Draft Umatilla Subbasin / Willow Creek Subbasin Summary

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Prepared for the
Northwest Power Planning Council

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Umatilla Subbasin / Willow Creek Subbasin Summary

Introduction

This subbasin summary includes an assessment of the Umatilla River, Willow Creek, Juniper Canyon and Sixmile Canyon watershed areas. It has evolved out of the rolling provincial review process, developed by the Northwest Power Planning Council (NWPPC) in February 2000, in response to recommendations by the Independent Scientific Review Panel (ISRP) and the Columbia Basin Fish and Wildlife Authority (CBFWA). The process of developing a subbasin summary was initiated as part of the provincial review process at a November 28-29, 2000 meeting in Pendleton, Oregon.

The primary intent of this document focuses on the Umatilla River subbasin, but includes discussion of other small adjacent watersheds where information is available. Willow Creek, Six Mile Canyon and Juniper Canyon represent significant wildlife habitat, are largely unstudied, and need to be addressed at greater depth in the future. These systems were included in this document because they have not been addressed in other subbasin summaries as part of this process. This summary is an interim document that provides context for project proposals during the provincial reviews, while a more extensive subbasin plan is developed.

The Umatilla River and Willow Creek subbasins are two of a number of subbasins included within the Columbia Plateau province (Figure 1). For the purpose of brevity, when appropriate, the Umatilla, Willow, Six Mile Canyon and Juniper Canyon will be referred to as the Umatilla/Willow subbasin (Figure 2).

Subbasin Description

General Description

Subbasin Location

Drainage Area

Draining an area of nearly 2,290 square miles (Gonthier and Harris 1977), the Umatilla River originates in the Blue Mountains of northeastern Oregon and flows north and west to enter the Columbia River at river mile (RM) 289. Elevations in the subbasin range from about 5,800 feet near Pole Springs on Thimbleberry Mountain to 260 feet at the mouth of the Umatilla River (Figure 3). The south and east portions of the drainage lie on the steep, timbered slopes of the Blue Mountains within the Umatilla National Forest. The remainder of the drainage consists of moderate slopes and level terrain.

To the west of the Umatilla subbasin is Willow Creek, a 79-mile long river that drains into the Columbia River at RM 253. Willow Creek and its tributaries drain an area of about 880 square miles, ranging in elevation from 269 feet at its confluence with the Columbia River, to 5,583 feet at its headwaters near Bald Mountain in the Umatilla National Forest. The upper Willow Creek drainage has a total annual flow of approximately 30,000 ac-ft; however, by RM 4, total annual flow is reduced to an estimated 23,000 ac-ft due to extensive irrigation withdrawals. The U. S. Army Corps of Engineers (COE) constructed a 160-ft high dam just upstream of Heppner, Oregon in an effort to control flash flood events, which in the past have claimed both lives and property. (http://www.nwp.usace.army.mil/op/D/standard/wc/wc.htm).

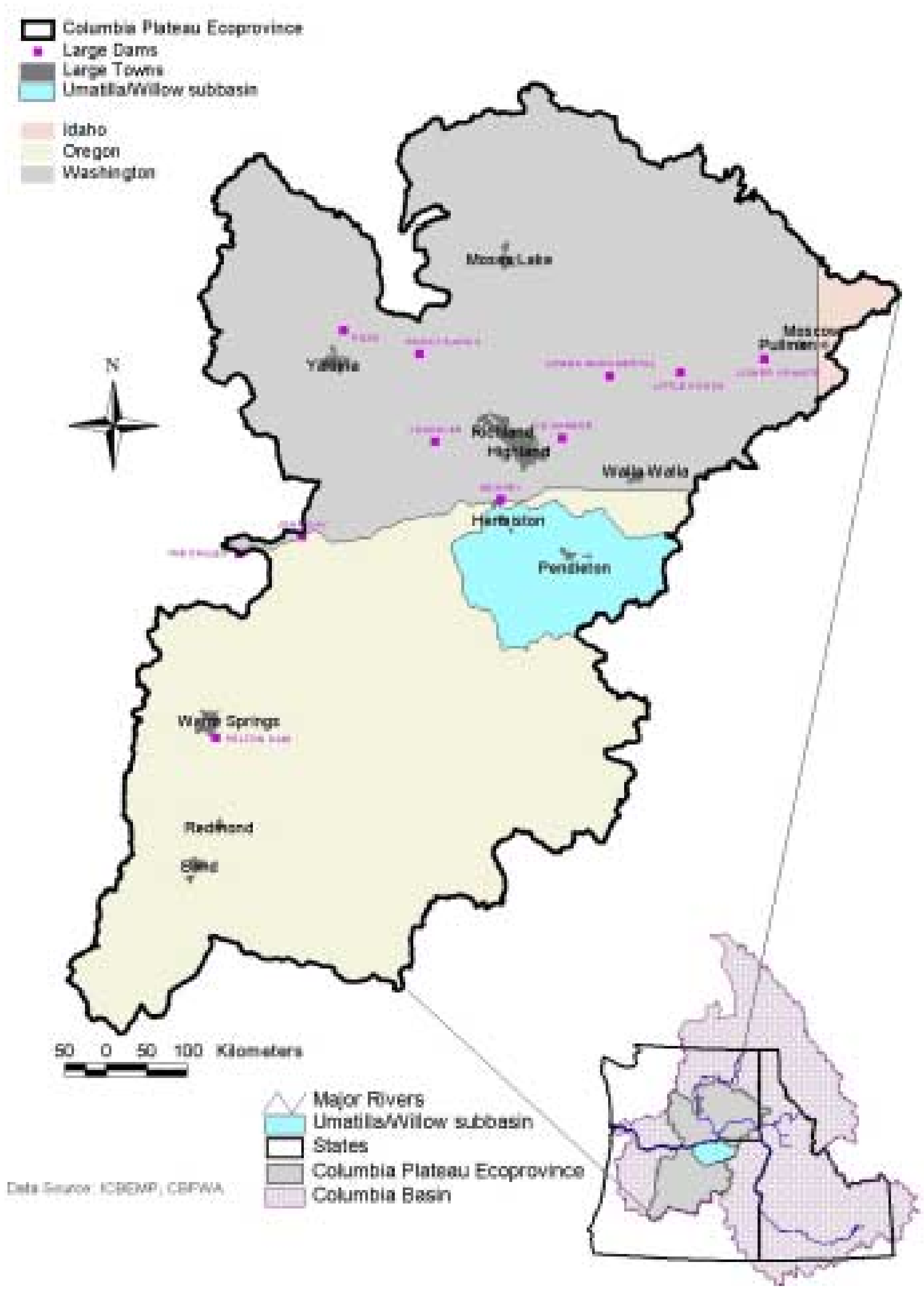

Figure 1 Umatilla/Willow subbasin within the Columbia Plateau ecoprovince

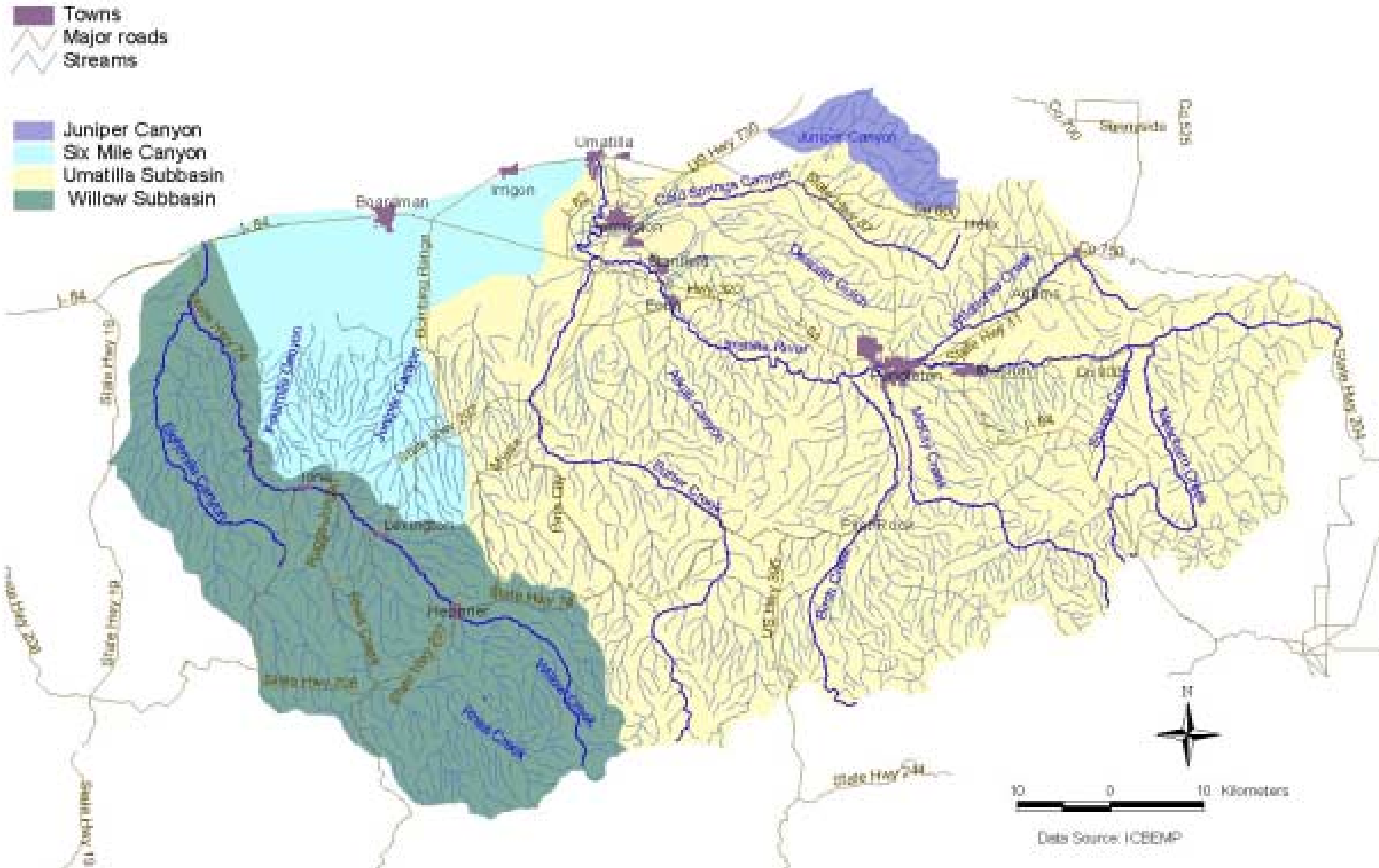

Figure 2 Assessment units and major features of the Umatilla/Willow subbasin

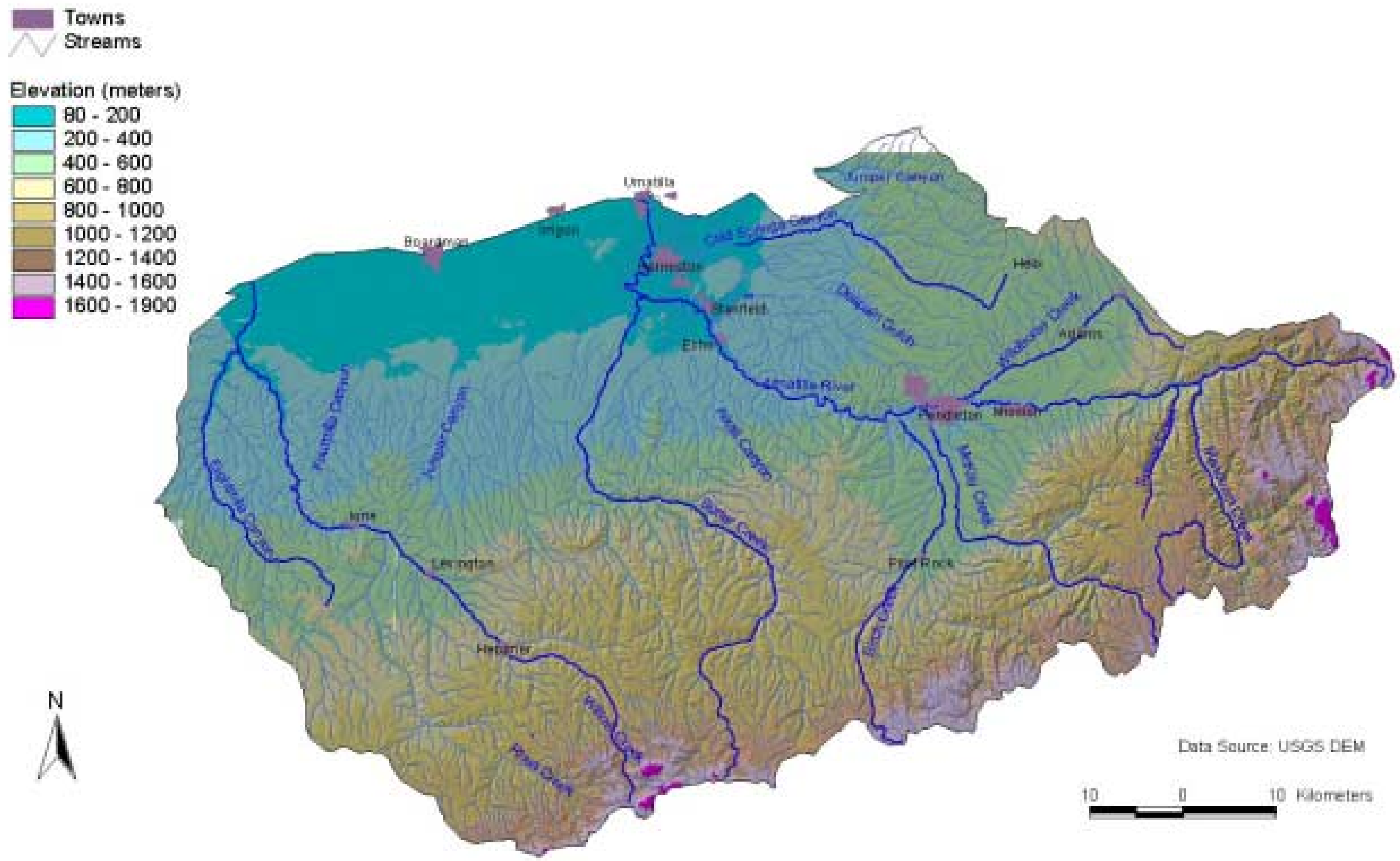

Figure 3. Elevation ranges in the Umatilla /Willow subbasin

This dam is located at the confluence of mainstem Willow Creek and the Balm Fork of Willow Creek and creates the 14,000 ac-ft Willow Creek Reservoir. The Juniper Canyon watershed, which lies to the east of the city of Umatilla, encompasses 72 square miles and enters the Columbia River at RM 315. Elevations within the drainage range from 105 feet at the Columbia River, to 617 feet at the headwaters. Flows in Juniper Creek are ephemeral, largely resulting from storm events.

Between the Willow Creek and Umatilla drainages lies a 472 square-mile expanse of semi-arid land. This area has seasonal streams, which seldom drain into a Columbia River tributary. These tributaries include Sixmile Canyon and Sand Hollow. Juniper Canyon enters the Columbia east of the Umatilla subbasin, 16 river miles downstream from the Umatilla/Columbia River confluence. The most significant human usage of the area is the Boardman Bombing Range.

The Umatilla subbasin lies within Umatilla and Morrow Counties, Oregon, with a negligible portion of the headwaters located in Union County. Seventy eight-percent of the Willow subbasin occurs in Morrow County, while 22% occurs in Gilliam County. The Umatilla drainage is a part of the historic homelands of the Walla Walla, Cayuse, and Umatilla Indian Tribes. Approximately 6.4 million acres (Confederated Tribes of the Umatilla Indian Reservation 1996) of their lands in northeast Oregon and southeast Washington were ceded to the federal government under the Treaty of 1855. The Tribes maintain reserved rights for these lands that include harvesting salmon, wildlife, and vegetative resources (U. S. Army Corps of Engineers 1997). The Umatilla Indian Reservation is located within the Umatilla subbasin, including the Confederated Tribes of the Umatilla Indian Reservation government headquarters at Mission, Oregon. Today, the lands of the CTUIR encompass approximately 236 square miles of northeastern Oregon (Confederated Tribes of the Umatilla Indian Reservation, 2000).

Climate

The entire Umatilla/Willow subbasin falls within Oregon's North Central Climatic Zone (Zone 6). The local climate is subject to different large-scale patterns depending on location within the subbasin (Figure 4). The major influence to the regional climate is the Cascade Mountains to the west, which form a barrier against warm moist fronts from the Pacific Ocean (Johnson and Clausnitzer 1992). The Columbia Gorge provides a break in the curtain of the Cascade Mountains and occasionally allows moisture laden marine air to penetrate into the northern Blue Mountains. This induces light to moderate precipitation (depending on elevation), and results in vegetation more common to the west slopes of the Cascades (Johnson and Clausnitzer 1992).

Light to moderate precipitation characterizes the climate in the subbasin, which experiences a wide range in annual temperatures, partially as a function of a highly diverse topography. A climatic gradient from northwest to southeast across coincides with increasing elevation. As a result, warm and dry conditions exist in the northwestern, low elevation portion of the subbasin, while cool and wet conditions prevail in the southeastern highlands of the Blue Mountains. The average growing season also changes with this northwest – southeast gradient, decreasing from northwest to southeast.

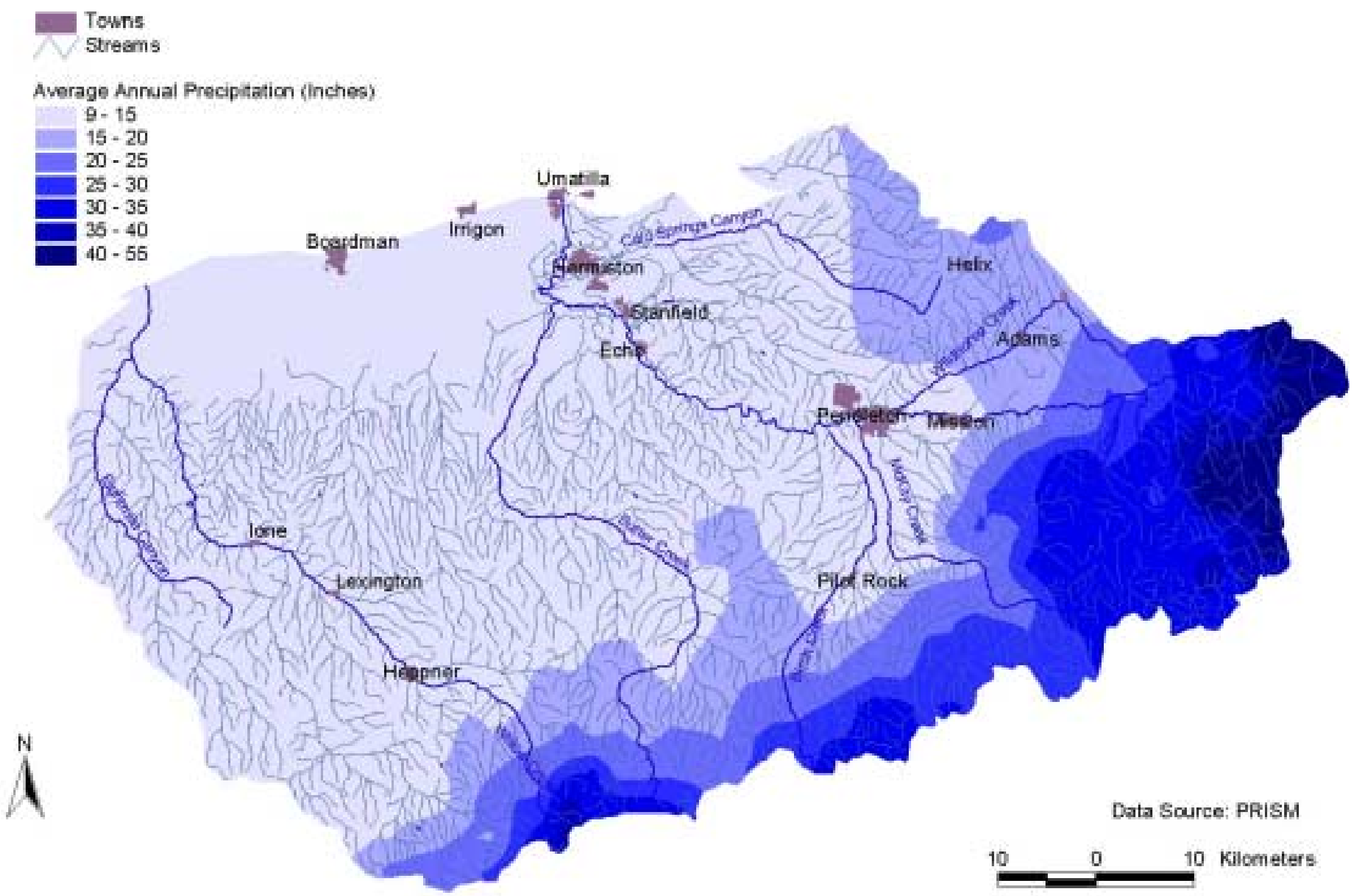

Figure 4. Precipitation ranges in the Umatilla /Willow subbasin

The subbasin experiences a continental climatic regime in the summer, with warm days, cool nights, and little precipitation. In the low elevation portions of the subbasin to the northwest, daytime summer temperatures of 100°F are not uncommon. Mean annual temperature and precipitation have fluctuated over the last century, with recent years showing an increase in precipitation and a slight decrease in temperature (Figure 5 and Figure 6).

