed project areas. A single pass with the electrofisher is made to evaluate community composition. All salmonids captured are counted, fork lengths measured and identified to species in the field. All other fish species numbers are visually estimated during sampling. Biological inventories are generally completed during the stable low flow period in mid-summer to avoid spawning migrations and seasonal fish movement (Karr et al., 1986).

Fish collection permits are required in the Umatilla River Basin because bull trout and summer steelhead are listed as threatened under the federal ESA. These permits specify sampling gear types and sampling periods. The UBNPME Project applies for and obtains all collection permits utilized by this project for fish sampling efforts.

Post-project biological inventories will occur in future project periods to assess fish utilization of instream enhancements and evaluate habitat recovery.

4. Aquatic Macroinvertebrate Sampling:

Macroinvertebrates are components of the aquatic environment that provide a connecting link in the food chain between multicelled periphyton, detritus from terrestrial sources and the fish population. As a food source they are essential to the growth and production of fish and, because of their strict habitat requirements, are very useful as indicators of changes in aquatic habitat (USDA, Forest Service, 1985). The diet of immature chinook salmon has been shown to be 95% insects, and immature coho salmon consume about 99% insects (Johnson and Ringler, 1980). Steelhead diets are largely insect as well (Johnson and Ringler, 1980).

Aquatic macroinvertebrate communities can reveal the quality of habitat components essential to aquatic fauna, such as water quality, substrate composition, riparian habitat quality, ecosystem stability, and past history (U.S. Bureau of Land Management, 1988). Aquatic macroinvertebrate communities are useful for monitoring biological integrity of streams since they function as integrators of pollution over time and are a direct measure of beneficial uses (aquatic life support) (Meyers, 1987). According to Schoen (1991), macroinvertebrates cover the whole range of pollution sensitivity, from highly sensitive stoneflies and mayflies down to very tolerant aquatic worms, so the presence or absence of particular taxonomic groups provides a good yardstick of pollution. Unlike fish, macroinvertebrates are relatively immobile. So, if macroinvertebrates are absent from their normal habitat, it is likely that pollution drove them out. In a healthy stream, one should find a balanced population consisting of many different kinds of organisms. Adverse chemical or physical changes that disrupt any part of the stream ecosystem often decrease community diversity. Macroinvertebrate populations usually recover more quickly than fish populations in response to water quality improvements and thus, appear to provide better subjects for assessing habitat recovery.

CTUIR Habitat Enhancement Project Personnel annually sample aquatic macroinvertebrate populations in the Mission Creek and Spring Hollow Creek drainages. Three 100-ft (30 m) stations were previously established in both drainages. Stations are located in stream reaches upstream (a control), within and downstream of habitat enhancement project areas. A total of nine macroinvertebrate samples are collected per stream. Three stratified, random macroinvertebrate samples are collected from riffles within each station with a Winget-Modified Surber Net to provide a measure of community representation and data for statistical analysis. The Winget-Modified Surber Net has been used as standard quantitative aquatic macroinvertebrate sampling equipment by the U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM) and other agencies since 1977. Compared to other sampling devices used for collecting aquatic macroinvertebrates, the Winget-Modified Surber Net is one of the most versatile and reliable for sampling, and the benthic communities collected can be used to assess existing current conditions in aquatic ecosystems (USFS Aquatic Ecosystem Lab, 1995). Physical habitat data collected in conjunction with aquatic macroinvertebrate surveys includes information regarding: stream gradient, depth, velocity, discharge, substrate types, and streambank vegetation. Water chemistry parameters measured at the time of the surveys includes: stream temperature, alkalinity, specific conductance, pH, sulfate, nitrate nitrogen, and orthophosphate concentrations. Aquatic macroinvertebrate samples and field support data are sent to the National Aquatic Monitoring Center at Utah State University in Logan, Utah. Macroinvertebrate sample results are then used to calculate biotic indices to assess stream health.

Biotic indices are calculated using the indicator taxa concept. Taxa are assigned water quality tolerance values based on their specific tolerances to pollution. Scores are typically weighted by taxa relative abundance. The most common biotic indices in use in the United States are the USFS Biotic Condition Index (BCI) and the Modified Hilsenhoff Biotic Index (HBI). The physical habitat characteristics and water chemistry parameters, measured at each station, are integrated into the macroinvertebrate analysis to determine the BCI. The USFS developed this index to provide a versatile monitoring tool for evaluating conditions in aquatic ecosystems and associated drainages. This index measures a stream against its own potential, not that of another stream, while integrating biological, physical habitat and water chemistry data. The HBI, an organic enrichment index based broadly upon family

taxonomy, is also calculated and can be used to detect nutrient enrichment, high sediment loads, low dissolved oxygen, and thermal impacts. The Shannon Diversity Index is the most widely used measure of diversity in community ecology and is defined by the relationship between the number of distinct taxa and their relative abundance.

Other data measures, calculated to assess stream health using aquatic macroinvertebrates, include:

- total abundance,
- Ephemeroptera, Plecoptera and Trichoptera (EPT) Taxa Richness,
- number of families,
- total taxa richness,
- Simpson Diversity Index,
- evenness,
- percent taxon or family dominance,
- percent of functional feeding groups.

Macroinvertebrate surveys will continue to be repeated at established stations in the Mission Creek and Spring Hollow Creek drainages at annual intervals. Macroinvertebrate data will provide an additional element in comparatively detecting trends over time to assist in determining habitat enhancement effectiveness.