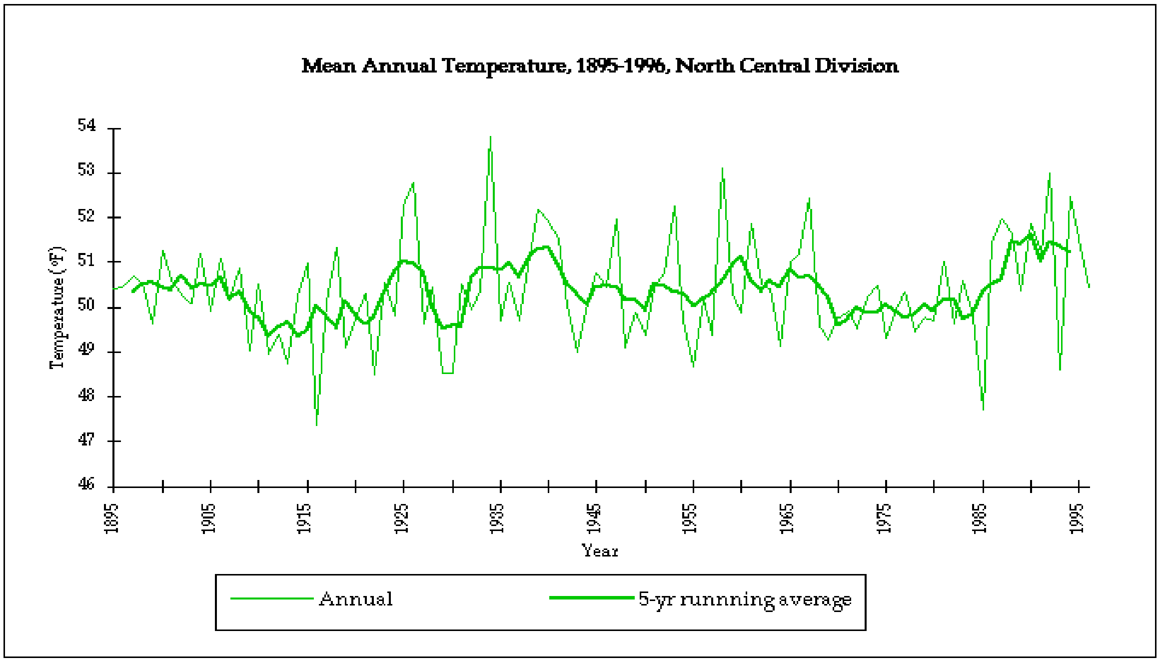

Figure 5. Air temperature in Climate Zone 6 (North Central) of Oregon state (1895-1995) (Oregon Climate Service 1999).

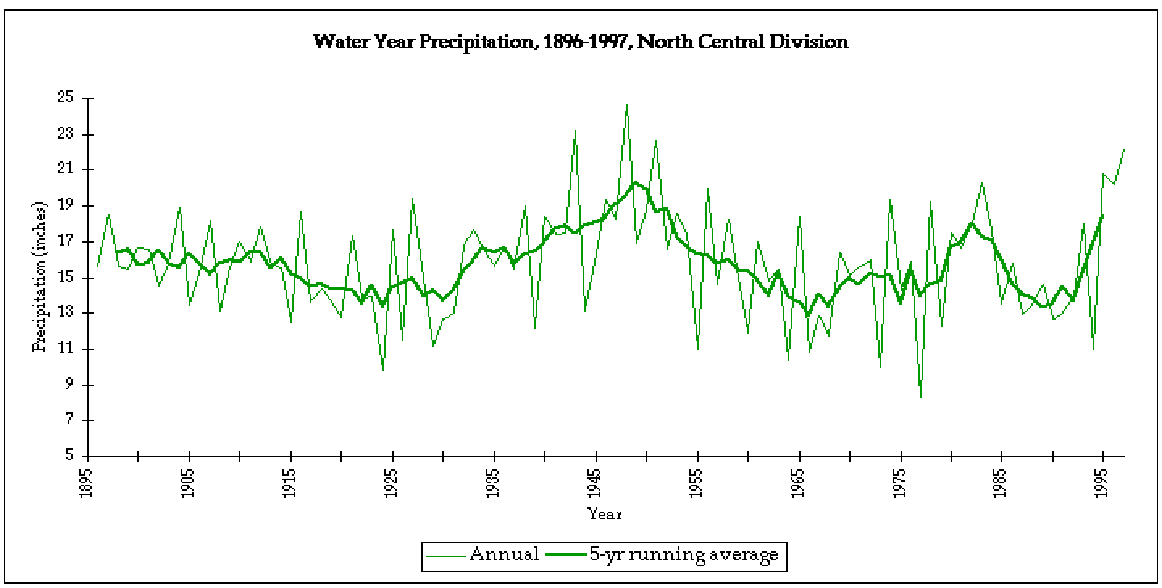

Figure 6. Precipitation in Climate Zone 6 (North Central) of Oregon state (1895-1995) (Oregon Climate Service 1999).

Precipitation across the subbasin falls mainly between late fall and early spring. Precipitation is generally adequate for wheat farming in the higher plateau areas, but inadequate for diversified farming (Bureau of Reclamation 1954). Average annual precipitation ranges between 55 inches in the southernmost portions of the Blue Mountains to less than nine inches near the Columbia River (Figure 4). The average monthly temperature and precipitation for the Hermiston, Pendleton and Pilot Rock stations in the Umatilla subbasin show low precipitation, strong seasonal variation, and slight variation by elevation (Figure 7 and Figure 8). These areas are all at relatively low elevations for the subbasin. Average monthly precipitation in the Willow subbasin and Sixmile Canyon area also vary by elevation (Figure 9), as demonstrated by differences recorded at the Boardman (620' el.) and Heppner (1890' el.) stations (Figure 9).

Geology and Soils

The Umatilla subbasin consists of two primary areas: the Blue Mountain physiographic province and the valley physiographic province (sometimes referred to as the Umatilla plain). The Umatilla River and its tributaries begin in the Blue Mountain physiographic province, which is characterized by deeply incised upland surfaces and a ramp-like slope call the Blue Mountain slope (U. S. Army Corps of Engineers 1947). The Blue Mountain province consists of flat-topped ridges and steep stair-stepped valley walls formed by thousands of feet of Miocene basalt flows that surrounded and largely engulfed the batholithic cores of the mountains (U. S. Army Corps of Engineers 1947). The structural deformation of the basalt and its subsequent erosion created the varied topography of the subbasin. The Miocene basalt belongs to a regionally widespread series of flows known as the Columbia Basin basalt.

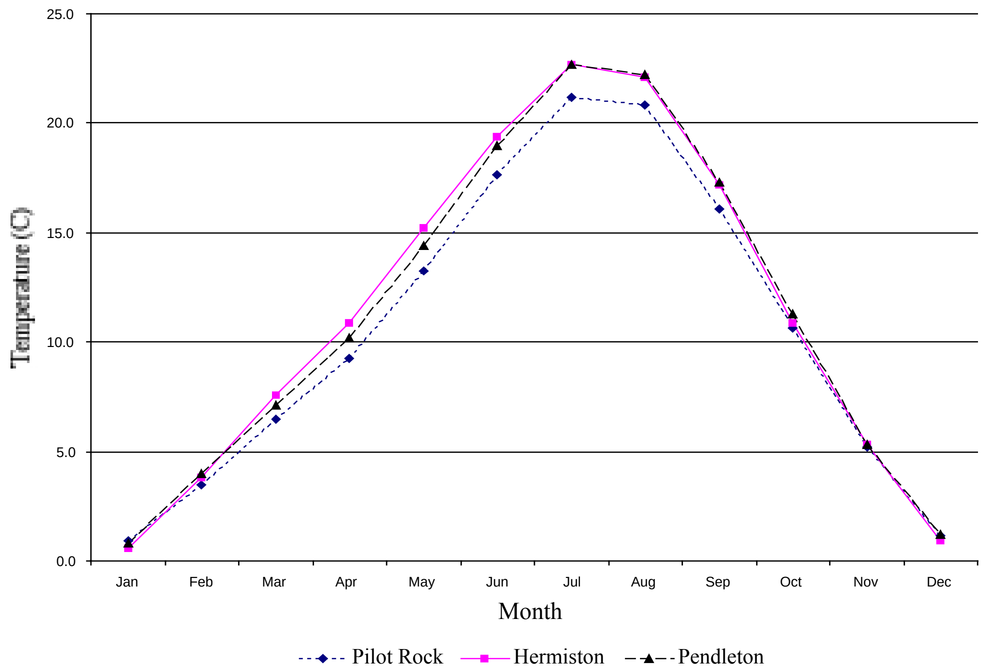

Figure 7. Average monthly temperature for three climate stations in the Umatilla subbasin, 1961-1990 (Oregon Climate Service 1999).

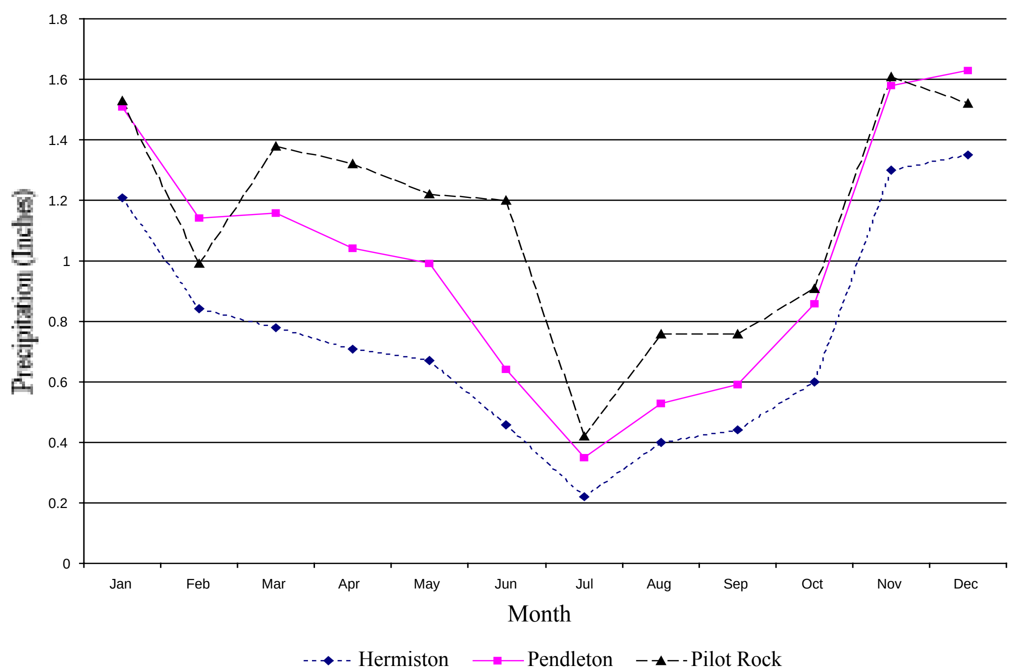

Figure 8. Average monthly precipitation at three climate stations in the Umatilla subbasin, 1961-1990 (Oregon Climate Service 1999).

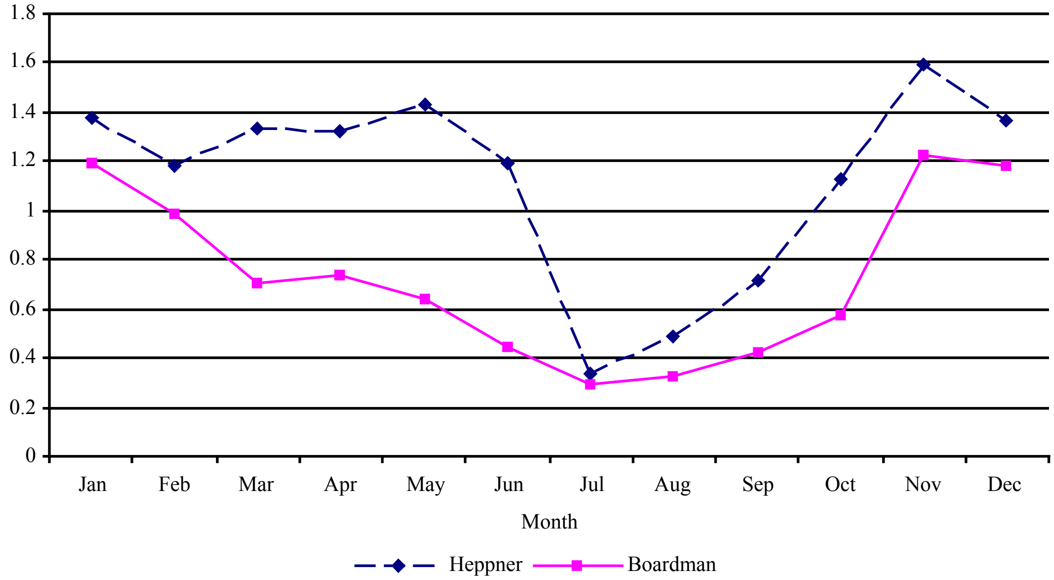

Figure 9. Average monthly precipitation at the Heppner and Boardman climate stations in the Willow subwatershed and Sixmile Canyon area (respectively) (Oregon Climate Service 1999)

Three major basalt formations occur in the Umatilla subbasin: the Saddle Mountains, Wanapum, and Grande Ronde. Each basalt formation is an aggradation of smaller individual flows sharing similar flow histories and chemistry extruded from a regional volcanic vent system and filling the shallow structural basin of the Columbia Plateau (Gonthier and Bolke 1993). The flow thickness can range from five feet to as much as 150 feet, and collectively is estimated to be hundreds to thousands of feet thick (Newcomb 1965). As the mountains were further uplifted and the horizontal basalt layers warped into a series of folds, streams carved canyons through the basalt layers, creating a highly dissected landscape (Davies-Smith et al. 1988).

As the streams leave the canyons of the Blue Mountain province, they cross a wide expanse of plains and terraces known as the valley physiographic province (Newcomb 1965). The valley province is comprised of tertiary and quaternary loess, alluvium, glacio-fluvial, and lacustrine sediment deposits which mantle the Columbia River basin across much of the lower elevations (Newcomb 1965). During the tertiary period, ancestral streams washed the oldest of the valley sedimentary deposits down from the canyons of the Blue Mountains and deposited them along the mountain front (Gonthier and Bolke 1993). Quaternary deposits of wind-borne silt, or loess, blanket much of the tertiary deposits and basalt flows in the subbasin. The source of these loess deposits was likely flood-deposited material left from the massive Missoula Floods that periodically inundated large areas of the Columbia Plateau from 12,800 to 15,000 years ago (Gonthier and Bolke 1993). The highly productive soils that make the region famous for its agriculture are largely derived from these quaternary and tertiary deposits.

There are about 75 different kinds of soil in the Umatilla subbasin ranging from highly fertile loess to volcanic ash derived from eruptions of Mt. St. Helens 21 years ago, Mt. Mazama 6,000 years ago, and Glacier Peak 11,250 years ago (Johnson and Makinson 1988). At higher elevations, the soils were formed in volcanic ash and residuum; other portions formed in loess, colluvium, and residuum (Johnson and Makinson 1988). The lowest elevation portion of the valley physiographic province around Hermiston consists of soils that formed in aeolian sand, loess alluvium and lacustrine sediment on terraces of the Columbia River (Johnson and Makinson 1988). The portion of the valley physiographic province that lies north of the Umatilla River formed in loess, lacustrine sediment, and alluvium on hills, terraces, and piedmonts (Johnson and Makinson 1988). The Umatilla River bounds the final soil unit found in the valley province on the north, and Birch Creek bounds it on the east. These soils were formed in loess, colluvium, and alluvium on hills.

Hydrology

Originating at nearly 6,000 feet in elevation, the Umatilla River headwaters flow out of the Blue Mountains through narrow, well-defined canyons. After leaving the mountains, the North and South Fork join to form the mainstem, a 90 mile reach of river which flows through a series of broad valleys that drain low rolling lands (U. S. Army Corps of Engineers 1997; Oregon Department of Environmental Quality 2000). The mainstem Umatilla River has eight main tributaries: the North and South Forks of the Umatilla River and Meacham Creek in the upper basin; Wildhorse, Tutuilla, McKay and Birch Creeks in the mid basin; and Butter Creek in the lower basin (Table 1).

Intermittent flows with spring peaks characterize flows in Juniper Canyon. The lower reaches of Willow Creek are also intermittent, while the upper portion maintains several perennial streams. Isolated storm events may cause locally high flows for short periods during the summer and early fall (Oregon Department of Water Resources 1988). The primary tributaries of Willow Creek are Eightmile Creek and Rhea Creek, while the primary tributaries in Juniper Canyon include the North and South Forks of Juniper Canyon.

All the primary tributaries of the Umatilla River drain the Blue Mountains and enter the Umatilla River from the south. Wildhorse Creek drains the divide between the Umatilla River and the Walla Walla River to the north. The North and South Forks of the Umatilla River and Meacham Creek account for approximately 14% of the Umatilla River subbasin drainage area, yet supply 40-50% of the average flow to the Umatilla River (Umatilla National Forest 2000). Average annual discharges are 223 cfs for the Umatilla and 193 cfs for Meacham Creek. Peak annual discharges for the Umatilla, at the city of Umatilla, average 6,321 cfs (Appendix A). Water runoff peaks in April, while the lowest flows generally occur in September (Umatilla National Forest 2000). The average monthly discharge of the Umatilla River (measured at RM 2.1) varies from 23 cubic feet per second (cfs) in July to1095 cfs in April (low flow at the mouth occurs in July rather than September because of upstream removals for irrigation), a difference that reflects the seasonal variation in precipitation.

Table 1. Mainstem length and drainage areas of streams within the Umatilla subbasin.

Drainage	Length (miles)	Area (sq. miles)	Distance from the mouth of the Umatilla River (miles)
North Fork Umatilla	9	34	86
South Fork Umatilla	10	57	86
Meacham Creek	31	165	79
Wildhorse Creek	34	190	55
Tutuilla	10	61	52
McKay Creek	32	191	51
Birch Creek	31	291	47
Butter Creek	57	465	14
Willow Creek	79	880	Tributary to Columbia R.
Juniper Canyon	19	72	Tributary to Columbia R.

In the plateau area, many intermittent streams are tributaries to the Umatilla River. Deep, incised channels characterize most of these creeks, with most only carrying water during periods of snowmelt or sustained rainfall. Little runoff from lands in the lower Umatilla subbasin occurs because of low precipitation, flat surface relief, and sandy soils (Bureau of Reclamation 1954). The Umatilla River below McKay Creek shows a decrease in the mean monthly instream flow in the downstream direction from Yoakum (RM 37.7) to the city of Umatilla (RM 2.1) (Figure 10). This decrease in flow is evident during both the summer and winter months, when surface water is diverted for storage and groundwater is recharged. The differential in water between the two stations is greatest in April and May when over 400 cfs of surface flow is lost in the 35-mile reach. Despite the loss between the two stations, flows have been improved by an inter-basin transfer of water from the Columbia River through the target flow period of September - June. Many of the larger tributaries lose surface flow during the summer through parts of their lengths. Sections of Birch, McKay, Butter, and Meacham Creeks are all subsurface during low flow periods (Oregon Department of Environmental Quality 1998). These losses are manifested in the mainstem Umatilla River flow at various tributary confluence points (Figure 11).

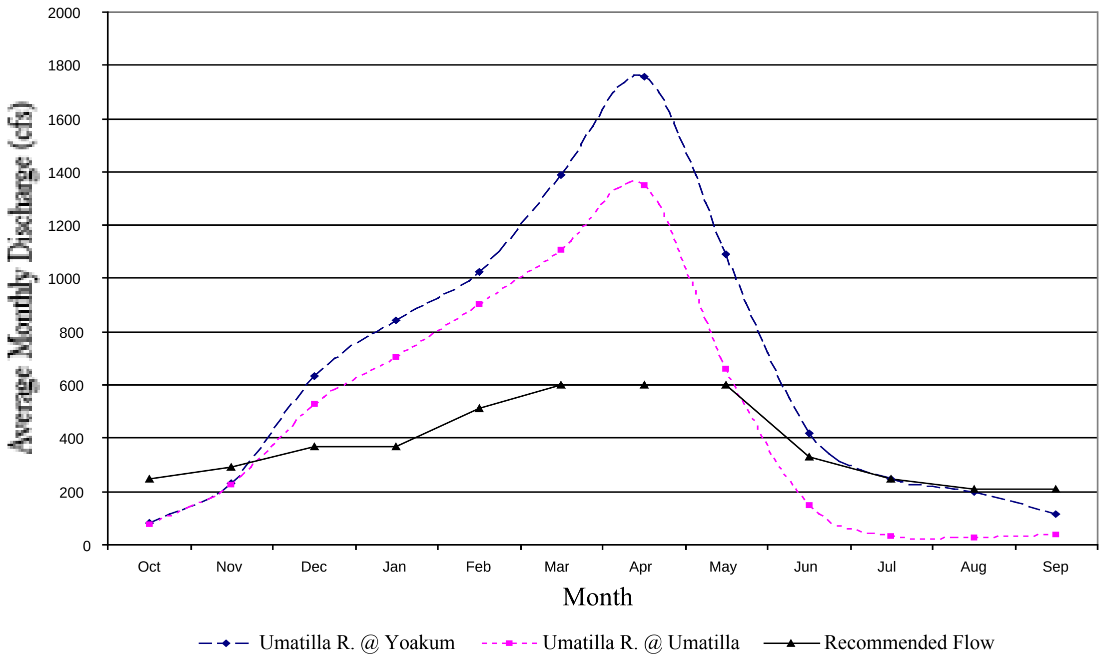

Figure 10. Mean monthly discharge for stream gages at Yoakum (RM 37.7) and the city of Umatilla (RM 2.1) and instream flow recommendation (Confederated Tribes of the Umatilla Indian Reservation 1999).