4. Water Temperature Monitoring:

Ryan Tempmentor and Ryan RTM 2000 thermographs are deployed within selected stream reaches (see Figure 3 on following page) in the upper Umatilla River Watershed. Several of these instruments are installed upstream, downstream and/or within project areas in the Umatilla River, Meacham Creek, Wildhorse Creek, Greasewood Creek, Spring Hollow Creek, Mission Creek, Buckaroo Creek and Squaw Creek to monitor the effectiveness of habitat improvements on water temperature cooling. The remaining thermographs are installed in Moonshine Creek, Coonskin Creek, Little Buckaroo Creek, Eagle Creek, and at additional Umatilla River and Wildhorse Creek sites to obtain data on potential habitat limiting factors and existing water quality conditions.

Thermographs are deployed in May. All instruments are recovered and downloaded into a computer program in October. The thermographs collect one temperature reading per hour. Maximum, minimum and average daily water temperatures are compiled in tabular form. Water temperatures are graphed for warmer months (June, July, August and September) to determine if temperatures are reached which could prove detrimental to salmonids.

Figure 3. Thermograph Locations 2000 Project Period
Location
1. Umatilla River - RM 56 (West Reservation Boundary)
2. Umatilla River - RM 76.5 (downstream from mouth of Squaw Creek)
3. Umatilla River - RM 81.7 (USGS Gage Station No. 14020000)

4.	Wildhorse Creek – RM 0 (upstream from confluence with Umatilla River)
5.	Wildhorse Creek – RM 1.4 (Oregon Water Resources Gage)
6.	Wildhorse Creek – RM 9.5 (upstream from mouth of Greasewood Creek)
7.	Wildhorse Creek – RM 18.3 (at Pambrun Road Bridge)
8.	Wildhorse Creek – RM 26
9.	Greasewood Creek – RM 0.1 (upstream of confluence with Wildhorse Creek)
10.	Spring Hollow Creek - RM 3.5
11.	Eagle Creek - RM 0.2 (at Umatilla County Road 685 Bridge)
12.	Mission Creek - RM 1.25 (upstream of Umatilla County Road 900 Bridge)
13.	Mission Creek - RM 3.7 (upstream of St. Andrew's Church)
14.	Mission Creek - RM 3.8 (downstream of stream forks)
15.	Moonshine Creek – RM 1.1 (upstream of Umatilla County Road 900 Bridge)
16.	Coonskin Creek – RM 0.2 (upstream of Umatilla County Road 900 Bridge)
17.	Buckaroo Creek – RM 2
18.	Little Buckaroo Creek – RM 0.04 (upstream from confluence with Buckaroo Creek)
19.	Squaw Creek - RM 2
20.	Squaw Creek - RM 9 (at confluence with Little Squaw Creek)
21.	Meacham Creek – RM 2 (USGS Gage Station No. 14020300)
22.	Meacham Creek – RM 5.25 (East Reservation Boundary)

5. Suspended Sediment Monitoring:

Three Isco Model 2700 Wastewater Samplers are deployed to obtain estimates of suspended sediments. These sampling sites include RM 81.7 Umatilla River, RM 56 Umatilla River and RM 2 Meacham Creek. Sampling sites are located at U.S. Geological Survey Gage Stations (see Figure 4 below for gage station identification numbers) and near CTUIR thermographs.

Samples are taken year round at 6-hour intervals to create a composite daily sample. The samples are processed monthly by Umatilla National Forest Service Personnel at the USFS Lab in Pendleton, Oregon to determine Jackson Turbidity Units, conductivity, total suspended solids and total dissolved solids. CTUIR staff correlate suspended sediment data with stream flow data collected from the adjacent gage stations to arrive at daily sediment loads (tons/day) estimates.

Figure 4. Suspended Sediment Monitoring Sites 2000
Location
Umatilla River – RM 56 @ USGS Gage Station No. 14020850 (West Reservation Boundary)
Umatilla River – RM 81.7 @ USGS Gage Station No. 14020000 (East Reservation Boundary)
Meacham Creek - RM 2 @ USGS Gage Station No. 14020300

Objective III: Continue Watershed Planning, Scoping and Education Process by Identifying and Developing Creative Solutions to Land Use Problems Impacting Fisheries Habitat in the Umatilla River Basin.

1. Watershed Analysis:

The CTUIR has subcontracted Washington State University (WSU) to conduct and complete a watershed analysis of the Umatilla River Basin by fiscal year 2002. This document will assist in subwatershed prioritization of anadromous fisheries habitat needs and determination of future habitat improvements. A prioritization schedule for BPA funded fisheries habitat projects in the Umatilla Basin has not been developed since the Umatilla Drainage Fish Habitat Improvement Implementation Plan (ODFW, CTUIR and USFS, 1988) was produced in 1988. Many of the habitat enhancements recommended in that document are no longer biologically valid (in-stream hard structures, rip-rapping, etc). Furthermore, many of the habitat deficient areas, identified in the plan, have been addressed. Therefore, an updated watershed analysis is necessary to guide future project activities. The current watershed analysis will include historical watershed conditions, present-day watershed conditions, on-going land use practices, biological data, anadromous fish habitat limiting factors, and data gaps.

2. Community Outreach Efforts:

The project conducts local outreach efforts. Outreach activities are coordinated with landowners, special interest groups and resource agency personnel. These activities assist the project in obtaining public input and support, identifying detrimental land use practices, and developing site-specific habitat restoration and mitigation measures. Watershed improvement workshops, tours and presentations are provided to area residents, students, agency personnel and other interested individuals.

RESULTS AND DISCUSSION

Objective I. **Maintain and Continue Implementation of Habitat Enhancement Projects throughout the Umatilla River Watershed.**

1. Pre-construction Preparation:

a. Assess Maintenance Needs

The physical condition and structural integrity of improvements within the upper Umatilla River, Meacham Creek, Boston Canyon Creek, Wildhorse Creek, Greasewood Creek, West Fork of Greasewood Creek, Spring Hollow Creek, Mission Creek, Buckaroo Creek and Squaw Creek project areas were evaluated in spring 2000. It was determined that a gravel bar located within the existing project area on the south stream bank at RM 85 Umatilla River be moved and incorporated into an adjacent point bar to reduce stream energy and stream channel confinement. Due to past poor survival of bareroot and tubling trees, project personnel determined that it would be beneficial to sting native willow cuttings into the stream channel margins and stream banks throughout the length of the Wildhorse Creek Project Area. Project personnel accomplished minor fence maintenance in project areas during the project period.

b. Project Cost Share

A total of $43,250 in CTUIR funds was secured to cover personnel salaries, fringe benefits and associated overhead expenses. BPA monies funded an additional $190,019 in salary, fringe benefit and overhead expense needs.

The U.S. Department of Agriculture's (USDA) Environmental Quality Incentive Program (EQIP) provided $41,330 in funds for wetland protection and development of eight off-stream spring developments in the Buckaroo Creek Watershed. CTUIR provided an additional $26,368 in funds towards this effort. Approximately $7,035 in BPA monies was utilized to provide staff support for development of a spring-site construction subcontract and for purchase of fence materials. The purpose of this project is to protect existing wetland areas from livestock damage and to better distribute livestock within the Buckaroo Creek Watershed.

Approximately $10,460 in BIA funds was cost shared with $13,747 in BPA project dollars to assist with noxious weed treatments on Reservation Indian Allotments, vehicle leases and insurance, and personnel training opportunities.

The USFWS provided a $5,000 Partners for Wildlife Grant and the National Fish and Wildlife Federation provided a $10,000 grant to assist with equipment subcontract costs on the Kent Beebe Stream Bank Stabilization Project at RM 37.4 Umatilla River. The Umatilla National Forest provided five conifer root wads, worth approximately $1,500 in value, for keying into rock barbs at this site. Approximately $1,980 to cover salaries for survey, lay out and design support for this project was provided by NRCS. The Umatilla County Farm Services Agency (FSA) provided $2,427 and the state of Oregon provided $1214 under the Conservation Reserve Enhancement Program (CREP) to extend restoration efforts into the Umatilla River floodplain. The landowner supplied $1211 in funds towards this project and shall receive an additional $1940 future program incentive payment under CREP for participating in conservation practices. An additional $19,860 in BPA project monies were utilized to cost share equipment subcontract expenses and fund construction materials (rock, native trees, and native grass plugs and seed), CTUIR Personnel salaries, fringe benefits and associated overhead costs.

The Oregon Department of Transportation (ODOT) replaced a bridge near the confluence of Greasewood Creek in 1999. As a result of this project, ODOT obligated $5,400 in off-site mitigation dollars to CTUIR in 2000 for future cost share on habitat restoration projects throughout the Umatilla Basin.

Washington School fifth grade students provided in-kind, tree planting services in the Spring Hollow Creek Project Area. Project staff time to obtain native willow cuttings was funded with BPA project monies.

A 1.8 million dollar mitigation trust fund has been finalized between the Union Pacific Railroad, ODFW and CTUIR. This funding will provide future habitat enhancement cost share opportunities within the Meacham Creek Watershed.

CTUIR prepared and submitted a grant application, requesting $15,000, to the U.S. Department of Commerce's National Oceanic Atmospheric Administration (NOAA) to purchase and replace a culvert on Mission Creek. If these dollars are secured, they will be cost shared with BPA funds and implemented during fiscal year 2001. A $5,500 Species Recovery Fund Grant Application was submitted to the National Wildlife Federation to assist with this culvert replacement project. These funds were not obtained.

c. Clearances and Land Owner Agreements

A five year Access, Implementation and Maintenance Agreement was entered into on June 26, 2000 between CTUIR and Kent Beebe. This property is located at approximately RM 37.4 Umatilla River. The purpose of this project is to stabilize 760 feet of eroding stream bank and improve in-stream habitat diversity.

CTUIR secured two riparian easements on the mid Umatilla River during the project period. Both fifteen-year agreements were entered into with Bill Wolfe Ranches Inc. on December 26, 2000 to restrict livestock from approximately 103 acres of the floodplain between RM 43.0 and RM 46.5 and promote passive habitat recovery.

Two additional riparian easements were obtained on the upper Umatilla River. A perpetual agreement was entered into on June 1, 2000 to implement riparian and in-stream improvements at the mouth of Mission Creek at approximately RM 63.5. This property is owned by Emma Stroud, George and Rochelle Peck, Dixie Ruchmann and Tonya Wojak and is located within Reservation Boundaries. Habitat enhancements proposed at this site will be implemented during fiscal year 2001. A fifteen-year riparian easement was secured with Tommy Hartman on July 27, 2000 for a property located at approximately RM 83 Umatilla River. Stream bank stabilization and in-stream habitat improvements will be implemented at this location in fiscal year 200l.