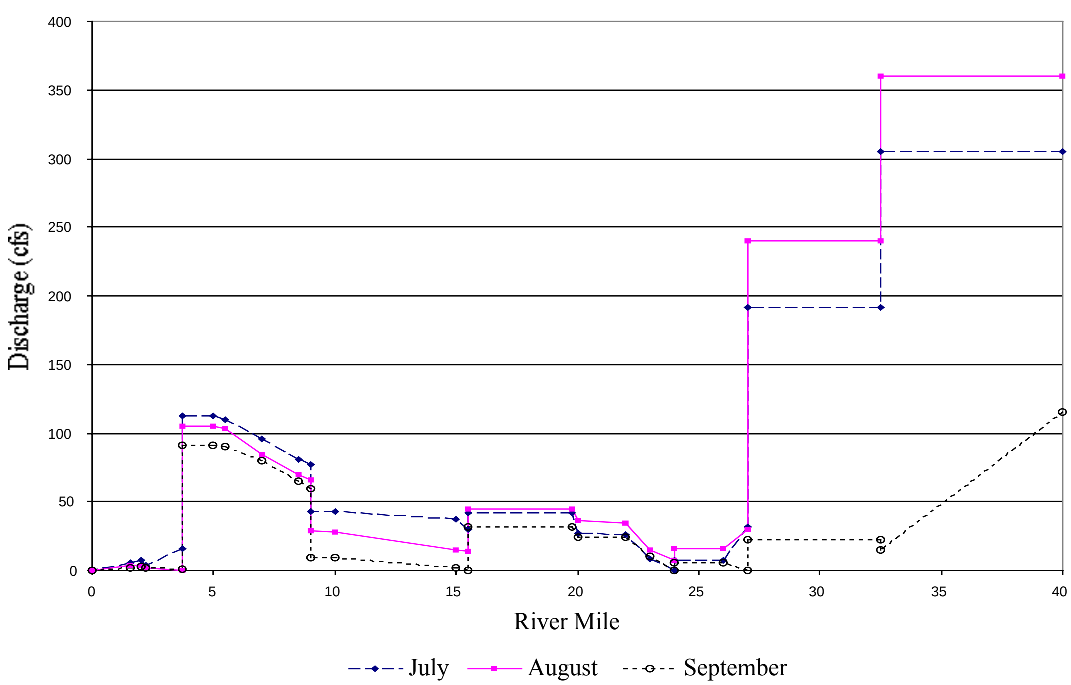

Figure 11. Discharge in the lower Umatilla River by river mile, July 14-17, August 11-14, September 8-11 (Kreag and Threlkeld 1991).

Peak flows in Willow Creek near Arlington, Oregon occur in January, while higher upstream near Heppner, Oregon they occur between March and April. Peak annual discharges for Willow Creek, near Arlington, average 4,575 cfs (Appendix B). Monthly discharge in the Willow Creek subbasin varies by gauging station. At the lowest elevation (station #14036000) peak runoff occurs in January, whereas higher up in the drainage, near Heppner, peak runoff occurs between March and April (Figure 12). Base flows typically occur during the months of July – September, during which time channels may run intermittent for prolonged periods (Oregon Water Resources Department 1988). Hydrologic data for Juniper Canyon is limited.

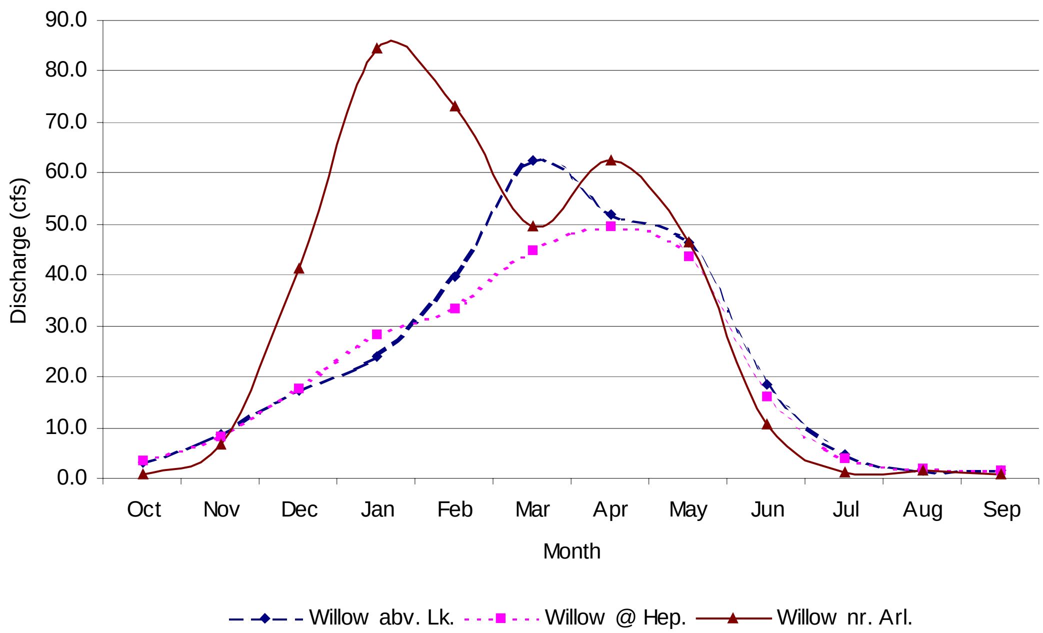

Figure 12. Mean monthly flows for Willow Creek at three gauging stations: Willow Creek above Willow Lake, Willow Creek at Hepner, and Willow Creek near Arlington, OR.

Most flooding events in the Umatilla/Willow subbasin result from rain-on-snow events. This usually occurs when snow accumulates between 1,500-3,500 feet elevation in the Blue Mountains and then is rapidly melted by rain and warm winds (Washington Department of Natural Resources 1998). Sixty-two percent of the Umatilla subbasin falls within the 1,500-3,500 foot range in what is termed the transient snow zone, an area that substantially contributes to the flood regime in the subbasin (Figure 13).

The most damaging floods occur as winter flooding events, commonly from December through February. A second common mechanism for flooding is rain-on-frozen soil events, which generally affect the lowland agricultural areas. These events often lead to high surface erosion in agricultural lands. A less common flooding mechanism is heavy summer thunderstorms.

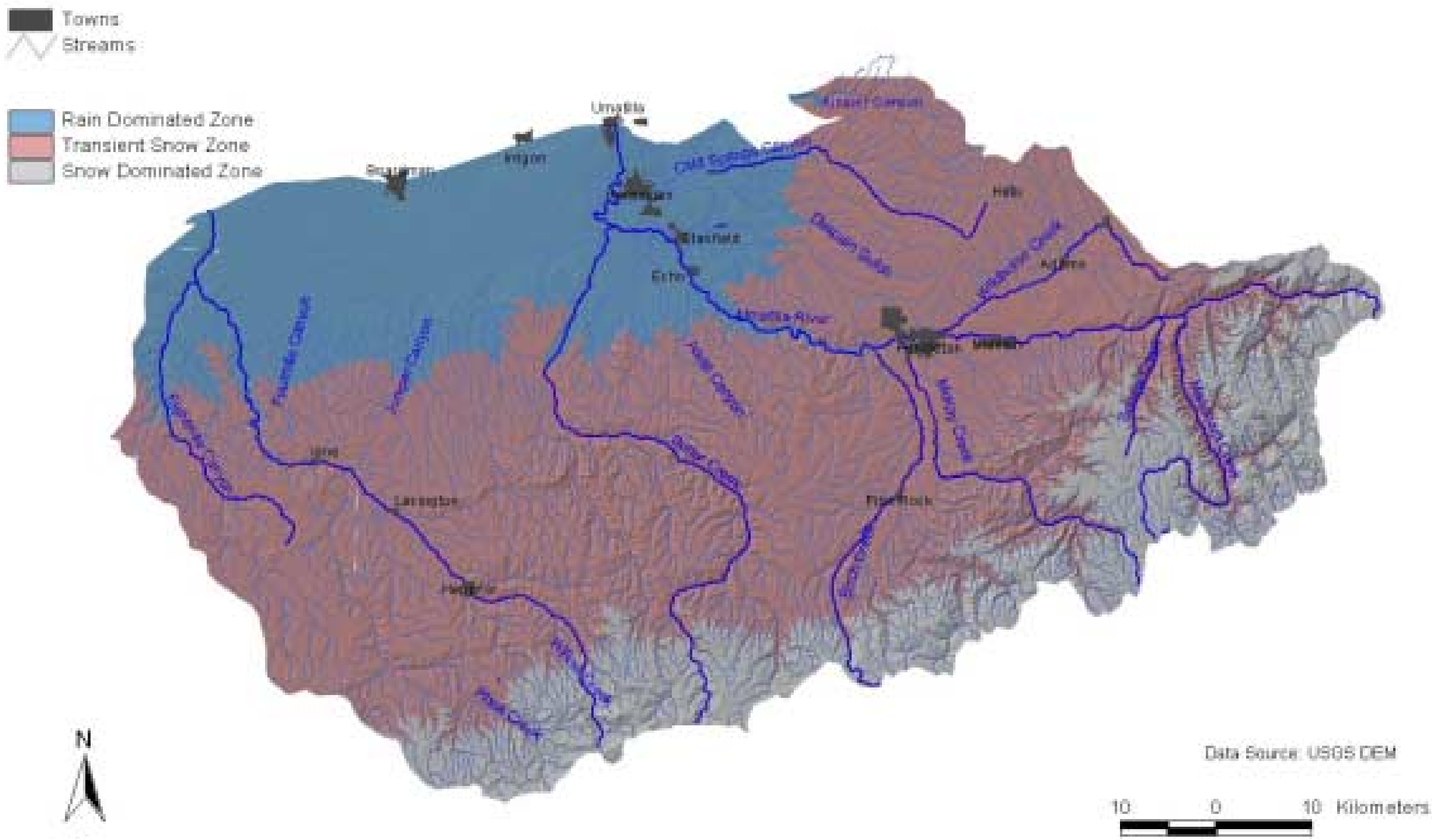

Figure 13. Transient snow zone elevation band in the Umatilla subbasin

Significant flooding has occurred 26 times since 1865. The U. S. Army Corps of Engineers (1955) identified the storm of May 26-30, 1906 as a "standard project general storm," meaning it produced a flood exceeded only on rare occasion. The 1906 flood was chosen as a benchmark because of its occurrence during a period of higher temperatures, which resulted in a greater percentage of the precipitation falling as rain and having a greater contribution to snowmelt runoff (U. S. Army Corps of Engineers 1955). Table 2 shows the inches of rainfall for each primary tributary for 120 hours during the storm. In the Willow Creek Subbasin, significant peak flows have been recorded in 1965, 1974 and 1979 (Appendix B). One of the most devastating floods in the history of the United States occurred as a flash flood in the Willow Creek subbasin on June 14, 1903 and resulted in the drowning of 247 people in the Heppner area (http://www.nwp.usace.army.mil/op/D/standard/wc/wc.htm).

Table 2. Umatilla standard project general storm (U. S. Army Corps. of Engineers 1955).

Sub-Unit	**Drainage Area (mi^2)**	**Storm Rainfall (in.)**	**Volume (acre-feet)**
Wildhorse Creek	190	4.49	49,069
Meacham Creek	165	6.56	65,075
North/ South Forks of the Umatilla	125	9.18	61,200
Butter Creek	465	2.99	74,152
Birch Creek	291	3.87	60,062
McKay Creek	191	5.26	53,582

The hydrology of the Umatilla River is heavily influenced through irrigation, and by releases of water from McKay Reservoir. Water is released from McKay Reservoir at RM 51 during peak irrigation periods. These releases contribute flows to reaches that were historically completely withdrawn by diversions downstream. During irrigation season, the primary source of inflows is from irrigation return flows and drains, with the larger tributaries contributing little to the Umatilla River. Irrigation diversions and drains dominate the hydrology of the river as the diversions remove water added for irrigation from McKay Reservoir. Streamflow drops considerably and temperatures rise with the reduction in flow at the diversion points. Where irrigation drains enter the river, stream flows show a modest increase and temperatures often show a slight decline. The impact of McKay Reservoir on the Umatilla River downstream is to lower mean monthly instream flows during the winter and increase them during the summer when stored water is used for irrigation (Figure 14). The reservoir has reduced mean monthly discharge in the Umatilla River during winter months. Mean annual flow differs between the two periods as well, with an average of 8,528 cfs between 1906-1926 and 7,987 between 1928-1984. The change in mean annual flow without a change in annual peaks reflects a change in distribution of the flow levels. Extensive channel alterations have occurred upstream of the gage, but it appears that they have had little impact on the peak flow at Yoakum.

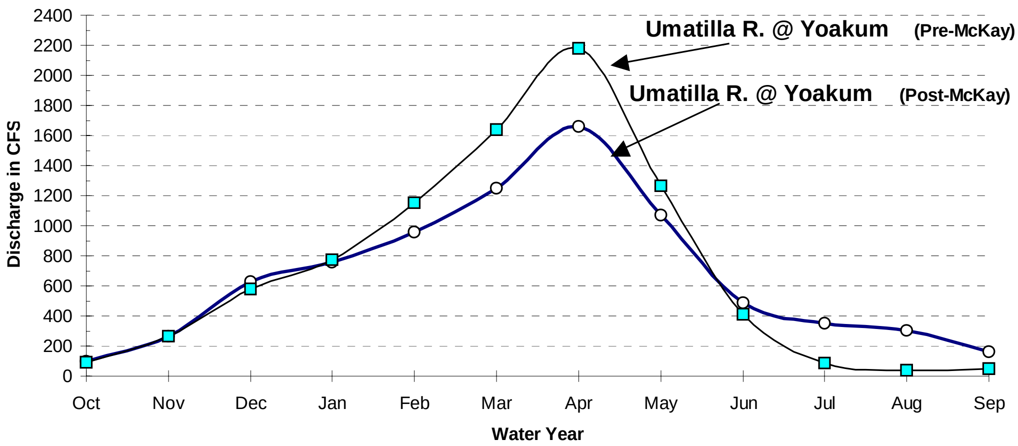

Figure 14. The impact of McKay reservoir releases on the Umatilla River at Yoakum (RM 37.7) (U. S. Geological Survey 1999).

Water Quality

The upper Umatilla subbasin has historically been valued as a source area for abundant clean, cold water and habitat for resident and migratory fish. For the last 25 years however, increased demands on the watershed have caused some streams to be state-listed as "water quality limited" (WQL) (Table 3; Figure 15 and Figure 16). In addition, the Umatilla Tribes have requested to be treated as a state (pursuant to the water quality act of 1987) and have coordinated with the Environmental Protection Agency (EPA) to develop water quality standards pertaining specifically to Reservation lands (Confederated Tribes of the Umatilla Indian Reservation 1999).

Table 3. 1998 §303(d) listed stream segments in the Umatilla subbasin (Oregon Department of Environmental Quality 2000)

Variable	Stream	Segment (boundaries)	Criterion
Temperature	Birch Cr.	Mouth to headwaters	Rearing 64°F
	Buckaroo Cr.	Mouth to headwaters	Rearing 64°F
	E. Birch Cr.	Mouth to Pearson Cr.	Rearing 64°F
	EF Meacham Cr.	Mouth to headwaters	Rearing 64°F
	McKay Cr.	Mouth to McKay Reservoir	Rearing 64°F
	Meacham Cr.	Mouth to headwaters	Rearing 64°F
	NF McKay Cr.	Mouth to headwaters	Rearing 64°F
	NF Meacham Cr.	Mouth to headwaters	Oregon Bull Trout
	NF Umatilla R.	Mouth to headwaters	Oregon Bull Trout
	Shimmiehorn Cr.	Mouth to headwaters	Oregon Bull Trout
	SF Umatilla R.	Mouth to headwaters	Oregon Bull Trout
	Squaw Cr.	Mouth to headwaters	Rearing 64°F
	Umatilla R.	Mouth to Lick Cr.	Rearing 64°F
	W. Birch Cr.	Mouth to headwaters	Rearing 64°F
	Westgate Canyon	Mouth to headwaters	Rearing 64°F
	Wildhorse Cr.	Mouth to headwaters	Rearing 64°F
	Willow Cr.	Mouth to Willow Cr. Lake	
Sediment	Beaver Cr.	Mouth to headwaters	
	Birch Cr., WF	Mouth to headwaters	
	Boston Canyon Cr.	Mouth to headwaters	
	Coonskin Cr.	Mouth to headwaters	
	Cottonwood Cr.	Mouth to headwaters	
	Line Cr.	Mouth to headwaters	
	Little Beaver Cr.	Mouth to headwaters	
	Lost Pin Cr.	Mouth to headwaters	
	McKay Cr., NF	Mouth to headwaters	
	Meacham Cr.	East Meacham Cr. to headwaters	
	Mill Cr.	Mouth to headwaters	
	Mission Cr.	Mouth to headwaters	
	Moonshine Cr.	Mouth to headwaters	
	Rail Cr.	Mouth to headwaters	
	Sheep Cr.	Mouth to headwaters	
	Twomile Cr.	Wildhorse Creek to Forks	
Turbidity	Umatilla River	Mouth to Mission Creek	>30 NTU
pH	Umatilla River	Highway 11 bridge site (RM 57.1)	
	Umatilla River	Yoakum bridge site (RM 37.2	
(*summer*)	Willow Cr.	Mouth to Willow Cr. Lake	
Nitrate	Wildhorse Cr.	Mouth to headwaters	>10mg/L
	Spring Hollow Cr.	Mouth to headwaters	>10mg/L
Ammonia	Lower Umatilla R.	Mouth to RM 5	
	North Hermiston Dam	Mouth to headwaters	
Bacteria	McKay Cr. – Summer	Mouth to McKay Reservoir	
	McKay Cr. – Fall/winter/Spring	Mouth to McKay Reservoir	
	Umatilla R. - Summer	Mouth to Speare Canyon	
	Balm Fork Willow	Willow Cr. Lake to headwaters	

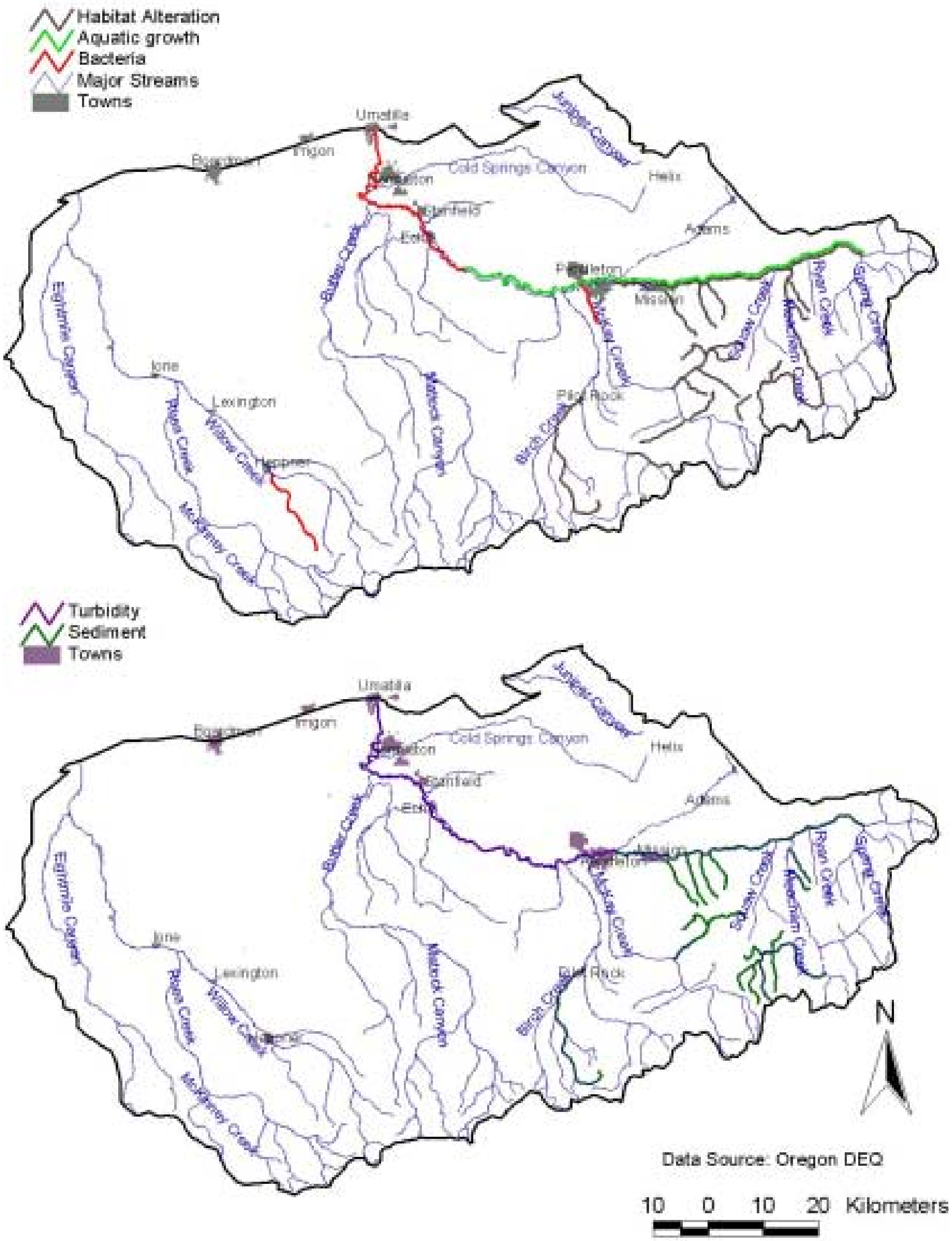

Figure 15. Stream segments in the Umatilla subbasin listed on the Oregon State 303(d) list