A Umatilla County Burning Permit was acquired to implement a controlled burn within the Wildhorse Creek Project Area to remove extensive areas of noxious weeds.

d. Fill and Removal Permits

The CTUIR Habitat Enhancement Project submitted a Joint Permit Application to the COE and ODSL for construction of six rock barbs with one large conifer root wad incorporated

into each barb and stinging of approximately 10,000 native willow cuttings along 760 feet of eroding stream bank at approximately RM 37.4 Umatilla River. The COE issued a Nationwide Permit Number 27 on July 3, 2000, and ODSL granted a Special Permit on July 24, 2000 authorizing implementation of this project.

A Joint Permit Application was submitted to COE and DSL for stinging and trenching native willow cuttings into stream banks and channel margins throughout the existing Wildhorse Creek Project Area between RM 10.0 and 12.5. ODSL granted these fill and removal activities under a General Authorization for Erosion Control Permit on July 20, 2000, and the COE approved this in-stream work under a Nationwide Permit Number 27 on July 25, 2000.

A CTUIR Tribal Stream Zone Alteration Permit Application was submitted to the CTUIR Department of Natural Resources - Water Resources Program to stabilize 242 feet of the south stream bank of the Umatilla River at RM 63.5. This project will be implemented during fiscal year 200l and shall include eight root wad revetments and three J-hook veins to halt erosion and provide in-stream habitat diversity. A Tribal Stream Zone Alteration Permit was issued for this work on September 12, 2000.

A gravel bar located on the south stream bank within the existing project area at RM 85 Umatilla River was moved and incorporated into an adjacent point bar to reduce stream energy and stream channel confinement. Initial implementation activities occurred at this site during the 1999 project period and relocation of gravels was permitted under previously issued COE and ODSL fill and removal permits.

The CTUIR Department of Natural Resources – Environmental Protection/Rights Protection (EPRP) Staff submitted Tribal Stream Zone Alteration Permit Applications and obtained necessary permits for development of eight spring sites within the Buckaroo Creek Watershed.

e. Endangered Species Act Requirements

CTUIR Habitat Enhancement Project Staff prepared BA's in conjunction with fill and removal permit applications for proposed stream bank stabilization projects at RM 37.4 and RM 63.5 Umatilla River and native willow reestablishment efforts between RM 10.0 and 12.5 Wildhorse Creek. Populations of ESA listed Columbia River bull trout and mid Columbia Evolutionary Significant Unit of summer steelhead occur at various life stages throughout the Umatilla Basin. All BA's indicated that potential project impacts to these fish populations would be negligible. BA's were submitted to BPA, whom forwarded this information onto the USFWS and NMFS to initiate ESA, Section 7 consultation proceedings for proposed in-stream project activities.

The USFWS and NMFS concurred that proposed project activities would not likely adversely affect ESA listed fish species or their habitats for the Kent Beebe Stream Bank Stabilization Project at RM 37.4 Umatilla River and Wildhorse Creek RM 10.0 through 12.5 revegetation efforts. Delays from NMFS in reviewing proposed implementation activities, nearly resulted in the Kent Beebe Stream Bank Stabilization Project not being implemented within the project period. ESA clearances were not received for the proposed stream bank stabilization project at RM 63.5 Umatilla River during the project period. This project will be implemented in fiscal year 2001.

f. Cultural/Archeological Monitoring

The CTUIR CRPP conducted a file and literature search and a 760-foot by 100-foot pedestrian cultural resource reconnaissance survey on the Kent Beebe property at RM 37.4 Umatilla River in July 2000. The file and literature search determined that little previous archeological work had been performed in the project vicinity. CTUIR CRPP Staff surveyed the proposed project site in 66-foot transects east along the Umatilla River shoreline covering a total area of approximately 131,230 square feet, on July 11, 2000. The remnants of two vehicles were observed along the shoreline. No other cultural resources were found at the site. CRPP prepared a report, documenting their findings, and submitted it to the State Historic Preservation Office. Due to potential subsurface archeological resources, a cultural resource monitor was present on the site during ground disturbing activities. The cultural resource monitor's salary was funded with project monies. No subsurface archeological resources were discovered during excavation.

The project funded a cultural resource monitor's salary to observe ground disturbances when developing spring sites within the Buckaroo Creek Watershed.

g. Design and Layout

A NRCS Civil Engineer developed hydraulic designs for six rock barb/conifer root wad combination structures to stabilize 760 feet of eroding stream bank on the Kent Beebe property at RM 37.4 Umatilla River. Proposed structure sites were staked prior to project implementation. The CTUIR hydrologist developed hydraulic designs for eight root wad revetments and three J-hook veins to address 242 feet of stream bank erosion and provide in-stream habitat diversity on the south stream bank of the Umatilla River at RM 63.5. This project will be implemented during fiscal year 200l.

h. Contracts

CTUIR Habitat Enhancement Project Personnel met with subcontractors, prior to proposed project implementations, to discuss subcontract terms and work performance requirements, work progress schedules, petroleum spill plans, and fire prevention and suppression plans.