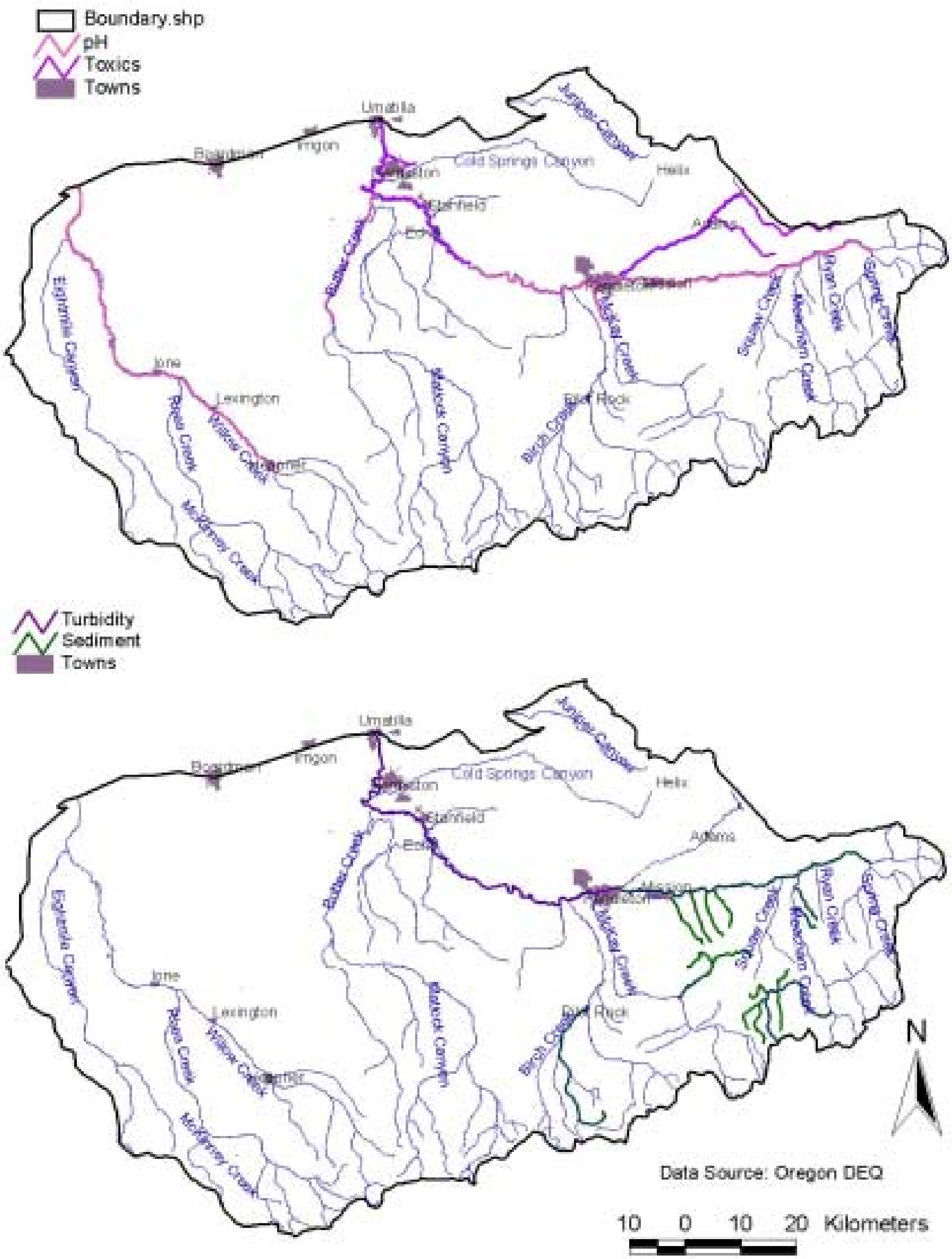

Figure 16. Stream segments in the Umatilla subbasin listed on the Oregon State 303(d) list (continued)

Temperature: The basic absolute criterion is ≤ 64°F (17.8°C). Two exceptions exist: when salmonid spawning, egg incubation, and fry emergence for native fish occur, standards for the specific times of use are ≤ 55°F (12.8°C); and when the waters support bull trout the standards are ≤ 50°F (10.0°C) (Boyd et al. 1999).

Dissolved Oxygen (DO): For water bodies providing salmonid spawning during periods from spawning until fry emergence from the gravels, the following criteria apply: DO shall not be less than 11.0 mg/l, but if the minimum intergravel DO measured as a spatial median is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, DO levels shall not be less than 95% of saturation. For water bodies identified by the Oregon Department of Environmental Quality (ODEQ) as providing cold-water aquatic life, the DO shall not be less than 8.0 mg/l as an absolute minimum. The DO level for cool-water aquatic life shall not be less than 6.5 mg/l. The minimum DO level for warm-water aquatic life is 5.5 mg/l.

Turbidity (Nephelometric Turbidity Units, NTU): No more than a 10% cumulative increase in natural stream turbidities are allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. In special situations (construction, emergencies) the NTU limit can be exceeded provided turbidity control techniques have been implemented and affected agencies have given authorization. A specific turbidity target of 30 NTU was developed for the Umatilla basin TMDL (ODEQ 2000).

pH (hydrogen ion concentration): pH shall not fall outside the range of 6.5 to 9.0. The ODEQ will determine if any pH values higher than 8.7 are anthropogenic or natural in origin. Where it is proven that any waters impounded by dams existing on January 1, 1996 would not have a pH exceedance if the impoundment was removed, exceptions will be made.

Bacteria standard: A 30-day log mean of 126 *E. coli* organisms per 100 ml based on a minimum of five samples; or no single sample shall exceed 406 *E. coli* organisms per 100 ml.

Temperature

Water temperature is a concern throughout most of the Umatilla/Willow subbasin from May until early November, when low flows exacerbate the problem. On the 1998 303(d) list, 287 miles of the Umatilla subbasin were listed as impaired for elevated water temperatures including the entire mainstem Umatilla River (Oregon Department of Environmental Quality et al. 2000). The highest water temperatures have been recorded in late July and early August when ambient air temperatures are high. During this period, the Umatilla River warms rapidly from the headwaters to the mouth, reaching sub-lethal (64°F to 74°F) and incipient lethal temperatures (74°F to 80°F) for its entire length (Boyd et al. 1999). Most of the tributaries where temperature data were collected also reached sub-lethal and incipient lethal ranges for salmonids (Boyd et al. 1999).

The basin's coolest mid-summer recorded temperatures are in the North Fork of the Umatilla River and Mission Creek, where maximum summer temperatures are usually below 60°F, not exceeding the state standard of 64°F (T. Shaw, CTUIR, personal communication, February 19, 2001). The South Fork of the Umatilla River experiences higher summertime temperatures often above 64°F, though rarely above 70°F. Data indicate a significant increase in temperature from the Umatilla River east of the Gibbon site (RM 80.0) to the Umatilla River at Cayuse Bridge (RM 69.4).

Significant differences in summer water temperatures occur in the North Fork Umatilla (high 50s) and the Meacham drainage (high 60s). The elevated temperature in Meacham Creek causes a 5 degrees Fahrenheit increase in the mainstem Umatilla River. The increase in temperature at Cayuse Bridge (RM 69.4) is attributed to the thermal load from Meacham Creek.

The Wildhorse drainage regularly experiences excessive summertime stream temperatures throughout the entire stream length. Headwaters often exceed 70˚F for long periods in the summer, while lower Wildhorse Creek can often experience stream temperatures exceeding 85˚F.

Sediment and Turbidity

The Umatilla River produces large amounts of sediment, much of which originates from the weathered basalt and unconsolidated loess deposits--the dominant geology in the basin. The primary sources include both bank and upland erosion of tributaries and tributary watersheds (respectively), both of which may be accelerated by land uses (Oregon Department of Environmental Quality 2000). The dominant erosion processes in the subbasin are surface erosion by sheetwash, rills and gullies, and bank erosion (Oregon Department of Environmental Quality 2000). Peak sedimentation usually occurs during rainstorms or snowmelts associated with freeze and thaw periods (Confederated Tribes of the Umatilla Indian Reservation 1990).

Neither EPA nor the State of Oregon has established numeric water quality standards for suspended solids or streambed fines. Umatilla Basin fisheries managers, however, determined through basin-specific knowledge and literature review that a 30 nephelometric turbidity units (NTU's) instream turbidity (not to exceed a 48-hour duration) standard will protect aquatic species (Oregon Department of Environmental Quality 2000). The 30 NTU target was correlated to total suspended solids (TSS) data to derive watershed target concentrations/loading capacities. Streams or watersheds in excess of this value were placed on the 303(d) list for standards violation.

One of the sediment-impaired stream segments that significantly deviated from the target standard was Wildhorse Creek (at its confluence with the Umatilla River), which had a peak turbidity value of over 5,000 NTU measured on April 23, 1997. High levels were also measured in McKay Creek. Wildhorse Creek turbidity mainly results from spring runoff, while McKay's turbidity is mostly a result of bottom withdrawal of water from the reservoir for flow augmentation. Composite samples of turbidity, collected at various stations during the winter of 1997-1998, show that Tutuilla, Birch, and five sites on the Umatilla mainstem exceeded standards on numerous occasions (Oregon Department of Environmental Quality 2000).

Embeddedness appears to be a problem (over 25%, identified by Chapman and McLeod in 1987 as a conservative estimate) in rearing habitat in two reaches of the upper Umatilla, both in the North Fork. In Meacham Creek, embeddedness has been measured at over 50% in 13 reaches. Surveys conducted by ODFW and CTUIR (Boyd et al. 1999) show that 19 of 42 stream reaches had fine sediment as the dominant substrate. The least managed watersheds typically had the lowest levels of embeddedness (Umatilla National Forest 2000).

pH: Elevated summer temperatures, excessive algal (periphyton) growth, and attendant increases in pH are common during summer months in the upper Umatilla River as it flows from the North and South Fork (forks) of the Umatilla to the Highway 11 Bridge at RM 57.1 (Oregon Department of Environmental Quality 2000). Median pH at Reith Bridge (RM 49.0), decreases with the hypolimnetic releases of water from McKay Reservoir, but then increases downstream at Yoakum Bridge (RM 37.2) (Oregon Department of Environmental Quality 2000). Elevated summertime temperatures and excessive algal growth are likely contributing to high pH levels recorded in Willow Creek, from the mouth upstream to Heppner.

Nitrate: The two stations (Spring Hollow Creek, a tributary to Wildhorse Creek, and Wildhorse Creek) for which nitrate standards are in violation have concentrations (>10 mg/L), which violate general criteria set for public water supplies. Concentrations at these stations may represent a serious health concern for infants and pregnant or nursing women (Oregon Health Division, Environmental Toxicology Section 1990 cited in Oregon Department of Environmental Quality 2000).

Nitrates show up in very low concentrations (<0.10 mg/L total Nitrate) in the upper subwatersheds, slightly elevated levels (<0.40 mg/L) in the middle Umatilla subwatershed, 0.20 – 1.50 mg/L in McKay Creek (downstream of dam), 0.20 – 4.10 mg/L (mostly 0.30 – 0.90 mg/L) in the lower Umatilla subwatershed, and 0.60 – 6.10 at Umatilla RM 2.1 (Purser 1994).

Nitrate levels in many parts of the Lower Umatilla Basin (hereafter LUB) exceed federal drinking water standards of nitrates-nitrogen concentrations of 10mg/l. Elevated nitrate levels can cause potentially fatal blood disorders in infants known as methemoglobinemia or Blue Baby Syndrome. The presence of high nitrates also indicates the presence of other contaminants in the soil and groundwater, including pesticides and microorganisms. High levels of nitrates are also of concern in the LUB as it is a high flood prone area and numerous private wells could be contaminated due to flooding. Due to high concentrations of nitrates-nitrogen levels in the groundwater, DEQ declared the LUB a Groundwater Management Area.

In 1997, in accordance with the Oregon Groundwater Protection Act, the ODEQ declared portions of Morrow and Umatilla Counties (Boardman and Irrigon vicinity) as the Lower Umatilla Groundwater Management Area, commonly known as the Lower Umatilla Basin (LUB). ODEQ and the Oregon Department of Agriculture (ODA) have the responsibility for the progress and success of the Lower Umatilla Groundwater Management Area Action Plan. The Umatilla and Morrow County Soil and Water Conservation Districts (SWCDs) are the primary entities overseeing implementation of this plan. A memorandum of agreement (MOA) was developed between the SWCDs, ODEQ and ODA. Activities associated with the plan include education and public awareness, cataloging information, developing an implementation strategy, identifying accepted systems of Best Management Practices (BMPs), compiling all existing data, developing and implementing specific plans related to groundwater improvements, identifying data gaps and documenting results.

Ammonia: Most reaches in the basin have low levels of ammonia (less than 0.1 mg/l). Exceptions include the Lower Umatilla River and North Hermiston Drain, which are in violation of EPA ammonia standards, primarily because of excessive temperatures and pH during the summer months (Oregon Department of Environmental Quality 2000). Other problem areas include Butter Creek, where ammonia concentrations have been measured at 0.3 to greater than 0.4mg/L (Oregon Department of Environmental Quality 1998).

Bacteria: Most reaches and tributaries of the Umatilla River upstream of Pendleton have low levels of *E. coli* bacteria (less than 150 per 100 ml). Areas in the subbasin with high *E. coli* counts include the middle reaches of Wildhorse Creek (450 to 600 per 100 ml), the Umatilla River near and downstream of the city of Pendleton (greater than 600 per 100ml), and the lower and middle reaches of Butter Creek (greater than 600 per 100 ml) (Oregon Department of Environmental Quality 1998). Bacteria levels are also high in the Balm Fork of Willow Creek.

Phosphorus and Orthophosphorus: Moderate to high (0.1 mg/l to 0.4 mg/l) total phosphorus levels occur in all water bodies upstream of Pendleton. Phosphorus increases dramatically from Pendleton downstream to Birch Creek (greater than 1.6 mg/l). Wildhorse Creek is another source of phosphorus to the Umatilla mainstem, contributing from below 0.4 mg/l to over 1.6 mg/l. High concentrations of phosphorus (O.8 mg/l to 1.6 mg/l) also occur in the lower reaches of Birch Creek downstream of Pilot Rock (Oregon Department of Environmental Quality 1998). Low concentrations of phosphorus (below 0.4 mg/l) occur in the lower mainstem of the Umatilla River from Birch Creek to Hermiston. Downstream of Hermiston, phosphorus concentrations increase to levels between 0.8 mg/l to 1.6 mg/l and then decline as the river reaches the Columbia River (0.4 mg/l to 0.8 mg/l) (Oregon Department of Environmental Quality 1998). Orthophosphorus levels throughout the Umatilla River basin are generally low (0.05 mg/l to 0.10 mg/l). Exceptions occur at the mouth of Butter Creek and in the Umatilla mainstem downstream of Hermiston, where concentrations increase to greater than 0.20 mg/l (Oregon Department of Environmental Quality 1998).

Vegetation

At one time grasslands occupied an extensive area in eastern Oregon. The major dominants included bunch grasses such as bluebunch wheatgrass, sheep fescue and giant wild rye (Shelford and Hanson 1947). The native grasses offered high quality grazing for livestock. During the droughts of the 1930’s one cattleman remarked, “when the first settlers came to the country there was an abundance of fine grass. The valleys were covered with tall meadow grass that was cut and stored for winter feed. The open hillsides all had a heavy stand of bunchgrass and scarcely any sagebrush” (Ewing, 1938). He later stated that it was now all cheatgrass and scablands. Remnant strips of the grassland steppe vegetation still exist throughout farmed areas, but are generally confined to areas inappropriate for farming.

According to Houle (1995), roots of indigenous bunchgrasses in the Palouse Region of southeastern Washington and northeastern Oregon, can extend 25 feet or deeper into the earth, and some of the deep root stalks live over 100 years. Such characteristics make native grasses instrumental in developing soils, controlling soil erosion, conserving water and providing wildlife habitat. Native bunchgrasses produce from seed, not by runners or rootstalks. Many native grass communities in the Umatilla subbasin have been lost because the plants were unable (they were burned, over-grazed, mowed, plowed or irrigated) to mature and spread seed. The combined stress of grazing and fire has allowed rabbitbrush (*Chrysothamnus nauseosus*) and cheatgrass (*Bromus tectorum*) to invade and dominate this association, rapidly reducing the cryptogamic crust (Poulton 1955).

As elevation increases, the grasslands intermingle with shrub/scrub plants, eventually grading into coniferous forests in the foothills of the Blue Mountains. As of December 1988, 21 sensitive plant species were located during a survey of 25% of the Umatilla National Forest (Umatilla National Forest 1990) (Table 4). Riparian vegetation on the mainstem Umatilla River and many tributaries is in poor condition, with approximately 70% of 422 miles inventoried identified as needing riparian improvements (United States Fish and Wildlife Service and National Marine Fisheries Service 1982). Riparian vegetation in the Willow Creek subbasin is estimated at less than 25% of historic levels (Environmental Protection Agency, Enviromapper, 1998). Figure 17 shows the vegetative cover types occurring throughout the Umatilla and Willow subbasins.

Table 4. Sensitive plant species on the Umatilla National Forest (Umatilla National Forest 1990).

Common Name	Scientific Name
Sierra onion	*Allium campanulatum*
Blue Mountain onion	*A. dictuon*
Swamp onion	*A. madidum*
Flat-leaved onion	*A. tolmiei var. platyphyllum*
Arctic Aster	*Aster sibiricus var. meritus*
Arthur's milkvetch	*Astragalus arthuri*
Transparent milkvetch	*A. diaphanus var. diaphanus*
Moonwort grape-fern	*Botrychium lunaria*
Pond sedge	*Carex limnophila*
Utah thistle	*Cirsium utahense*
Male fern	*Dryopteris filix-mas*
Sabin's lupin	*Lupinus sabinii*
Stiff clubmoss	*Lycopodium annotinum*
Bank monkey-flower	*Mimulus clivicola*
Washington monkey-flower	*M. washingtonensis*
Common twinpod	*Physaria didymocarpa var. didymocarpa*
Blue Mountain buttercup	*Ranunculus oresterus*
Umatilla gooseberry	*Ribes cognatum*
Wenaha current	*R. wolfii*
Scapose catchfly	*Silene scaposa var. scaposa*
Subalpine spiraea	*Spiraea densiflora var. splendens*

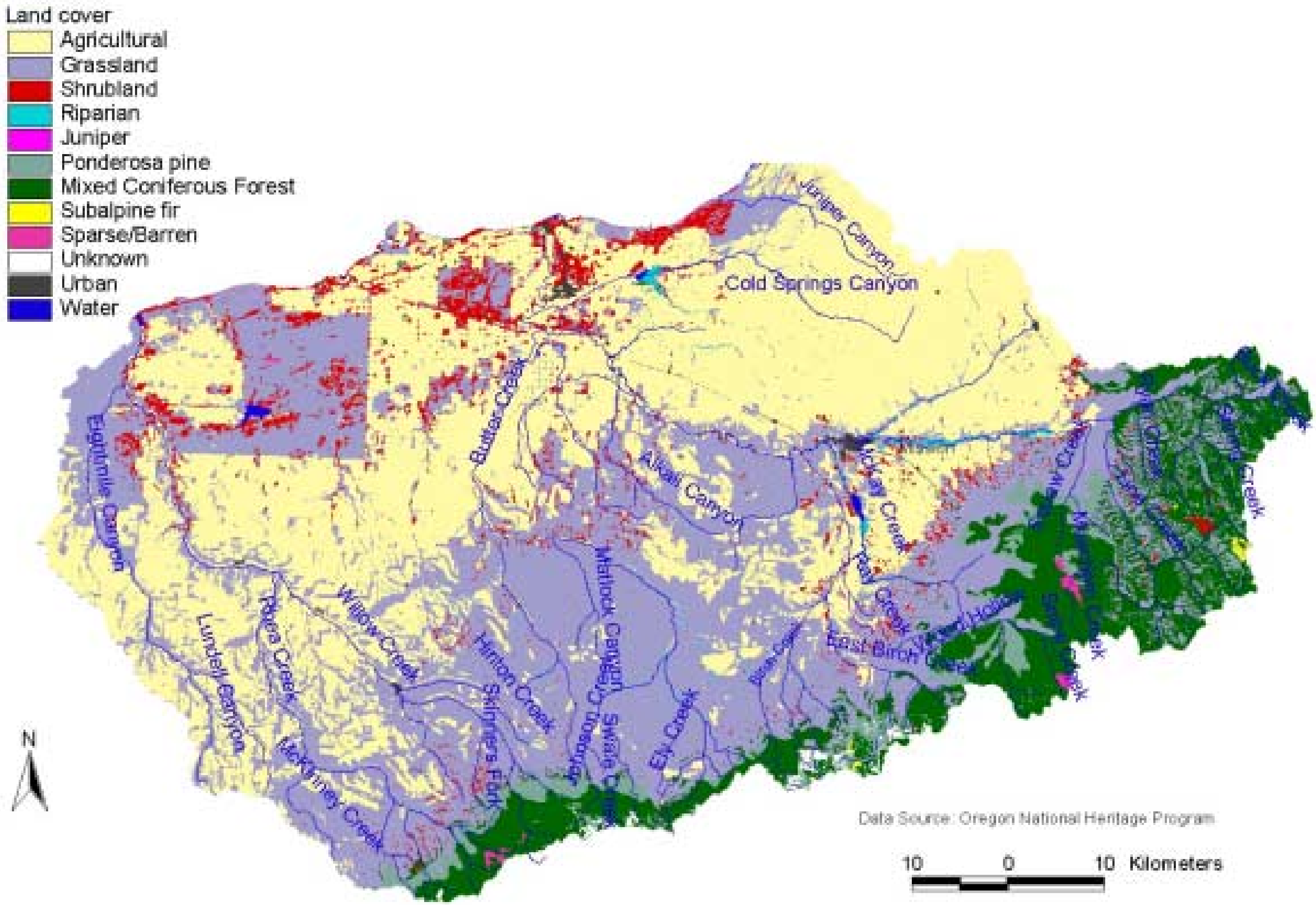

Figure 17. Land cover types occurring throughout the Umatilla/Willow subbasin

Major Land Uses

Land Ownership

The majority of land in the Umatilla subbasin is privately owned (Table 5). Thirty-seven percent of the drainage is managed by federal agencies, including the U. S. Forest Service, which manages over 90% of federally owned lands. Other landowners in the subbasin include the State of Oregon, Umatilla County, cities, and the Umatilla Indian Reservation, much of which is privately owned (Figure 18) (Confederated Tribes of the Umatilla Indian Reservation 1990).

Table 5. Land ownership and percentage of area owned in the Umatilla/Willow Subbasin.

Land Ownership	Land Area Owned (acres)	Percentage of Total Area
Private Land[1]	2,154,827	82.37
U. S. Forest Service	200,213	7.65
Bureau of Land Management	14,000	0.54
Corps of Engineers	591	0.02
Department of Defense	66,563	2.54
U. S. Fish & Wildlife Service	4,558	0.17
Umatilla Indian Reservation[1]	172,000	6.57
State of Oregon	3,414	0.13

[1] *includes non-Indian owned land on the Confederated Tribes of the Umatilla Indian Reservation*

The Bureau of Indian Affairs (BIA) estimated the total resident Indian population on or near the Reservation at more than 2,400 in 1998 (including Indians enrolled with other Tribes). The August 1998 CTUIR membership numbered 2,140 members living on and off Reservation lands. The Reservation is also home to about 1,700 non-Indians. Federal legislation in the late 1800's reduced the Reservation from 245,699 acres to its current total of approximately 172,000 acres (including 158,000 acres on the principal Reservation and 14,000 acres on the South Reservation, including portions in the upper Grande Ronde subbasin) (Confederated Tribes of the Umatilla Indian Reservation 2000). Current landownership within Reservation boundaries includes 12,041 acres owned by the Tribal government and 71,757 acres retained in trust by Tribal members (L. Broncheau, CTUIR, personal communication, February 2001). Non-Indians own the majority of remaining lands on the Reservation. The Dawes Allotment Act of 1887 allotted 100,000 acres on the Reservation to non-Indians (Confederated Tribes of the Umatilla Indian Reservation 1996).

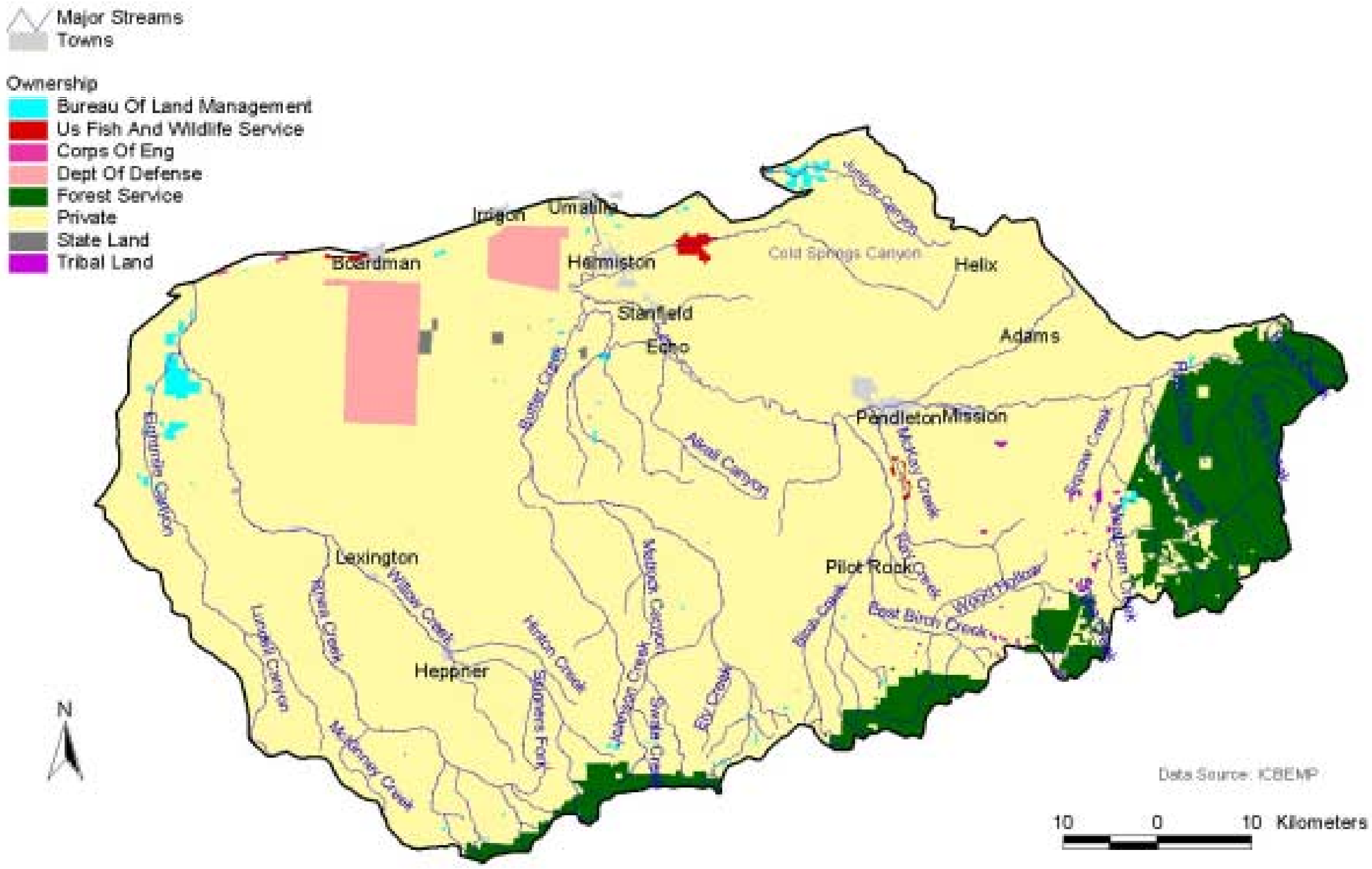

Figure 18. Land ownership in the Umatilla/Willow subbasin

Land Use

The economies of Umatilla and Morrow Counties are largely natural resource-based, with the majority of the land used for agricultural purposes, as defined by the proportion of the total area designated as cropland and pasture (Figure 19). The acreage defined as rangeland or forestland comprises the remaining area of the subbasin, supporting both the livestock and timber industries. Agricultural land, both dryland and irrigated, comprise about 42% of the Umatilla Basin area (Umatilla Soil and Water Conservation District 2001). Rangeland and range-forest transition areas account for another 42%, and the remaining portion of the basin is approximately 13% forest and 3% urban and developed areas (Umatilla Soil and Water Conservation District 2001).

Agriculture

Farming is no longer among the largest sectors of the economy in either county, and is the slowest growing portion of the local economy, accounting for no more than 5% of county earnings in 1997 (U.S. Bureau of Census et al. 2000). Although farming is not one of the largest income producing industries in either county, it is still the most prevalent land use (Figure 19).

Economically, the Umatilla Basin is regarded as one of the state's major agricultural centers. Umatilla County ranks second in the state in agricultural commodity sales at $275 million (Umatilla Soil and Water Conservation District 2001). Wheat and other grains are the major commodities, followed by cattle and potatoes. Hay and vegetables are also large contributors with vineyards, canola, and other alternative crops emerging as new commodities (Table 6). Currently 10-15% of the cropland has been retired from crop production, enrolled in the Conservation Reserve Program and seeded to grass, shrubs and trees (Figure 20). The timber industry has declined dramatically in recent years primarily due to harvest reductions on national forest lands. Food processing, mainly located in the lower basin, has continued to expand.

Table 6. U. S. census data for crop production in Umatilla County (Bureau of Census et al. 2000).

Umatilla County	1987	1992	1997
Total Cropland (acres)	738,377	708,209	706,872
Harvested Cropland (acres)	372,197	381,564	404,545
Irrigated Land (acres)	111,657	116,001	128,658
Wheat (acres)	227,108	268,523	263,624
Barley (acres)	34,130	12,134	16,354
Oats (acres)	1371	111	108
Hay-alfalfa, silage (acres)	155,555	110,734	163,698
Vegetables (acres)	35,881	33,744	39,656
Orchards (acres)	4853	5079	4840

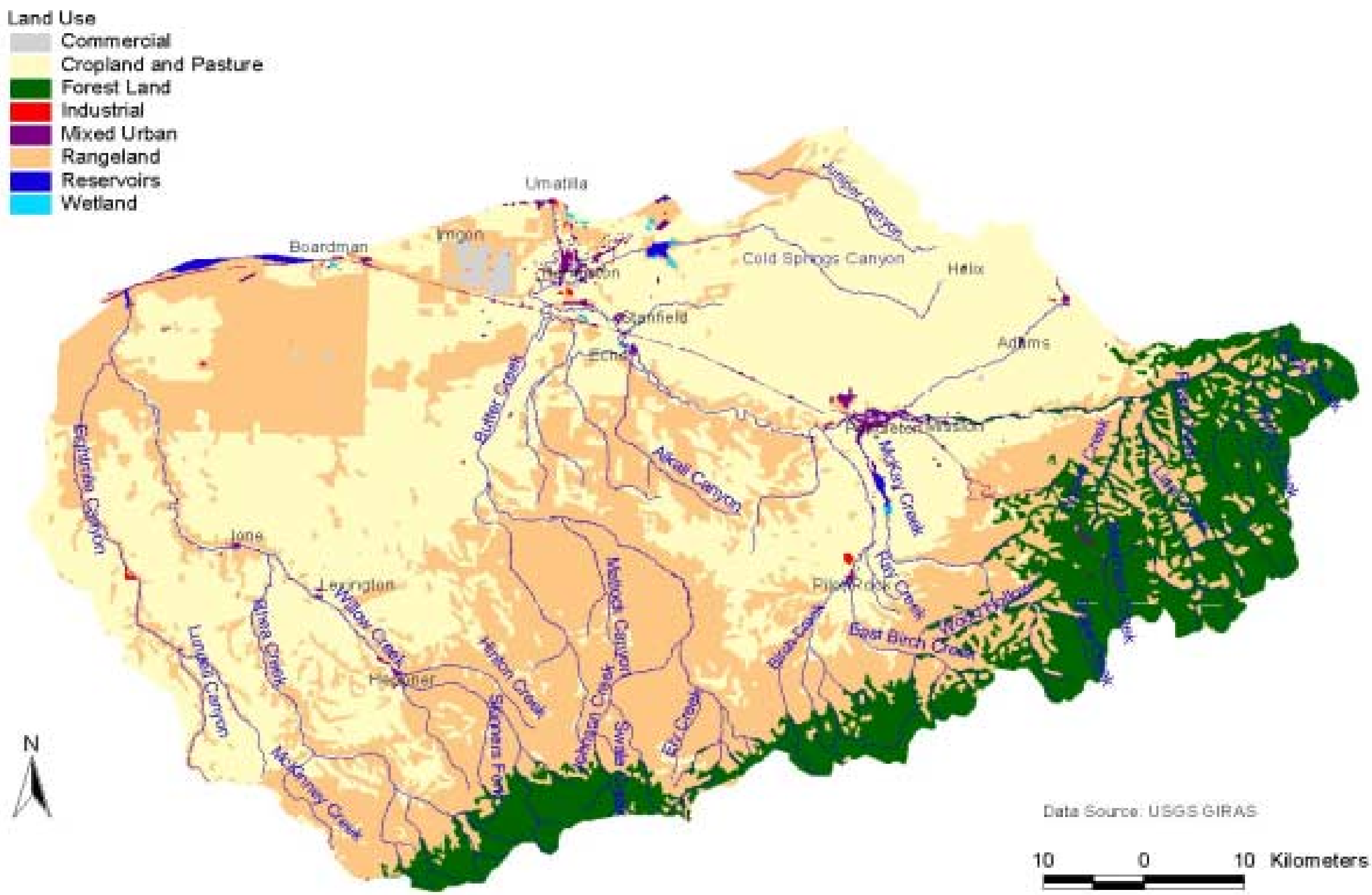

Figure 19. Land use in the Umatilla/Willow subbasin

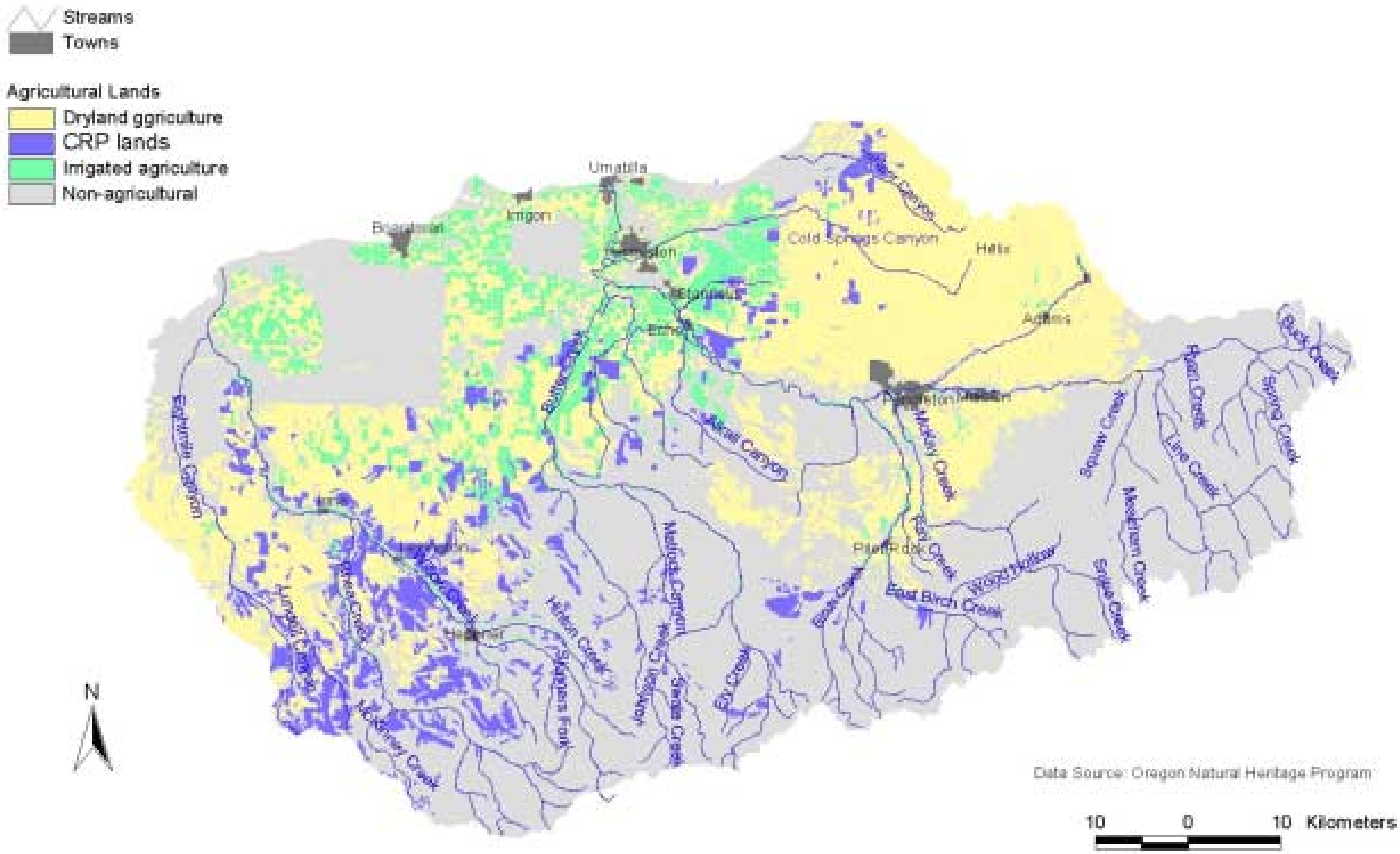

Figure 20. Agricultural lands within the Umatilla/Willow subbasin

While the total acreage dedicated to cropland has decreased over the past fifteen years, the amount of harvested land has increased. The total value of crops has also steadily risen. This has resulted from increases in irrigation and a shift by farmers to higher value crops (U.S. Bureau of Census et. al. 2000). Irrigated crops grown in the lower basin include alfalfa, small grains, mint, corn, potatoes, onions, watermelons and asparagus (USDA Soil Conservation Service 1988). Cropland agriculture within the Umatilla Subbasin can be divided into two distinct categories: irrigated and non-irrigated. Irrigated crop farming extends from above Three Mile Falls Dam at RM 4 upstream to the mouth of McKay Creek at approximately RM 51, including portions of the Butter, Birch and McKay Creek Drainages. A few water withdrawals for agricultural crops do occur upstream of McKay Creek and the city of Pendleton. Dryland crop farming occurs primarily in the mid Umatilla Watershed, in general from the mouth of McKay Creek upstream to the vicinity of Cayuse on the Umatilla Indian Reservation, and within the Tutuilla/Patawa and Wildhorse Creek subwatersheds (Figure 20).

The primary non-irrigated crop practices occurring within the basin include small grain-pea rotations and winter wheat/summer fallow operations (Shaw and Sexton 2000). Some of the most productive agricultural soils in the Umatilla Subbasin occur within the Wildhorse Creek watershed, more specifically within the Greasewood, Sand Hollow, Gerking and Spring Hollow Creek Drainages (Shaw and Sexton 2000). According to the *Soil Survey of Umatilla County Area, Oregon* (1988) many of the properties located within these drainages 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 (USDA, Soil Conservation Service 1988).

The high fertility of this region has been extensively exploited, resulting in considerable resource impacts. Erosion of topsoil from this area, primarily during winter months, results from current farming practices. Poor agricultural practices common throughout the subbasin include farming in public right-of-ways, failing to leave crop residue or maintain tilth, lack of contour plowing and cultivation, and the absence of terraces, water diversions, or grass waterways (Shaw and Sexton 2000). Eroded soils are deposited into roadside ditches and waterways. Vast wetland areas within the Greasewood Creek, Sandhollow Creek and Gerking Creek drainages have been converted to traditional wheat-fallow rotations. Farmers in these areas have removed nearly all upland and riparian vegetative cover and restricted streams to single “ditches” in an effort to maximize crop production and control seepage and alkali. One elderly resident remembered these systems supporting major waterfowl populations and believes that waterfowl use has shifted to irrigation circles in the lower basin (T. Shaw, personal communication, February 2001). Natural Resource Conservation Service (NRCS) personnel estimate that as much as 130 tons/acre of top soil erode annually from cropland fields in the Greasewood Creek Drainage (B. Adelman, Natural Resource Conservation Service, personal communication January 1996), a 20,452 acre area where croplands comprise 98 % of the area. While a few farmers implement soil saving measures within the Wildhorse Creek watershed, most fail to apply conservation-based agriculture, resulting in high rates of erosion.

The largest dryland crop erosion problems in the Umatilla subbasin result from traditional winter wheat/summer fallow operations. Michael Stoltz (1999), former Umatilla County – Oregon State University Agriculture Extension Agent, indicated that tremendous soil erosion from dryland wheat areas occurs due to the summer fallow cropping system using the moldboard plow. The winter wheat/summer fallow monoculture cropping system of Oregon's Columbia basin in 9" to 20" rainfall zones is not sustainable, either biologically or economically (Rasmussen et al. 1993). According to the Agricultural Research Service and Natural Resources Conservation Service (NRCS), this cropping system is subject to tremendous water erosion problems, especially when rain falls on frozen soils. Summer fallow has decreased the soil organic matter to half or less of its original levels under native grassland, contributing to erosion and crusting problems after seeding dryland crops. Annual cropping, compared to winter wheat/fallow, saves approximately six tons of soil per acre on sixty bushels of winter wheat per acre land and three tons per acre on 45 bushels per acre land. No till annual cropping reduces soil erosion to near zero per acre (NRCS RUSLE formulas; Stoltz 1999).

Many of the soil conservation approaches encouraged today are not new concepts. Bennett (1947) recognized as early as the 1930's in wheat areas that, "fair to good control of erosion can be obtained by plowing down stubble (rather than burning it) in such a way that part of the straw protrudes above the ground, affording considerable surface protection, especially against wind". Some early local pioneers recognized that such practices provided benefits over 100 years ago. A June 16, 1890 newspaper account regarding wheat farming within the Wildhorse Creek Drainage states, "T.H. Lacefield, who has returned from a tour of the Adams neighborhood, says that the farmers are this year learning a practical lesson—not to burn their stubbles. These catch and hold the snow, preventing it from being blown from the soil, and more moisture is thus secured. The places where snow had drifted during the winter were easily distinguishable by the better growth and condition of the grain." (Adams Ladies Club, 1993). Major steps need to be taken to improve dryland crop practices and to reduce impacts to resources from traditional methods.

A variety of United States Department of Agriculture (USDA) incentive programs are currently available to crop growers through the local NRCS and county Farm Service Agency (FSA) offices. Payments to growers with commodity crops have been, and still are a significant part of most farm budgets. Commodity crops are commonly defined as annually cropped food and fiber crops. Resource treatment options as a requirement for federal payments has varied greatly.

Prior to 1985, deficiency payments had limited conservation requirements. Set-aside or non-cropped acres had a minimum cover requirement; cropped acreage had no conservation requirement. Conservation Practices were implemented under what was called the "Agricultural Conservation Program" (ACP). ACP made cost share available for individual practices. These practices included grass waterways, tree plantings, ponds, terraces, and other conservation practices. ACP is no longer available.

Currently, the "Environmental Quality Incentives Program" (EQIP) offers limited cost-share funds. Under this program growers are contracted to install a conservation system of practices, rather than an individual practice. The conservation needs are evaluated on a total farm basis. Contracts are awarded on a bid basis. While this can be a good buy for USDA, EQIP has had limited grower acceptance. This is partially due to a lack of funding for EQIP at the federal level.

The most significant federal agriculture program in Umatilla County over the past 15 years has been the "Conservation Reserve Program" (CRP). Under this program, growers get paid on an annual per acre basis to retire and set aside cropland areas. Contracts can be from ten to 15 years depending on specific practices involved. There are two types of sign-ups; a standard sign-up, which is on a bid basis, and during a designated sign-up period; the other option is a special practice sign-up, which can occur at any time. The special practice sign-up is for specific areas and often includes native grasses, trees, and shrubs. The CRP program has achieved significant conservation and wildlife habitat benefits. Within Umatilla County, nearly 100,200 acres are currently under this program or soon to be placed under the program. This makes up one-seventh of all cropland areas in Umatilla County (Figure 20). In addition to grass cover, more than 1,400 acres of trees and shrubs have been planted under Continuous CRP funding (Table 7).