An $880 professional services agreement was awarded to A. Key Excavating on August 6, 2000 to move a gravel bar and incorporate the gravel and cobble materials into an adjacent point bar in the RM 85 Umatilla River Project Area. A D-7 bull dozer was inspected at the site by CTUIR Habitat Enhancement Project Personnel and determined to be in good working order, free from excessive leaks in hydraulic, fuel and power systems. Initial implementation activities occurred at this site during the 1999 project period.

A 14 day operated heavy equipment subcontract was awarded to D.P.M. Enterprises on September 12, 2000 to provide and transport 750 yards of rock, slope 760 feet of eroding stream bank, bury approximately 180 feet of irrigation pipe, construct six rock barbs, incorporate five root wads with attached boles into rock barbs, sting in native willows and participate in a bioengineering workshop at RM 37.4 Umatilla River. This contractor was terminated from this $24,650 subcontract for default on September 29, 2000. D.P.M. Enterprises' subcontractor was reimbursed $14,000 for provision and transport of 750 yards of rock. D.P.M. Enterprises failed to compensate CTUIR and BPA $2,100 in incurred debt for non-compliance with required contract services. A $10,800 subcontract was issued to

Kim Strickland on October 5, 2001 for completion of contract services at this site. An excavator was inspected by project personnel and determined to be in good working order, free from excessive leaks in hydraulic, fuel and power systems. Project personnel obtained all plant materials and assisted with planting efforts. All services were completed satisfactorily.

Kim Strickland entered into a $2,681 subcontract on October 18, 2000 to sting and trench approximately 10,000 native willows into stream channel margins and stream banks between RM 10 and RM 12.5 in the Wildhorse Creek Project Area. Project personnel inspected an excavator prior to project implementation and determined that it was adequately operating and free of leaks. Project personnel were responsible for obtaining willow cuttings and assisting with their planting. All subcontract services were completed adequately.

A $2,174 professional services agreement for moving and stockpiling rock at the RM 37.4 Umatilla River Project Area and a $4,555 professional services agreement for transporting rock to the proposed RM 63.5 Umatilla River Project Area were awarded to Kim Strickland in October and November 2000.

A $5,445 root wad purchase and delivery subcontract was awarded to W-4 Construction, Inc. for provision and transport of 22 conifers. Footer logs and conifer boles with attached root wads, delivered under this subcontract, will be utilized for the proposed fiscal year 2001 stream bank stabilization project at RM 63.5 Umatilla River.

Umatilla County Weed Control was subcontracted to eradicate noxious weeds in approximately 16 miles of stream corridor within existing project areas. A total of $3,027 in project funds was cost shared with BIA dollars to treat noxious weeds.

i. Transect and Photo Point Establishment

Prior to project implementation, two new photo points were established at the RM 37.4 Umatilla River Project Area. Slides will continue to be taken annually to provide a visual record of changes in riparian vegetative recovery.

No new transects were established during the 2000 project period.

2. Maintain and Implement Habitat Enhancements:

a. Instream and Stream Bank Improvements

A gravel bar was removed from the south stream bank within the existing RM 85 Umatilla River Project Area and incorporated into an adjacent point bar to reduce stream energy and stream channel confinement. Initial implementation activities occurred at this site during the 1999 project period.

A project was implemented in September and October 2000 on the Kent Beebe property at RM 37.4 Umatilla River to stabilize 760 feet of eroding stream bank and improve instream habitat diversity. This project included burying approximately 180 feet of irrigation pipe, sloping the stream bank, constructing six rock barbs, incorporating five root wads with attached boles into rock barbs and stinging in approximately 10,000 native willows cuttings.

A total of 750 cubic yards of 24 to 46-inch diameter rock was transported to the project site and utilized in construction of the barbs. Five large conifer root wads, 18 to 30 inches in diameter at breast height (dbh), with 18 to 20 foot attached boles were donated and delivered to the site by the Umatilla National Forest and incorporated into the rock barbs. Native willow cuttings were collected and transported to the site by project personnel.

A native revegetation project was implemented in October 2000 on the S&M Farming Company, Sam Haynes, Frances Myers, and John Adams, Inc. properties between RM 10 and RM 12.5 within the existing Wildhorse Creek Project Area. This project involved stinging and trenching approximately 10, 000 native willow cuttings into stream channel margins and stream banks. Project personnel obtained willow cuttings and assisted the equipment contractor with planting them.

b. Livestock Exclusion and Riparian Corridor Fencing

No new fencing was constructed under the project in fiscal year 2000. The CTUIR Habitat Enhancement Project provided fence materials to the CTUIR Department of Natural Resources – EPRP Staff to fence off eight new spring developments and protect wetland areas within the Buckaroo Creek Watershed. This project is located entirely within Reservation Boundaries and was implemented to restrict livestock within BIA Range Unit Six from concentrating in riparian areas during the grazing season.

Minor fence repairs and water gap maintenance were performed by CTUIR Habitat Enhancement Project Personnel in the Umatilla River, Meacham Creek, Boston Canyon Creek, Mission Creek, Wildhorse Creek, Greasewood Creek, West Fork of Greasewood Creek, Spring Hollow Creek, Buckaroo Creek, Squaw Creek and McKay Creek project areas.

c. Revegetation

The CTUIR Habitat Enhancement Project Staff planted approximately 20,195 various native willow species (*Salix spp.*) during the project period. Trees planted included cuttings and tublings. These were planted at the RM 37.4 Umatilla River Project Area during initial project implementation and between RM 10 and 12.5 in the existing Wildhorse Creek Project Area. Washington School and Hawthorne School fifth grade students planted approximately 1,000 willow cuttings in the Spring Hollow Creek Project Area. All plant source materials were locally obtained from within the Umatilla River Basin.