Table 7. Umatilla County practices in acreage from 1986-2001 (U. S. Department of Agriculture 2000)

County	Conservation Reserve Practice	Activity Acres
Umatilla	established grass	47,536.4
	introduced grasses	32,597.3
	native grasses	14,076.1
	tree planting	853.5
	established trees	870.5
	wildlife habitat	9,971.9
	wildlife food plots	75.2
	grass waterways	44.9
	filter strips	1,071.3
	riparian buffers	185.5
Morrow	established grass	79, 666.1
	introduced grasses	33, 881.9
	native grasses	63.8
	field windbreaks	39.8
	wildlife food plots	17.5
	contour grass	10.3
	filter strips	522.4
	riparian buffers	28.8

Other conservation-based programs include the Direct Seeding Program. The program is a partnership between the Umatilla County Soil and Water Conservation District (SWCD), Oregon State University (OSU) – Umatilla County Extension Service, EPA, ODEQ, and Oregon Watershed Enhancement Board (OWEB). The Direct Seeding Program provides growers with an incentive payment of $10 per acre for up to 200 acres per producer, up to three crop rotations per entity. The fall 1997-spring 1998 program served 25 growers and 3800 acres of incentive payments, fall 1998 - spring 1999 program served 27 growers and 4300 acres of incentives, and the fall 1999 - spring 2000 program served 41 producers and 11,580 acres of incentives. An additional five growers agreed to a long-term demonstration cropping system over a period of five years on 726 acres during 1999-2000. The total incentives paid over this period of time are over $154,000 with an additional 59,000 acres of direct seeding without incentives. The current program is funded through 2001.

As elsewhere in the United States, farm sizes in the Umatilla Subbasin are increasing, while the numbers of farms are decreasing. Economy of scale is forcing the smaller family owned and operated farms to sell out to their larger neighbors.

While some small farms have managed to survive by targeting niche markets, the large-scale operations control the most land (Table 8). These large-scale operations also exercise more influence on agricultural policy. The difference in average farm size between Morrow and Umatilla Counties is a factor of climate. The climate in Morrow county is more suited to growing grain crops, whereas the growing season in Umatilla county is shorter and more suited for production of rangeland vegetation and diversified crops (U. S. Bureau of Reclamation 1954).

Table 8. U. S. census data for farms in Umatilla and Morrow Counties (Bureau of Census et al. 2000).

1997 Census of Agriculture	**Umatilla County**	**Morrow County**
Number of Farms	1,488	420
Land in Farms (acres)	134,5097	1,118,226
No. of Farms (1-9 acres)	340	46
No. of Farms (10-49 acres)	383	58
No. of Farms (50-179 acres)	213	54
No. of Farms (180-499 acres)	139	41
No. of Farms (500-999 acres)	114	33
No. of Farms (>1000 acres)	299	188
Average Size of Farms (acres)	904	2662

Timber

In the Umatilla subbasin, 94% of lands managed by the Umatilla National Forest (UNF) support a mixed forest. Predominant conifer species include ponderosa pine, Douglas fir, grand fir, white fir, sub-alpine fir, western larch, Englemann spruce, and lodgepole pine. According to Langston (1995), millions of acres in the Blue Mountains have changed from predominant ponderosa pine forests to fir-dominated forests. On the Umatilla National Forest, ponderosa pine was 34% of tree volume in 1931, and only 16% in 1981 (Langston

1995). Forty-three percent of the Umatilla National Forest was dominated by open pine stands in 1905 and in 1991 only a seventh of those forests remained pine (Langston 1994). A proportionately low percentage of Umatilla National Forest acres are harvested for timber; moreover, timber harvests have declined substantially over the past 20 years (Table 9).

Table 9. Timber sales in the Umatilla subbasin by UNF (Umatilla National Forest 2000)

Period of Harvest	Timber Sales (acres)	Harvest Rate (ac/yr)
1990-1994 (5 years)	4,091	818
1980-1989 (10 years)	17,572	1,757
1970-1978 (9 years)	26,374	2,931
1960-1969 (10 years)	6,963	693
1958-1959 (2 years)	983	492

Harvest primarily occurs in the North and South Forks of the Umatilla River, accounting for 32% of timber cut on the forest, and Meacham Creek, which constitutes an estimated 18% of the harvest (Umatilla National Forest 2000). This harvest has occurred on only 10% of the forested land since the early 1960's (Umatilla National Forest, 2000). Most of the timber sale activity occurs on slopes less than 30% (Umatilla National Forest 2000). The Umatilla National Forest has designated a large area surrounding the North Fork of the Umatilla River as a Wilderness Area, precluding it from further harvest activities.

Two of the subwatersheds occurring within the National Forest are designated as areas of concern due to extensive (greater than 15% of the forested area) clearcutting: Spring Creek (28.2%) and Upper Meacham/Wilbur subwatersheds (28.6%). Several other subwatersheds are of concern due to high road densities (over 2.0 miles/square mile): Upper North Fork of the Umatilla, Buck Creek, Thomas Creek, Spring Creek, Shimmiehorn Creek, Upper South Fork of the Umatilla; East Meacham and Owsley (Umatilla National Forest 2000). Forests retard runoff during heavy rains and periods of rapid melting of snows, and increase the amount of water that percolates into the ground. By decreasing runoff and increasing percolation, forested areas lower flood levels and raise low water levels (Whitaker, 1947). Historical timber harvests in steep headwater portions of the Umatilla subbasin, such as within the Wildhorse Creek watershed, has likely altered runoff rates by reducing riparian and water storage capacities (Shaw and Sexton 2000).

Historical harvests of ponderosa pines and suppression of fires by federal foresters have largely resulted in firs replacing ponderosa pines in eastern Oregon. When fires were suppressed in the open ponderosa pine forests, firs grew faster than pines in the resultant shade and soon dominated the forest (Langston 1995). The firs are not as resistant to insect attacks, and they provide far more fuel to sustain intense fires, killing entire stands of trees (Langston 1995). Historically, only light fires burned through open pines every 10 years or so, few fires resulted in major losses of timber (Langston 1995).

Range

In the early-1900's, the subbasin was intensively grazed by sheep. A 1908 advertisement in Sunset Magazine (http://cgi.ebay.com/aw-cgi/eBayISAPI.d11?ViewItem&item=504718931) indicated that in 1907 Umatilla County shipped 6,000,000 pounds of wool, marketed 185,000 sheep, and shipped 125,000 head of beef cattle (these numbers would have also included livestock from the Oregon portion of the Walla Walla subbasin). Cattle have since exceeded the number of sheep, and in 1990, comprised the majority of livestock grazed in Umatilla County (Figure 21). Some of the watersheds where grazing is the primary or secondary land use include Spring Hollow Creek, Mission Creek, Buckaroo Creek, Squaw Creek, McKay Creek, Moonshine Creek and Cottonwood Creek (Shaw and Sexton 2000)

Figure 21. Umatilla County livestock (Oliver et al. 1994). NOT PROVIDED

Although the value and apportioning of crops has been in flux over the past 15 years, the value of livestock has remained relatively stable (OSU 1997). A slow, steady increase in the numbers of livestock raised in Umatilla County is noteworthy, given the decline in red meat consumption in the U.S. (Table 10).

Table 10. Umatilla County Livestock Summary (Oregon State University, 1997)

Umatilla County	1994	1995	1996
Cattle	76,000	76,000	82,000
Sheep	98,000	105,200	105,200
Dairy	300	300	300
Hogs	1,200	1,200	1,200
Horses and Mules	3,800	3,800	3,800

The Forest Service has granted 17 grazing allotments in the Umatilla National Forest (Umatilla National Forest, 2000). Approximately 48,800 acres (33%) of the Umatilla National Forest is covered in grasslands, making it highly suitable for grazing. Over-grazing has had major impacts on native vegetation throughout the Umatilla subbasin. Problems associated with over-grazing have included (1) overstocking of pastures and range areas, reducing the total amount of native vegetation, (2) replacing native vegetation with plants of low forage value and (3) reduction of surface cover, resulting in increased surface and wind erosion (Shelford and Hanson 1947). For instance, in mid and low elevation portions of the Wildhorse Creek watershed, overgrazing of livestock and absence of pasture rotation plans have contributed to poor water quality and loss of floodplain function (Shaw and Sexton 2000).

According to Langston (1995), large sheep herds, which were common in Umatilla County by the mid-1880's, were not the cause of range destruction, but rather the result. Cattle had already overgrazed the range to the extent that sheep did far better under the poor range conditions because they required less water and forage to survive the harsh eastern Oregon winters. By the 1890's, native grasses, though naturally recuperative under conservative use, were partially destroyed by unregulated grazing by sheep as well as by cattle (Brown 1947). Large Tribal horse herds also likely impacted native grasses in the region. Early accounts of the Umatilla River country report that the Tribes owned a tremendous number of horse (Confederated Tribes of the Umatilla Indian Reservation 1996). Around 1870, according to early reports, one Indian chief owned a band of 5,000 horses (Harper, et al. 1948). As early as 1811, Wilson Price Hunt noted that there were 2,000 horses for 34 Indian families at just one winter encampment adjacent to the Umatilla River (Langston 1995).

Urban Development

Increasing farm sizes and efficiency require fewer people to work the land; however, the rise in manufacturing, processing, and job opportunities has resulted in a steady influx of people into Umatilla and Morrow counties. In 1995, the population of Umatilla County was 64,040, with a growth of 9% since 1985 (Bureau of Census et al. 2000). Morrow County is more sparsely populated, with a total resident population of 8,922 in 1995, but has a higher growth rate of 18% since 1985 (Bureau of Census et al. 2000). Table 11 shows general population data for cities occurring within the subbasin.

Development of homes, farm buildings and roads within the floodplain have straightened and confined stream channels in many portions of the subbasin, and have eliminated riparian vegetation (Shaw and Sexton 2000). In areas such as the lower McKay Creek and Mission Creek watersheds, residential land uses have encroached on the floodplain. When combined with other land uses, this has resulted in increased stream velocities, increased instream gravel movement, and has significantly reduced the amount of available fish and wildlife habitat.

Table 11. Population in the Umatilla/Willow subbasin (State of Oregon 2000; http://www.placesnamed.com/M/i/mission.asp)

City	Population									
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Adams	223	227	233	236	243	246	247	248	253	256
Athena	1014	1025	1045	1064	1077	1092	1094	1092	1106	1116
Boardman	1383	1479	1529	1630	1688	1781	1861	1969	2081	2220
Echo	501	507	516	525	533	540	546	550	569	588
Helix	150	151	156	158	159	163	162	163	165	166
Heppner	1425	1479	1493	1549	1555	1580	1600	1648	1695	1774
Hermiston	10386	10490	10684	10873	11023	11197	11420	11529	11872	12366
Ione	255	265	268	280	283	287	293	302	313	329
Irrigon	740	795	824	880	919	973	1022	1084	1149	1230
Lexington	273	286	292	306	309	320	326	339	353	372
Mission	664	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pendleton	15108	15236	15422	15597	15700	15777	15738	15768	15989	16190
Pilot Rock	1479	1491	1518	1539	1553	1567	1564	1556	1572	1582
Stanfield	1559	1585	1618	1652	1681	1709	1719	1724	1752	1773
Umatilla	3064	3098	3153	3208	3251	3292	3306	3317	3424	3540

Impoundments and Irrigation Projects

Two major storage reservoirs exist in the Umatilla subbasin: McKay Reservoir, which has a total active capacity of 73,800 acre-feet, and Cold Springs Reservoir, which has a total active capacity of 44,650 acre-feet (http://dataweb.usbr.gov/html/umatilla.html). Flows from the reservoirs are routed through six major Bureau of Reclamation project irrigation diversions located in the lower subbasin (Oregon Department of Environmental Quality 2000). These flows supply water to local irrigation districts, companies and non-incorporated groups, including the Stanfield Irrigation District (SID), Westland Irrigation District (WID), the Hermiston Irrigation District (HID), the West Extension Irrigation District (WEID), and the Teel Irrigation District (TID) (T. Justus, Oregon Water Resources Department, personal communication, February 2001).

The reservoirs were constructed in the early 20th century as part of the Umatilla Basin Project, which was designed to supply irrigation flows to irrigation districts during high-demand summer months. The project, however, dewatered the Umatilla River for several months each year and blocked fish passage. The Congressional Act of March 11, 1976 (90 Stat. 205, Public Law 94-288) reauthorized McKay Dam and Reservoir for irrigation, flood control, fish and wildlife resources, recreation, and safety of dams (http://dataweb.usbr.gov/html/umatilla.html). Following longstanding water disputes in the 1970's, Congress passed the Umatilla Basin Project Act on October 28, 1988 (102 Stat. 2791, Public Law 100-557). The Act provides a phased approach to restoring instream flows for anadromous fish in the Umatilla River by altering the existing Umatilla Basin Project (http://dataweb.usbr.gov/html/umatilla.html). Target flows were set for the lower reaches of the Umatilla River, and work has been completed on the inter-basin transfer of water for irrigation from the Columbia River. While it does not increase flows year-round, the Umatilla Basin Project does increase flows during critical salmon migration periods in the spring and fall. Phase I of the Umatilla Basin Project, completed in 1993, pumps water from the Columbia River to the WEID to assist when live flows in the Umatilla River drop below target values. In 1995, the first part of Phase II was completed. This pumps water from the Columbia River to satisfy the HID's winter water right for filling Cold Springs Reservoir when live flows drop below target values. The second part of Phase II began in 1999 and involved the SID. When live flows drop below target levels, Columbia River water is transferred to the SID, leaving the water reserved for the SID in McKay Reservoir for fisheries use. This amounts to 24,967 ac-ft of water for use in maintaining instream flow in the Umatilla River below McKay Creek. Phase III, involving the WID is currently under negotiation.

Habitat surveys by Contor (et al. 1997) document the effects of McKay Reservoir water releases on salmonid habitat suitability. Surveys determined that hypolimnetic releases of cool water during early summer months kept temperatures suitable for salmonids in areas between Westland dam and the McKay Creek confluence. The discharge, however, is not continuous during the summer, and water temperatures can become extreme when releases are stopped. In addition, warmer epilimnetic waters can be discharged upon the depletion of the hypolimnion, further contributing to unsuitable habitat conditions (Contor et al. 1997).

Similar to other subbasins that rely on diverted surface water for irrigation, the Umatilla has had problems with passage, entrainment, and injuries to fish at points of diversion (POD). In an effort to address this problem, outdated juvenile and adult fish passage facilities were reconstructed between 1988 and 1994 at five major irrigation dams on the lower Umatilla River. Reconstructions followed design standards set by the National Marine Fisheries Service (NMFS). Oregon Department of Fish and Wildlife (ODFW) conducted studies to evaluate screen efficiency and migration survival of juvenile salmonids between 1988 and 1994 (Knapp and Ward 1990, Hayes et al. 1992, Cameron and Knapp 1993, Cameron et al. 1994, 1995, 1997). From 1991 – 1995, most test fish passing through the updated bypass facilities and fish ladders with negligible injury ($P<0.10$) (Knapp 2000 in review). Between 1995 and 2000, subsequent evaluations identified salmonid outmigration survival (refer to Knapp et al. 1996, 1998a, 1998b, 2000).

Protected Areas

The vast majority of protected area acreage lies within the Umatilla National Forest. The most important of these is the North Fork Umatilla Wilderness Area, a 20,300 acre refuge, set aside to ensure high quality streams and wildlife habitat. Table 12 provides a summary of all protected lands within the Umatilla National Forest. While the reasons and methods of protection differ, each area is similar in that its unique characteristics merit special methods of preservation. Table 13 delineates those areas in the Umatilla subbasin protected and/or managed using a conservation strategy.

Table 12. Protective management designations and relative area for lands within the Umatilla National Forest. (Umatilla National Forest 2000)

Description	Total Acres	% Acres*
Management for Scenic and Recreation Purposes	7,617	16
Roaded Natural	156	<1
Developed Recreation (ski area, campgrounds)	552	<1
Old Growth	4,699	3
Wilderness	20,258	14
Wildlife Habitat	41,677	28
Riparian	1,671	1
Grass Tree Mosaic (harvest only if wildlife habitat is met)	61,470	41
Timber and Big Game (scheduled harvest, habitat emphasis)	8,368	6
High Ridge Evaluation Area	859	<1

Table 13. Areas in the Umatilla subbasin that are protected and/or are managed using a conservation strategy.

Site	Location	Acreage	Agency	Type of Protection/Management
Wilderness	North Fork Umatilla Wilderness Area	20,300	USFS	Managed as Wilderness
Wanaket	Above McNary Dam	2,700	CTUIR	NWPPC Wildlife Mitigation
Squaw Cr.	Umatilla Indian Reservation	7,021	CTUIR	NWPPC Wildlife Mitigation
McKay Cr. Natl. Wildlife Refuge	McKay Reservoir	515 land 1,200 surface acres	USFWS	Wildlife Refuge
Cold Springs Natl. Wildlife Refuge	Cold Springs Reservoir	>1,000 land acres; 1,530 surface acres	USFWS	Wildlife Refuge
Umatilla National Wildlife Refuge	Columbia River @ Irrigon	14,000	USFWS	Wildlife Refuge
Steelhead Park	Lower Basin	1 mile of river	ODFW	Refuge Area
Power City Wildlife Area	Hermiston	N/A	ODFW	State Wildlife Area
Irrigon Wildlife Area	Irrigon on Columbia River	1,000	ODFW	State Wildlife Area
Willow Creek Wildlife Area	On Columbia River @ Willow Creek	700	ODFW	State Wildlife Area
Coyote Springs Wildlife Area	Boardman	100	ODFW	State Wildlife Area
Boardman Wildlife Area	Boardman	150	ODFW	State Wildlife Area

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

Currently more than 31 species of fish inhabit the Umatilla subbasin. Seventeen species are native to the subbasin (Table 14). Spring chinook, fall chinook and coho salmon became extinct in the basin in the 1900s and were reintroduced with hatchery stock in the 1980s and have begun to reproduce naturally.

Table 14. Fish Species present in the Umatilla River Subbasin

Species	Origin[1]	Location[2]	Status[3]	Comments
Bull Trout (*Salvelinus confluentus*)	N	R, T	C	
Spring Chinook (*Oncorhynchus tshawytscha*)	H	R, T	C	
Fall Chinook (*Oncorhynchus tshawytscha*)	H	R, T	C	
Coho Salmon (*Oncorhynchus kisutch*)	H	R, T	C	
Redband Trout/Summer Steelhead (*Oncorhynchus mykiss*)	N	R, T	A	
Mountain Whitefish (*Prosopium williamsoni*)	N	R, T	U	
Pacific Lamprey (*Lampetra tridentata*)	N	R, T	U	
Western Brook Lamprey (*Lampetra richardsoni*)	N	R, T	U	
Longnose Dace (*Rhinichthys cataractae*)	N	R, T	I	
Speckled Dace (*Rhinichthys osculus*)	N	R, T	A	
Umatilla Dace (*Rhinichthys umatilla*)	N	R, T	I	
Leopard Dace (*Rhinichthys falcatus*)	N	R, T	I	
Chiselmouth (*Acrocheilus alutaceus*)	N	R, T	C	
Peamouth (*Mylocheilus caurinus*)	N	R, T	U	
Redside shiner (*Richardsonius balteatus*)	N	R, T	A	
Northern pikeminnow (*Ptychocheilus oregonensis*)	N	R, T	C	
Sucker (Catostomidae)	N	R, T	C	Bridgelip, largescale
Carp (*Cyprinus carpio*)	E	R, T	U	
Pumpkinseed (*Lepomis gibbosus*)	E	R, T	R	
Bluegill (*Lepomis macrochirus*)	E	R, T	R	
White crappie (*Pomoxis annularis*)	E	R, T	R	
Black crappie (*Pomoxis nigromaculatus*)	E	R, T	R	
Yellow Perch (*Perca flavescens*)	E	R, T	R	
Large Mouth Bass (*Micropterus salmoides*)	E	R	U	
Small Mouth Bass (*Micropterus dolomieu*)	E	R	C	
Brown Bullhead (*Ameiurus nebulosus*)	E	R	U	
Channel Catfish (*Ictalurus punctatus*)	E	R	U	
Mosquitofish (*Gambusia*)	E	R	U	Seasonal
Paiute sculpin (*Cottus beldingi*)	N	R, T	C	
Margin sculpin (*Cottus marginatus*)	N	R, T	C	
Torrent sculpin (*Cottus rhotheus*)	N	R, T	R	

1 Origin: N=Native stock, E=exotic H=hatchery reintroduction with a naturalized sub-population
2 Location: R= mainstem rivers T= tributaries
Fish species abundance based on average number of fish per 100m^2: A=abundant, R=rare, U=uncommon, C=common, and I=insufficient data

The species composition and distribution of fish in the Willow Creek subbasin is not well known. However, resident redband trout are known to persist in the more suitable reaches and headwater tributaries of Willow Creek and the more common non salmonid resident species are likely present in abundance. Sixteen Mile Canyon, Sand Hollow and Juniper Canyon are known to be intermittent streams in many locations; however extensive surveys have not been conducted and there may be some perennial reaches that support fish
The predominant anadromous salmonid in the Umatilla subbasin is summer steelhead, which is the anadromous form of inland redband rainbow trout (*Oncorhynchus mykiss*). Redband trout have the widest distribution and likely the greatest abundance of salmonids in the basin (T. Bailey, Oregon Department of Fish and Wildlife, personal communication, January 2001).

Anadromous salmonids that currently occur in the subbasin include summer steelhead (*O. mykiss*), coho (*O. kisutch*), and spring and fall chinook (*O. tshawytscha*). Coho and chinook have been reintroduced from Columbia River hatchery stock, while steelhead are currently supplemented by hatchery-reared fish using wild, endemic broodstock to prevent domestication. Resident salmonid species inhabiting the Umatilla subbasin include mountain whitefish (*Prosopium williamsoni*), redband trout (*O. mykiss*) and bull trout (*Salvelinus confluentus*).