Stream banks and terraces, disturbed from 2000 implementation activities within the mid Umatilla River and Wildhorse Creek project areas, and a meadow within the McKay Creek Project Area were seeded with a total of 300 pounds of native bunch grasses or native grass/legume equivalents. A total of 2,160 basin wildrye grass (*Elymus cinereus*) plugs were planted in the mid Umatilla River and Wildhorse Creek project areas.

The grass seed utilized within the mid Umatilla River Project Area was comprised of a 40 pound mixture which included 25% sherman big bluegrass (*Poa ampla*), 25% critania thickspike wheatgrass (*Agropyron dasystachyum*), 25% whitmar beardless wheatgrass (*Agropyrun inerme*) and 25% magnar basin wildrye (*Elymus cinereus).* A 190 pound mixture containing 41.6% rosana western wheatgrass (*Agropyron smithii*), 25% sand dropseed (*Sporobolus cryptandrus*), 16.7% magnar basin wild rye and 16.7% sherman big

bluegrass was used in the Wildhorse Creek Project Area. Seventy pounds of this seed mixture was also utilized within the McKay Creek Project Area. Thirty hundred and sixty basin wildrye grass plugs were planted within the Wildhorse Creek Project Area. An additional 800 grass plugs were planted at RM 37.4 in the Mid Umatilla River Project Area. Seeding of native grasses and native grass equivalents assists with stream channel stabilization and sediment filtering during high flow periods.

d. Noxious Weed Control

Umatilla County Weed Control chemically treated "A" Pest Weeds, as identified on Umatilla County's Noxious Weed List, within all existing project areas. Three chemical treatments were applied over approximately 13 stream miles of project areas throughout the 2000 growing season.

BIA - Umatilla Agency Range Management Staff coordinated with the project to address noxious weeds in upland watershed areas on the Reservation, including Meacham Creek, Squaw Creek, Buckaroo Creek and Mission Creek. .

All chemical applications were consistent with ORS.570.505 and FIFRA Regulations.

3. Post-implementation Final Review:

All subcontractors maintained a daily log and work progress schedule.

CTUIR Habitat Enhancement Project Personnel inspected all habitat improvements, including instream and bank stabilization structures, sloped stream banks, irrigation pipe and trees, at RM 37.4 Umatilla River and within the Wildhorse Creek Project area immediately following project implementation.

Project personnel inspected all rock, root wads, logs and trees, prior to purchase and delivery to RM 37.4 and RM 63.5 Umatilla River, to ensure subcontract conformity.

Umatilla County Weed Control provided an annual description and summary of all noxious weeds identified and treated in project areas. Project personnel coordinated closely with Umatilla County Weed Control and individual landowners to assure that nuisance weeds were adequately identified and eradicated.

D.P.M. Enterprises was terminated from an operated equipment subcontract on the Kent Beebe Stream Bank Stabilization Project at RM 37.4 Umatilla River for failure to comply with required subcontract services. All other subcontract services, implemented during the project period, met subcontract requirements and were completed in a satisfactory and timely manner. CTUIR Habitat Enhancement Project Personnel photo documented various stages of project implementations.

Objective II. Continue Post-project Monitoring and Collect Baseline Data to Identify Habitat Limiting Factors and to Quantify Short and Long-Term Effects of Habitat Enhancement Activities in the Umatilla River Basin.

1. Transect Measurements and Photo Point Monitoring:

No new stream channel cross sections were established or measurements repeated at existing transect sites during the 2000 project period. Cross sections will continue to be measured as time allows.

Slides were taken during spring and fall of 2000 at 94 existing and two newly established photo point locations. Photo points are located within the Umatilla River, Meacham Creek, Boston Canyon Creek, Wildhorse Creek, Greasewood Creek, West Fork of Greasewood Creek, Spring Hollow Creek, Mission Creek, Buckaroo Creek, McKay Creek, Moonshine Creek and Cottonwood Creek project areas. Slides obtained, document project recovery and provide a visual record of annual changes within riparian and floodplain areas. Photographs indicate an upward, downward, or static trend in woody vegetation, streambank stability and cover (Meyers, 1987). However, initial vegetation "expression", obvious in photographs, should not be confused with vegetation "succession" required for stream ecosystem health (Elmore and Beschta, 1987).

2. Fish Habitat Surveys:

No habitat surveys were conducted during the 2000 project period. Habitat surveys were previously conducted on the mid Umatilla River (Contor, et al.,1996) by the CTUIR UBNPME Staff. Refer to the **DESCRIPTION OF PROJECT AREAS** section of this report to view more complete descriptions of habitat conditions within the Umatilla Basin. Major flood events occurred in the fall of 1995 and winter of 1996 after streams were surveyed. These high flow events likely altered some physical characteristics, previously identified and described from the habitat surveys.

3. Biological Inventories:

No biological inventories were conducted under the project during fiscal year 2000. The CTUIR UBNPME Staff conducted spawning surveys and biological inventories in the vicinity of the RM 37.4 Umatilla River Project Area in (what years?). This information can be viewed in (which annual reports?).

4. Aquatic Macroinvertebrate Sampling:

No macroinvertebrate samples were collected under the project in 2000. Delays in obtaining ESA clearances, resulted in project personnel focusing on in-stream implementation activities during the designated September sampling period.