Spring chinook, fall chinook and coho were absent from the subbasin for approximately 75 years. Irrigation and agricultural development in the early 1900's is the primary cause of the decline of steelhead, and directly related to the extirpation of spring chinook salmon (Bureau of Reclamation 1988; Oregon Department of Environmental Quality 2000). Their reintroduction and supplementation occurred in conjunction with actions designed to reconstruct diversion structures and augment flows (Oregon Department of Environmental Quality 2000).

Steelhead/Redband Trout

In the last 35 years, adult steelhead returns have fluctuated in the Umatilla subbasin in a similar pattern to steelhead in the John Day and other systems in the region (Figure 22). Table 15 summarizes the disposition of adult steelhead returns in the Umatilla Subbasin. Endemic Umatilla steelhead are artificially supplemented using wild endemic brood stock to prevent domestication. Hatchery reared steelhead are the progeny of about 115 wild parents taken from a cross section of the run annually. Between 1986 and 1988, hatchery steelhead comprised roughly ten percent of the adult return (CTUIR and ODFW 1990). Between 1989 and 1996, the percent of the adult run comprised of hatchery fish climbed from 14% to as much as 43%, and in 1997 hatchery fish outnumbered natural fish, comprising 60% of the adult returns (Figure 23). In 1999 and 2000 hatchery fish represented 39.8 and 25.3% of the run respectively (Table 15). The hatchery fish are passed above Three-Mile Dam for harvest opportunities and to supplement natural production by spawning naturally.

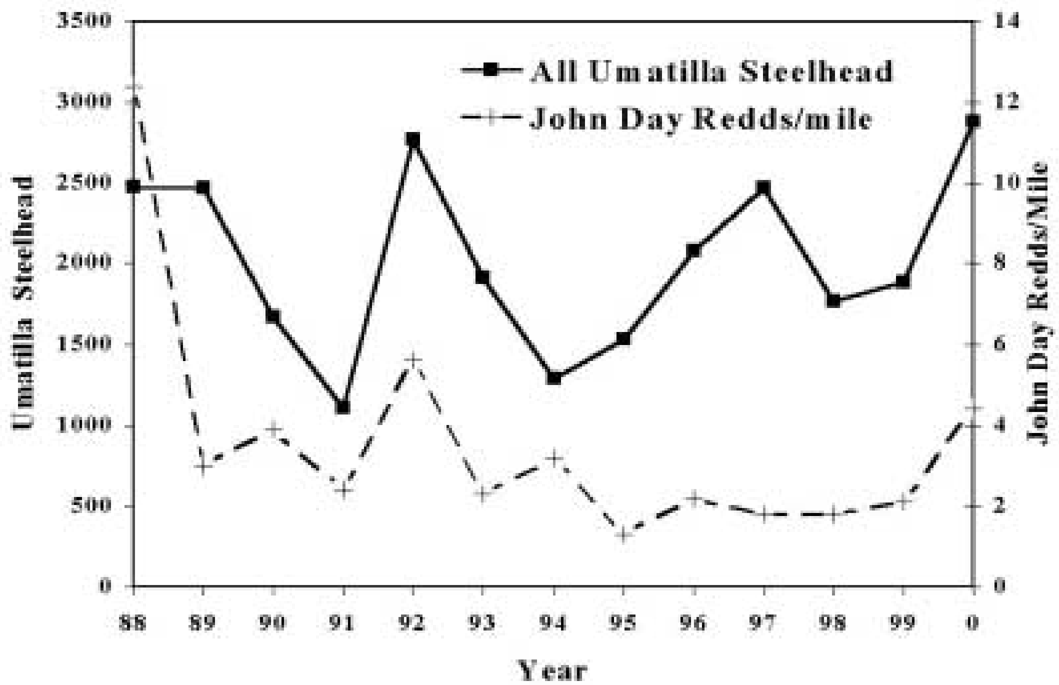

Figure 22. Umatilla and John Day steelhead trends (Contor et al. 2000; Chilcote 1998)

Table 15. Umatilla Summer Steelhead Adult Return, Harvest and Escapement Disposition 1987-88 through 1999-2000 return years (Contor et al. 2000).

RUN YEAR	1987 1988	1988 1989	1989 1990	1990 1991	1991 1992	1992 1993	1993 1994	1994 1995	1995 1996	1996 1997	1997 1998	1998 1999	1999 2000
N-STS Enumerated at TMD	2315	2104	1422	724	2247	1298	945	875	1299	1014	862	1135	2160
H-STS Enumerated at TMD	165	370	245	387	522	616	345	656	782	1463	903	751	732
All STS Enumerated at TMD	2480	2474	1667	1111	2769	1914	1290	1531	2081	2477	1765	1886	2892
N-STS Sacrificed or Mortalities at TMD	20	12	40	2	3	4	0	0	8	5	2	1	0

RUN YEAR	1987 1988	1988 1989	1989 1990	1990 1991	1991 1992	1992 1993	1993 1994	1994 1995	1995 1996	1996 1997	1997 1998	1998 1999	1999 2000
H-STS Sacrificed or Mortalities at TMD	5	17	143	50	112	69	51	33	73	95	70	75	42
N-STS Taken for Brood Stock	151	158	92	99	237	129	93	86	107	100	86	110	115
N-STS Spawned	62	84	53	85	172	95	79	59	63	75	68	76	
H-STS Taken for Brood Stock	0	0	0	103	95	91	42	68	26	10	30	15	15
H-STS Spawned	0	0	0	42	0	3	17	22	21	3	21	4	
N-STS Females Released above TMD	1436	1232			1193	875	642	602	863	689	550	716	1317
N-STS Males Released above TMD	708	702			814	290	210	187	321	220	224	308	728
N-STS Released above TMD	2144	1934	1290	623	2007	1165	852	789	1184	909	774	1024	2045
H-STS Females Released above TMD	114	216			161	266	186	274	371	666	476	425	351
H-STS Males Released above TMD	46	137			154	190	66	281	312	692	327	236	324
H-STS Released above TMD	160	353	102	234	315	456	252	555	683	1358	803	661	675
N-STS Harvested above TMD-CTUIR						5	5	5	0	0	5	5	
H-STS Harvested above TMD-CTUIR						25	20	20	39	33	33	39	
N-STS Harvested above TMD-ODF&W								0	0	0	0	0	
H-STS Harvested above TMD-ODF&W						22	5	21	25	24	12	47	
N-STS Females Available to Spawn	1436*	1232*			1193*	872	639	599	863	689	548	713	
N-STS Males Available to Spawn	708*	702*			814*	288	208	185	321	220	221	306	

RUN YEAR	1987 1988	1988 1989	1989 1990	1990 1991	1991 1992	1992 1993	1993 1994	1994 1995	1995 1996	1996 1997	1997 1998	1998 1999	1999 2000
N-STS Potentially Available to Spawn	2144*	1934*	1290*	623*	2007*	1160	847	784	1184	909	769	1019	
H-STS Females Available to Spawn	114*	216*			161*	242	173	253	339	637	454	382	
H-STS Males Available to Spawn	46*	137*			154*	167	54	261	280	664	305	193	
H-STS Available to Spawn	160*	353*	102*	234*	315*	409	227	514	619	1301	759	575	
Total Female STS Available to Spawn	1550*	1448*			1354*	1114	812	852	1202	1326	1002	1095	
STS Redds Observed in Index Reaches	138	77	HW	HW	135	HW	64	74	119	138	126	218	238
Total STS Redds Observed	275	128	HW	HW	300	HW	224	126	150	149	217	270	523
Index Reaches Miles Surveyed	18.5	20	HW	HW	21.4	HW	21.4	21.4	21.4	21.4	21.4	21.4	21.4
Redds Per Mile in Index Reaches	7.5	3.9	HW	HW	6.3	HW	3.0	3.5	5.6	6.4	5.9	10.2	11.1
Total Miles Surveyed in Umatilla River	61.0	50.2	HW	HW	67.2	HW	65.8	35.0	34.4	24.6	38.0	37.2	47.6
Redds Per Mile in all Areas	4.5	2.5	HW	HW	4.5	HW	3.4	3.6	4.4	6.1	5.7	7.9	11

Notes * harvest not estimated; HW=high water; harvest estimates assumed sex ratio of 50-50; no adjustments were made for catch and release and hooking related mortalities; Index reaches are in Squaw, N.F. Meacham, Buckaroo, Camp and Boston Canyon Creeks and the S.F. Umatilla River.

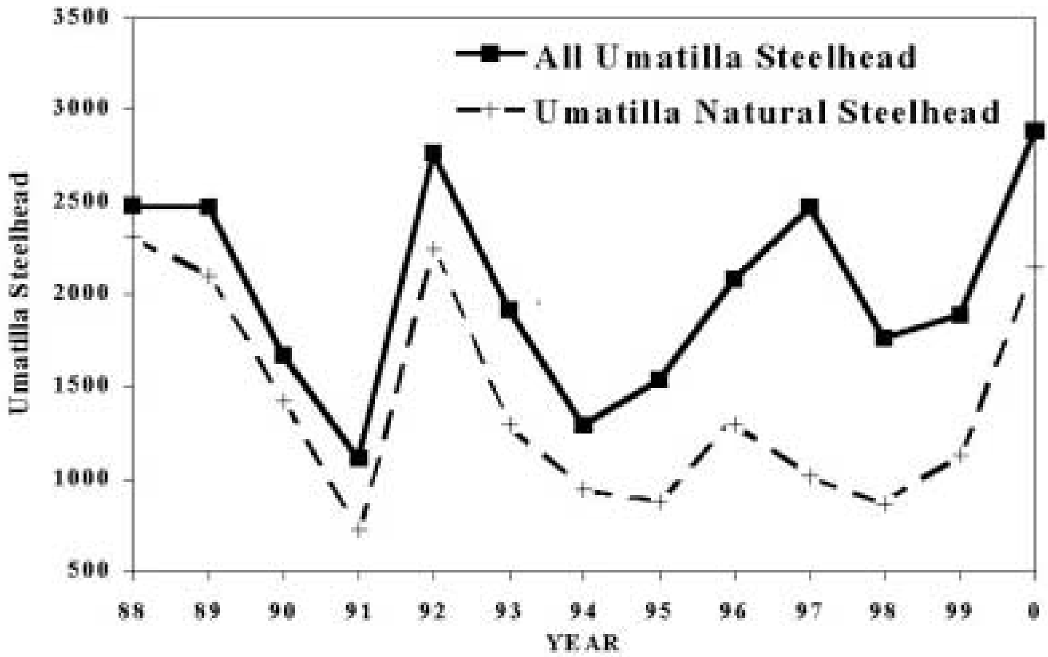

Figure 23. Umatilla adult summer steelhead returns 1988-2000 (Contor et al. 2000).

Adult steelhead were also counted at Birch Creek by the Oregon Department of Fish and Wildlife from 1995 to 1999 (Table 16). The fish are collected in a fish ladder trap on a diversion dam located approximately 1/4 mile downstream of the confluence of the East and West forks of Birch Creek. An estimated 60% of the adult steelhead that pass this location jump over the diversion dam and are not counted in the trap. In 1995-1996, biologists from the Department of Fish and Wildlife conducted a mark/recapture study that led to a total escapement estimate above the trap location of 358 wild and 15 hatchery fish for a total of 373. For that year, this accounted for approximately 30% of the wild fish that were counted at Three Mile Dam on the Umatilla. Mark/recapture data in other years was insufficient to make an accurate escapement estimate.

Table 16. Adult summer steelhead collected at the fish trap on Birch Creek (T. Bailey, Oregon Department of Fish and Wildlife, personal communication, January 2001).

Run Year	Wild	Hatchery	% Hatchery	Total
1995-96	143	6	4	149
1996-97	109	6	5	115
1997-98	85	1	1	86
1998-99	73	0	0	73

A series of Natural Production Monitoring and Evaluation (NPME) studies have been, and are currently being conducted by the Confederated Tribes of the Umatilla Indian. NPME survey data established the general spawning locations of summer steelhead in the Umatilla River and conducted annual surveys of a number of key index areas. Spawning occurs in the mainstem of the Umatilla River primarily from Minthorn Springs upstream (RM 65) and in the headwater tributaries; however, some spawning has been observed as far downstream as Feed Canal Diversion (RM 28). Major spawning tributaries include Birch Creek; Meacham Creek and Squaw Creek (Table 17). Hatchery reared endemic summer steelhead are frequently observed digging redds and spawning naturally during spawning surveys (Contor et al. 1998).

CTUIR annually monitors trends in species composition, abundance and rearing density of salmonids at index sites located throughout the Umatilla subbasin. During the summer low flow periods from 1993-1996, CTUIR estimated juvenile steelhead abundance in the primary rearing areas using habitat surveys that estimated suitable stream habitat areas to reach specific steelhead densities derived from extensive sampling using removal-depletion methods. Juvenile natural steelhead abundance in the primary rearing areas was approximately 725,000 during that time period (Contor et al. 1996). These estimates do not include many of the newly emerged fry or smolts that outmigrated prior to the summer sampling period. Of the total 770 miles of stream in the subbasin, 233 miles are estimated to be suitable summer rearing habitat for juvenile steelhead based on salmonid catch, water temperatures and flows (Contor et al. 1996). Surveyors found the highest numbers of juvenile steelhead/mile between RM 81.8 and RM 89.6 of the Umatilla River, and in the tributaries of Birch, Meacham and Squaw Creeks (Contor et al. 1996).

Table 17. Number of Redds Observed in Index Areas for Spawning Surveys for Umatilla Summer Steelhead (Contor et al. 1997).

River Section	1992		1993		1994		1995		1996	
	#	**mi.**	**#**	**mi.**	**#**	**mi.**	**#**	**mi.**	**#**	**mi.**
Squaw Creek	**77**	6.7	**10**	6.7	**36**	6.7	**45**	6.7	**58**	6.7
Buckaroo Creek	**5**	3	**6**	3	**0**	3	**6**	3	**12**	3
Meacham Creek	**120**	18	**6**	15.8	**40**	18.2	**12**	3.1	**n/a**	
NF Meacham Creek	**30**	5	**3**	3.3	**11**	5	**14**	5	**30**	5
Camp Creek	**8**	2.5	**7**	2.5	**6**	2.5	**5**	2.5	**7**	2.5
Boston Canyon Creek	**0**	1	**6**	1	**3**	1	**0**	1	**9**	1
NF Umatilla River	**17**	2.5	**n/a**		**4**	4	**1**	2	**n/a**	
SF Umatilla River	**15**	4.2	**8**	4.2	**8**	4.2	**4**	3.2	**n/a**	
Ryan Creek	**3**	2	**n/a**		**3**	3	**n/a**		**n/a**	
Minthorn Springs	**5**	.2	**n/a**		**1**	.2	**n/a**		**2**	.2
Pearson Creek	**1**	6	**3**	8	**31**	5	**8**	2	**11**	4
East Birch Creek	**4**	1	**11**	4.5	**61**	7.0	**31**	6.5	**n/a**	
West Birch Creek	**0**	3.3	**3**	4.5	**20**	6.0	**n/a**		**n/a**	

Moderate to high rearing densities (20-300+ fish/100m^2) of juvenile steelhead/ redband trout were observed during the summer low flow periods in most stream habitat with persistent flow and suitable water temperatures (Figure 24): steelhead rearing streams include, but are not limited to, Ryan Creek, Buck Creek, Duncan Canyon Creek, Shimmiehorn Creek, Spring Creek, North and East Forks of Meacham Creek, Butcher Creek, Thomas Creek, Moonshine Creek, Buckaroo Creek, Westgate Canyon Creek, Johnson Creek, Pearson Creek, East and West Birch Creeks, Boston Canyon Creek, Camp Creek, Mission Creek, Coonskin Creek, Owsley Creek and others (Contor et al. 1998). (Table 18)

Table 18. Highest Densities of Juvenile Steelhead in the Umatilla Subbasin (Contor et al. 1996; Oregon Department of Fish and Wildlife Data [E. Birch Creek] 1996).

Reach	River Mile	Length (mi)	Suitable Miles	Steelhead/ Mile	Total Steelhead
Umatilla River	81.8-89.6	7	7	8392	58744
Meacham Creek	0-15	15	12.9	5576	71930
N.F. Umatilla River		10	9	5500	49500
Meacham Creek	15-36	21	17	4500	76500
Squaw Creek		10	8.75	4367	38211
East Birch Creek	1.5-15	13.5	13.5	4787	64627

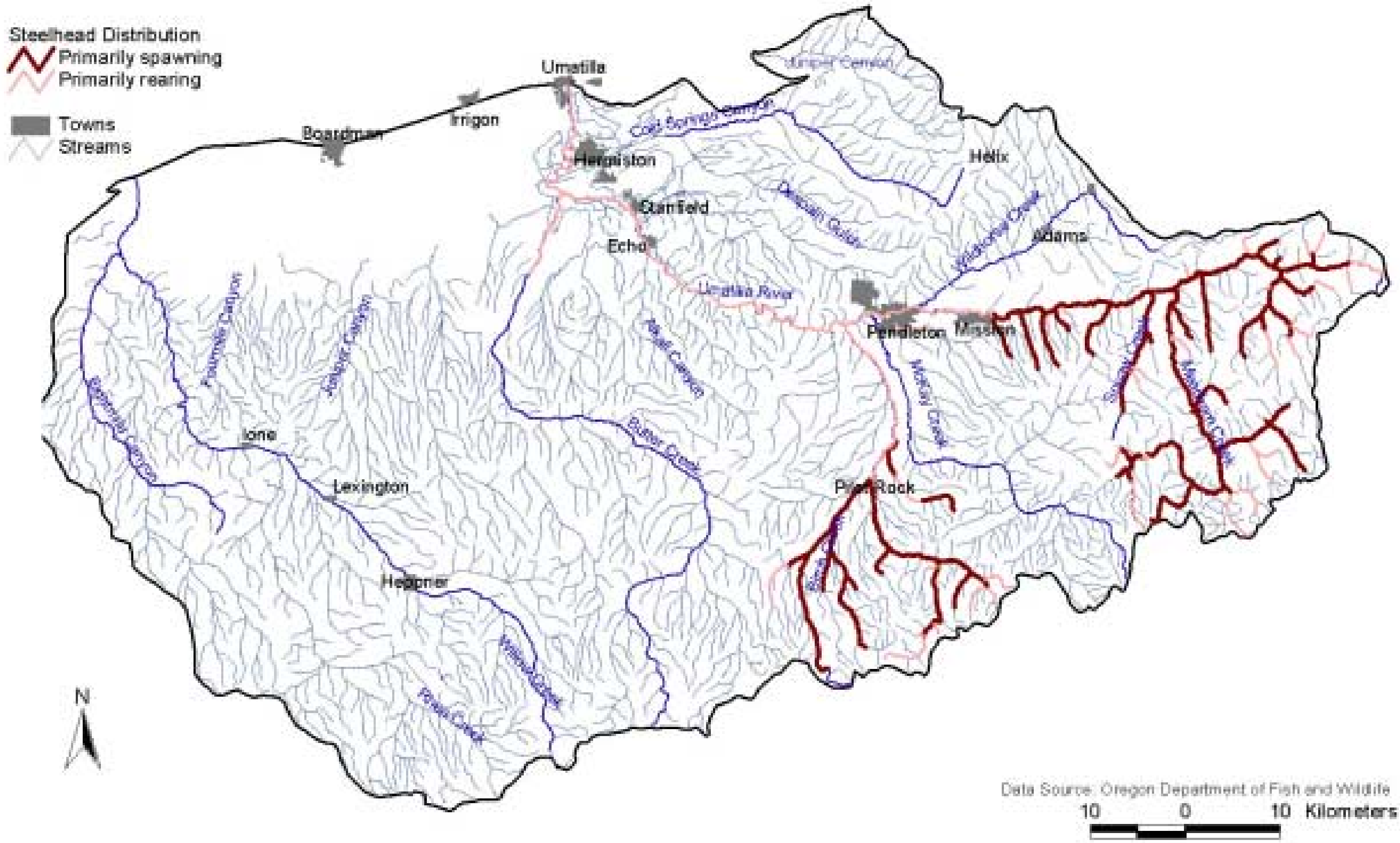

Figure 24. Steelhead distribution, spawning and rearing areas in the Umatilla subbasin

During the late fall, winter and early spring, juvenile steelhead were observed throughout the basin, including reaches that are often intermittent during the summer. During spring and early summer, juvenile steelhead move into the higher quality habitat areas associated with headwater streams, spring areas and the upper reaches of the mainstem (Figure 25).