Aquatic macroinvertebrate monitoring will resume at existing sampling sites in future project years. Site-specific aquatic macroinvertebrate data shall assist in assessment and improvement of aquatic habitat and water quality within a given stream reach. Information obtained from aquatic macroinvertebrate surveys should prove useful in showing the effects of physical and water chemistry influences (i.e. habitat improvements) within project areas over time.

4. Water Temperature Monitoring:

Temperatures in excess of 65°F impair growth and survival in salmonids (USFWS and National Marine Fisheries Service, 1981). Abnormally high temperature conditions during migration can contribute to outbreaks of disease among adult chinook salmon often

resulting in pre-spawning mortality. Temperatures in excess of 68°F have been shown to result in impairment of chinook salmon. High stream temperatures may also stress juvenile steelhead during warm summer months. Temperatures exceeding 73°F result in direct mortality to chinook salmon and steelhead (*Oncorhynchus mykiss*) (Bell, 1984).

Thermographs were deployed at 22 locations throughout the upper Umatilla River Basin (see Figure 3., page 20 for locations). Stream temperature data was summarized into tabular form, illustrating maximum, average and minimum daily Celsius and Fahrenheit temperatures during thermograph deployment periods. A binder containing water temperature tables is maintained in the CTUIR Habitat Enhancement Project Office. Summer (June, July, August and September) stream temperatures were graphed to determine if temperatures exceeded limits detrimental to anadromous salmonids. Graphed data can be viewed in Appendix B.

The thermograph deployed at RM 76.5 Umatilla River was discovered out of water resulting in loss of data from June to June 1999. The thermograph at RM 26 Wildhorse Creek malfunctioned, and 1999 temperature data was unrecoverable for this site.

Figure . illustrates the total number of days average and maximum stream temperatures exceeded 65°F, 70°F, 75°F and 80°F between June 1 and September 30, 1999 at thermograph deployment sites. Due to the problems mentioned in the previous paragraph, data from two sites could not be summarized, as is indicated in Figure .

Figure 5. Number of Days Average and Maximum Stream Temperatures Exceeded 65, 70, 75 and 80 Degrees Fahrenheit from June 1 - September 30, 2000

Thermograph Location	Number of days temp > 65°F		Number of days temp > 70°F		Number of days temp > 75°F		Number of days temp > 80°F	
	Avg Temp	Max Temp	Avg Temp	Max Temp	Avg Temp	Max Temp	Avg Temp	Max Temp
Umatilla River (RM 56.0)	No data		No data		No data		No data	
Umatilla River (RM 76.5)	52	93	6	70	0	27	0	0
Umatilla River (RM 81.7)	18	69	0	35	0	0	0	0
Wildhorse Creek	95	110	51	95	20	63	0	38

(RM 0.0)								
Wildhorse Creek (RM 9.5)	Incomplete data set		Incomplete data set		Incomplete data set		Incomplete data set	
Wildhorse Creek (RM 26.0)	17	75	0	21	0	0	0	0
Greasewood Creek (RM 0.1)	56	97	19	52	0	20	0	0
Eagle Creek (RM 0.20)	Incomplete data set		Incomplete data set		Incomplete data set		Incomplete data set	
Spring Hollow Creek (RM 3.5)	33	68	4	23	0	2	0	0
Mission Creek (RM 1.25)	0	3	0	0	0	0	0	0
Mission Creek (RM 3.7)	0	5	0	0	0	0	0	0
Mission Creek (RM 3.8)	0	38	0	1	0	0	0	0
Moonshine Creek (RM 1.1)	53	86	5	61	0	19	0	0
Coonskin Creek (RM 0.2)	2	29	0	0	0	0	0	0
Buckaroo Creek (RM 2.0)	53	98	16	79	0	47	0	19
Little Buckaroo Creek (RM 0.04)	3	94	0	52	0	30	0	20
Squaw Creek (RM 2.0)	37	105	0	75	0	34	0	0
Squaw Creek (RM 9.0)	29	89	0	68	0	26	0	2
Meacham Creek (RM 2.0)	No data		No data		No data		No data	
Meacham Creek (RM 5.25)	31	94	0	70	0	24	0	0

Mission Creek and Coonskin Creek exhibited the temperatures most conducive for salmonid survival and rearing. However, a habitat inventory conducted by CTUIR UBNPME Staff during the summer of 1995 documented that 77% of Mission Creek was dry by late summer (Contor, et al., 1996). The CTUIR discovered mean salmonid densities in Mission Creek to be 0.0931 fish/m^2 and 0.3200 fish/m^2 in Coonskin Creek (Contor, et al. 1996).

Stream temperatures in Spring Hollow Creek were more than adequate for salmonid utilization. However, extensive erosion of soils from cropland fields within this drainage appears to restrict salmonid production in Spring Hollow Creek. Shaw (1996,1997and 1998) also found high sulfate levels in this system. Average summer stream temperatures within Moonshine Creek and Squaw Creek proved sufficient for fish, but intermittent stream flows limit available fish habitat within these tributaries during summer months.

Stream temperatures averaged eight to ten degrees Fahrenheit cooler within the lower Wildhorse Creek Project Area at RM 9.5 in the summers of 1998 and 1999 than during previous summers. The CTUIR Habitat Enhancement Project has monitored temperatures at this site since the summer of 1995. Temperature data obtained at this site from 1995 through 1997 illustrated much higher temperatures and greater diurnal fluctuations. It is unknown whether CTUIR's habitat improvements have resulted in cooler, more consistent temperatures at this site. Continued out-year monitoring at this location may provide answers to this anomaly.

Stream temperatures were highest, exceeding 85 F on several days, at RM 56 Umatilla River and at RM .04 Little Buckaroo Creek. In general, stream temperatures throughout the Umatilla River Basin averaged two to six degrees Fahrenheit cooler in the summer of 1999 than during previous years. Notable exceptions were temperatures at RM .04 Little Buckaroo Creek and RM 9 Squaw Creek. Both of these sites had maximum stream temperatures reaching several degrees warmer than during past summers. Cooler ambient temperatures likely contributed to more moderate stream temperatures at most sites. It is unknown why maximum stream temperatures were above average at RM .04 Little Buckaroo Creek and RM 9 Squaw Creek.

5. Suspended Sediment Monitoring:

Siltation, a leading cause of non-point source pollution, is especially harmful to fish and aquatic ecosystems. Sediments harm fish by reducing dissolved oxygen levels and by smothering eggs and newly hatched fry. Sediment deposits also can eliminate aquatic plants that provide cover for fish and the invertebrates they consume (Trout Unlimited, 1994).

CTUIR Habitat Enhancement Project Personnel collected daily suspended sediment data from three ISCO Model 2700 Wastewater Samplers. Data obtained was averaged and combined with gage station stream flow data to arrive at daily estimates of total sediment yield at RM 2 Meacham Creek (at USGS Gage Station No. 14020300), RM 56 Umatilla River (at USGS Gage Station No. 14020850) and RM 81.7 Umatilla River (at USGS Gage Station No. 14020000). Due to the samplers malfunctioning or requiring repair from flood events, several months of suspended sediment data was unobtainable. Suspended sediment data was graphed, and this information is presented in Appendix C (absence of data is indicated by lack of a contiguous sediment yield line on graphs). Tabular daily

sediment yield data and stream discharge data is currently maintained at the CTUIR Habitat Enhancement Project Office.

Stream flows during 2000 ranged from a peak of cfs on to a minimum of cfs from through at RM 2 Meacham Creek, a peak of cfs on to a minimum of cfs on several days in RM 56 Umatilla River, and a peak of cfs on December 30 to a minimum of cfs in late and early at RM 81.7 Umatilla River.

Peaks in sediment yield generally corresponded closely with winter and early spring high flow events. Maximum documented 2000 daily sediment yields of tons per day at RM 2 Meacham Creek, tons per day at RM 56 Umatilla River and tons per day at RM 81.7 Umatilla River occurred on , 2000 during a major high flow event. The highest annual sediment yields likely occurred on , 2000 during peak flow periods. However, this can not be substantiated because all three sediment samplers were inoperative on that date.

Objective III: <u>Continue Watershed Planning, Scoping and Education Process by Identifying Problems and Developing Creative Solutions to Land Use Problems Impacting Fisheries Habitat in the Umatilla River Basin.</u>

1. Watershed Analysis:

WSU Staff and CTUIR Habitat Enhancement Project Personnel held several watershed analysis coordination meetings to exchange ideas, obtain agency input, and update interested parties on progress. Efforts to develop a Umatilla Basin Watershed Analysis will continue through 2001. A finalized document will be available in early 2002.

2. Community Outreach Efforts:

The following public outreach efforts occurred during the 2000 project period:

- Coordinated with the Umatilla Basin Watershed Council in the development of long term monitoring needs to be incorporated into the Umatilla Basin Total Maximum Daily Load/Water Quality Management Plan.

- Participated and provided a display and educational literature to seventh and eight grade students at the Umatilla-Morrow County Education Service District (ESD) Career Showcase “2000”.

- Coordinated with ODSL, U.S. Environmental Protection Agency, Oregon Department of Fish and Wildlife and Umatilla National Forest in planning and implementing a landowner/contractor oriented bioengineering workshop in September 2000.

- Coordinated with Washington and Hawthorne Elementary Schools to have fifth grade students plant native willow cuttings in the Spring Hollow Creek Project Area.

- Participated in Hawthorne School’s Fifth Grade Career Day.

- Provided the McKay Creek Project Area for ESD’s 2000 Watershed Field Day and presented habitat restoration talks and native willow reestablishment training to participants.

- Participated and provided a display and educational literature to the public at the CTUIR Salmon Restoration Open House.

- Provided displays at the Columbia River Inter-Tribal Fisheries Commission’s (CRITFC) Jammin’ for Salmon Concert Fundraiser to obtain cost-share dollars for Northwest Salmon Corps’ Programs, CTUIR’s Home for the Salmon Campaign and CRITFC’s Spirit of the Salmon Campaign.

- Provided field instruction to Sunridge Middle School Students, including water quality, macroinvertebrate and stream habitat monitoring and stream bank revegetation, on lower Tutuilla Creek.
- Provided salmon habitat and stream restoration talks to CTUIR Salmon Walk

participants.

- Provided an outdoor stream function and habitat enhancement presentation to the American Association of University Women.

- Mentored a Tribal Youth under the Saturday Academy Apprenticeships in Science and Engineering Program.

- Provided a tour of project areas and presentations to participants at the USFS Region 6 – Stream and Watershed Restoration Design and Implementation Workshop.

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