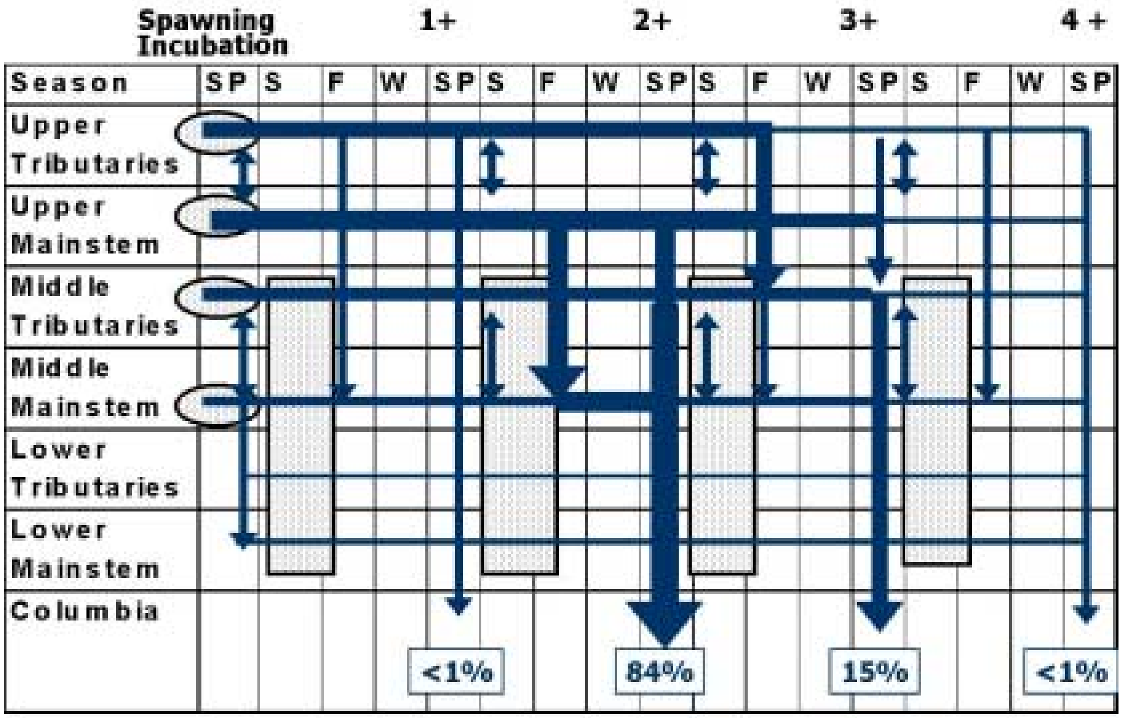

Figure 25. Life history of Umatilla summer steelhead; shaded ovals represent areas and times where redds are at risk from scouring and/or sedimentation during high flows; shaded rectangles represent times and areas where high water temperatures may be limiting (Contor et al. 1998)

Since the summer of 1999, additional summer rearing habitat has been available from the mouth of McKay Creek (RM 50.5) downstream to approximately Yoakum (RM 34). Cool water is released from McKay Reservoir for irrigation use during most of each summer. In the past, water released from McKay Reservoir fluctuated tremendously during early and late summer depending on irrigation needs. Water temperatures were often suitable for juvenile steelhead throughout the reach during all but one or two weeks during the summer. Beginning in 1999, flows were augmented during those times so that water temperatures remained suitable. This represents a significant increase in suitable mainstem summer rearing habitat. Monitoring in 1999 and 2000 indicates the areas were utilized by juvenile coho salmon and steelhead/redband trout during the entire summer and by juvenile fall chinook through mid July.

Butter Creek does not support steelhead because of passage barriers, but redband trout persist in the more suitable reaches and headwater tributaries. The Butter Creek population is separated from the Birch Creek and the upper Umatilla/Meacham Creek populations by more than 40 river miles with a number of permanent passage barriers as well as several reaches that are dry during much of the year. The available juvenile rearing habitat is vital because rearing has been identified as the most limited life stage due to low flows in much of the Umatilla subbasin (Evans 1984). Rearing habitat above McKay Reservoir also contains a significant amount of suitable and restorable rearing habitat currently used by redband trout. Juvenile summer steelhead outmigration begins with many juveniles leaving the headwater areas in the fall and rearing in the mid- to lower mainstem and in ephemeral tributaries and stream reaches to varying degrees (Figure 25). Outmigrants generally begin leaving the lower Umatilla River in March and continue through May with notable exceptions before and after the main migration. Based on age and growth information derived from the scales of returning adults and outmigrating juveniles, approximately 84% of the outmigrants are age 2+ and 15% are age 3+ with a very few individuals at ages 1+ and 4+. Juvenile steelhead outmigrant survival in the lower portion of the Umatilla subbasin is variable. Results from 1995 – 1999 pit tag surveys showed survival estimates for steelhead in the lower subbasin to fluctuate between 50 – 54%, and when compared to other salmonids, steelhead exhibit a relatively protracted period of outmigration (Knapp 2000 *in review*). Migration patterns for hatchery and natural summer steelhead were similar, but longer in duration for natural salmon than hatchery fish. Comparisons of hatchery and natural steelhead also showed that the condition of hatchery steelhead deteriorated over time and that hatchery fish were generally larger than natural fish at the smolt stage (Knapp 2000 *in review*).

The sport steelhead fishery in the Umatilla River has been directed toward the harvest of hatchery origin fish since the 1992-93 run year. ODFW harvest surveys estimated that sport anglers catch between 100 to 400 steelhead each year, but anglers have only kept up to about 100 steelhead per year. Non-tribal catch and harvest of summer steelhead in the Umatilla River is shown in Figure 26. Under current state regulation, all non-fin clipped steelhead are required to be released unharmed. The open season has been September 1 though April 15 since the 1992-93 run year as well. Prior to this the season was open from December 1 through March 31. The bag limit varied over the years from two fish/day – 10/year, to two fish/day – 40/year, and finally two fish/day – 20/year. The open area for the fishery is from the mouth upstream to the western boundary of the Umatilla Indian reservation upstream from the Hwy 11 Bridge in Pendleton. Tribal harvest estimates average about 40 steelhead with 5 to 10% of the harvest being wild steelhead.

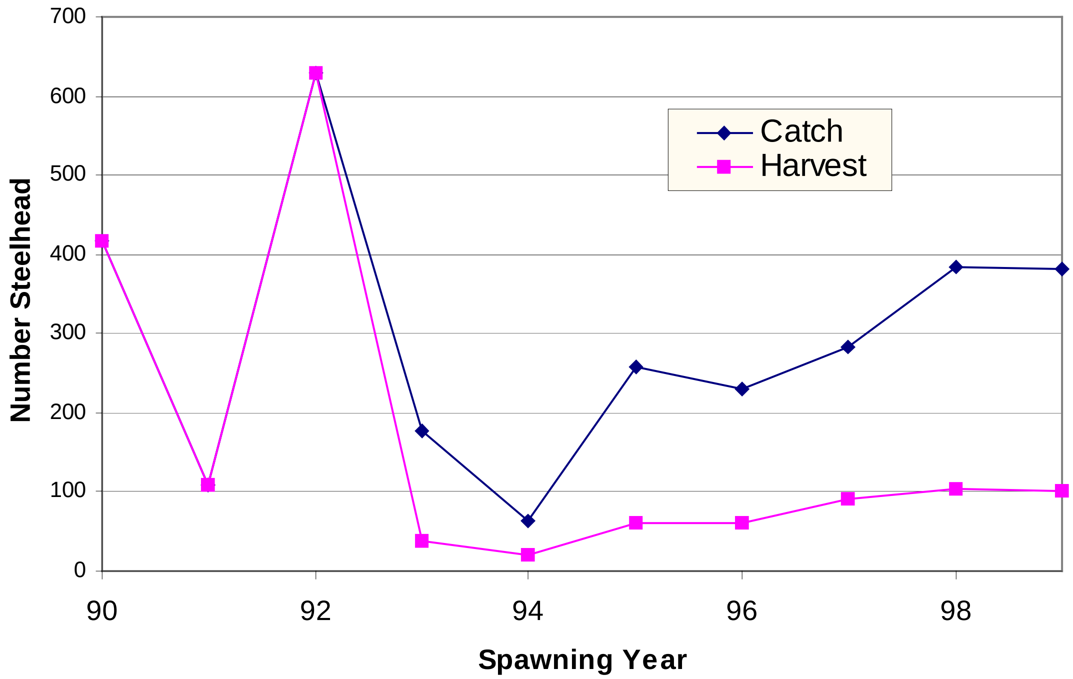

Figure 26. Sport angler catch and harvest of summer steelhead for spawning years 1990 – 1999. Data for years 1990-1992 are estimates derived from returns of angler harvest cards. Data for years 1993 – 1999 are from creel census (Oregon Department of Fish and Wildlife data).

In addition to harvest mortality, juvenile salmonid predation by avian species, particularly gulls, was estimated to be high near the Three Mile Falls Dam (RM 3.7). Losses were attributed to water clarity, hatchery fish abundance, and low flows (Knapp 2000 *in review*).

Spring Chinook

The Umatilla River is believed to have once supported large runs of spring chinook salmon, but the populations have since gone extinct (CTUIR and ODFW 1990). Van Cleve and Ting (1960) reported that there was a large return of chinook salmon in 1914 and that Indians and non-Indians caught thousands and thousands of salmon from spring to fall. The last sighting of the Umatilla run of spring chinook was in 1963 (Oregon State Game Commission 1963). Spring chinook were reintroduced to the subbasin beginning in 1986 using Carson stock (CTUIR and ODFW 1990). The current management objective is to return 8,000 adult spring chinook salmon to the Umatilla River (excluding ocean and out-of-basin harvest). The objective is to allow an escapement of 3000 fish for natural spawning, take 1000 fish for brood stock and harvest the remaining 4000. The spring chinook population is considered a key species because of its historical presence, recently demonstrated natural production potential and its tribal and non-tribal cultural significance.

The number of adult spring chinook returning to the Umatilla River has fluctuated in recent years with returns of greater than 2000 adults in 1990, 1996 and 1997, and 2000 (Table 19; Figure 27).

Table 19. Umatilla spring chinook adult return, spawning and harvest summary data.

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
H-CHS Adults Enumerated at TMD	68	2158	1294	461	1202	261	389	2074	2033	343	1742	3874
N-CHS Adults Enumerated at TMD								77	161	66	22	346
Total CHS Enumerated at TMD	68	2158	1294	461	1202	261	389	2151	2194	409	1764	4220
Jacks Enumerated at TMD	96	32	36	3	19	10	107	122	4	20	210	123
CHS Sacrificed or Mortalities at TMD	36	25	234	200	165	31	55	57	58	11	79	29
CHS taken for brood Stock	0	200	0	0	0	0	0	0	600	202	631	619
Adults Released above TMD	64	1949	1085	263	1050	235	378	2132	1537	207	1138	3562
Jacks Released above TMD	64	16	11	1	6	5	63	84	3	9	126	94
Ad. Clip. CHS Released above TMD	3	685	479	135	603	133	162	572	400	38	327	1281
Harvest above TMD-CTUIR	0	N/D	82	0	176	0	0	167	187	0	110*	695*
Harvest above TMD-ODF&W	0	20	23	0	18	0	0	206	31	0	11	143**
Adults Available to Spawn	128		980	263	856	235	378	1759	1319	207	1020	2724
Adults Sampled on Spawning Grounds	6	272	228	78	471	112	194	715	667	89	539	1388
Jacks Sampled on Spawning Grounds	-		2	1	3	1	22	24	1	2	40	32
Adult Percent Recovered (After Harvest)	4.7	13.8	23.3	29.7	55.0	47.7	51.3	40.6	50.6	43.0	52.8	51
Number of Ad Clips Sampled	0	83	136	39	356	50	78	166	182	17	137	394
Percent Ad Clipped Adults Recovered	0.0	12.1	28.4	28.9	59.0	37.6	48.1	29.0	45.5	44.7	41.9	30.8
Prespawning Mortalities Sampled (Adults)	?	?	88	22	124	19	60	256	230	28	157	227
Prespawning Mortalities Sampled (Jacks)	-		1	1	1	1	10	5	0	0	13	7
Spawned Out Adults Sampled	?	?	130	48	336	93	126	440	401	61	361	1102
Spawned Out Jacks Sampled			1		2	0	11	19	1	1	27	20
Redds Observed	14	289	144	59	224	74	90	347	288	60	292	721
Spawned Out Females Sampled	?	?	81	37	205	56	73	267	244	41	228	689

*harvest includes 12 gaff mortalities in 1999 and 17 gaff mortalities in 2000; **does not include 441 adults harvested below Three Mile Dam.

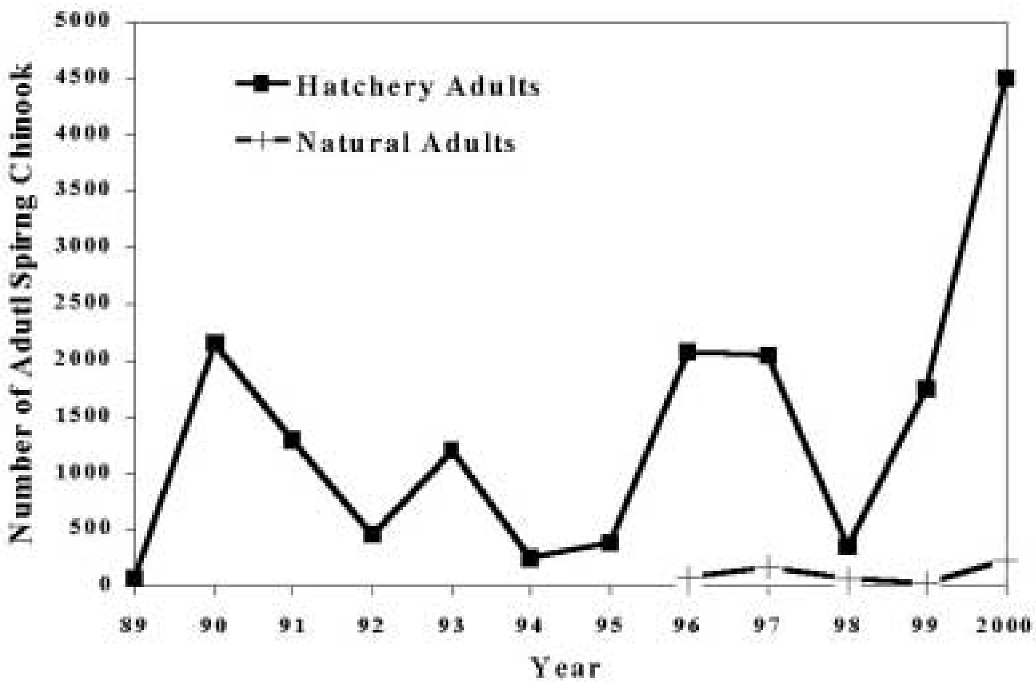

Figure 27. Natural and hatchery spring chinook returns to the Umatilla subbasin 1989-2000 (Contor et al. 2000).

The highest returns are still below the objective of 8,000 adults. The number of jack spring chinook has also fluctuated between 58% in 1989 and less than 1% in 1997 (Table 19).

Returning adult hatchery spring chinook have been allowed to spawn naturally in the Umatilla River. Returns from natural spawners began in 1996 and increased to over 300 in 2000 (Figure 27). There is an estimated 1,549 acres of spring chinook spawning and rearing habitat in the Umatilla Subbasin (Northwest Power Planning Council 1988). The United States vs. Oregon Production Report estimated the chinook natural production capacity at 43,500 smolts and 870 adults (ODFW 1987, cited in CTUIR and ODFW 1990). Of the 770 total miles of stream habitat in the Umatilla Subbasin, only 64.5 miles (8.4%) were deemed suitable for chinook salmon (Contor et al. 1996).

Quality spawning areas are limited to the North Fork Umatilla River and the mainstem Umatilla River above RM 79 (Table 20, Figure 28). The number of redds observed and the estimated egg deposition has fluctuated through the years and has been determined by the number of adults available for spawning and their rate of survival to spawning (Figure 29 and Figure 30). Spawning surveys indicate that survival to spawning is often well above 90 % in the quality headwater habitat, but can be very low in the marginal habitat (Figure 30). During the last three years more and more adult spawners have been observed in the quality spawning habitat in the headwaters. Most spawned-out carcasses of naturally produced adults are observed in quality headwater habitat, and their numbers are increasing. A portion of the naturally spawning hatchery adults select marginal habitat with warm water temperatures and have poor survival to spawning (Figure 30). Figure 31 summarizes the percent of observed Umatilla adult spring chinook carcasses that had spawned successfully by river mile from 1991-1997.

Table 20. Spring chinook redd distributions, 1989-1996 (Contor et al. 1997; Contor et al.1998)

River Section	1989	1990	1991	1992	1993	1994	1995	1996	1997
N.F. Umatilla	0	68	13	10	27	16	13	51	47
RM 86-89.5	14	174	21	13	25	13	21	57	71
RM 83-86			29	15	14	6	10	50	72
RM 80-83	0		26	13	31	9	13	44	37
RM 78.9-80	0		20	6	39	14	13	34	10
RM 76.7-78.9	0	36					7	29	19
RM 73.6-76.7	0		0	0	25	2	4	42	12
RM 70-73.6	0	0	0	0	0	0	0	21	12
RM 67.5-70	0	0	0	0	0	0	0	8	0
Meacham Creek RM 1-15	0	11	35	1	63	14	9	11	8
TOTAL	14	287	144	59	224	74	90	347	288

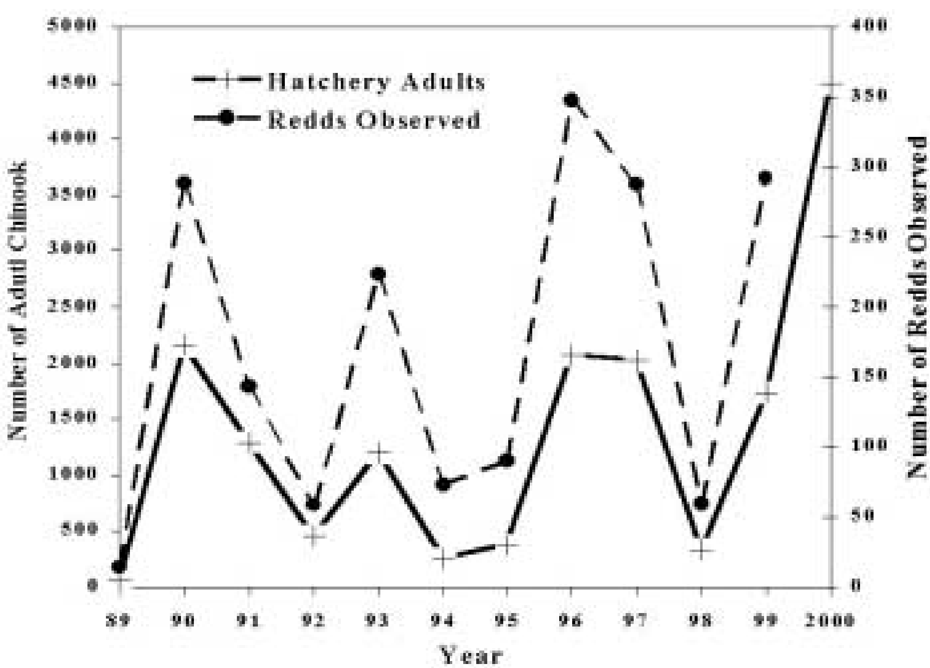

Figure 28. Umatilla spring chinook adult returns and the number of redds observed on spawning grounds, 1989-1999.

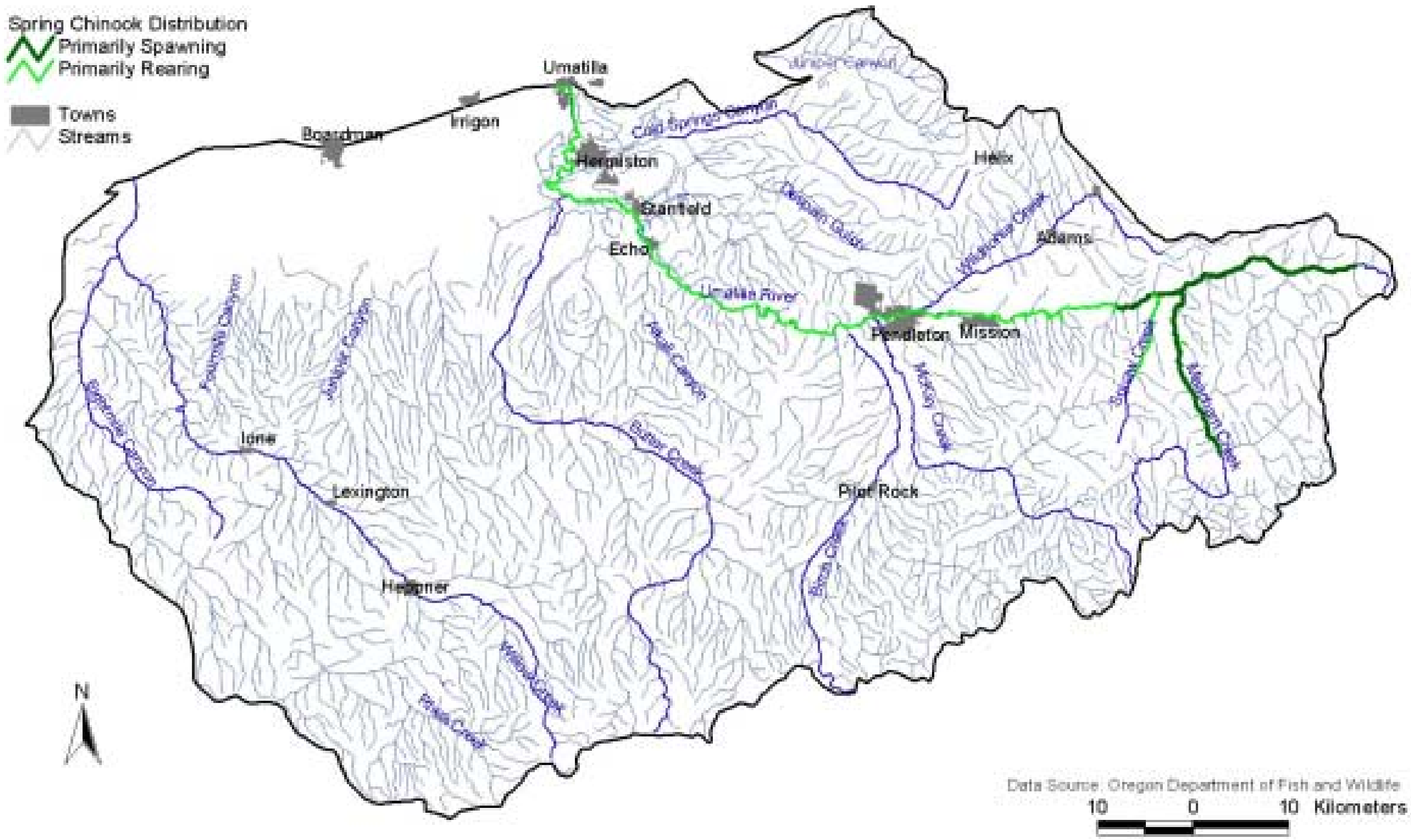

Figure 29. Spring chinook distribution, spawning and rearing areas in the Umatilla subbasin

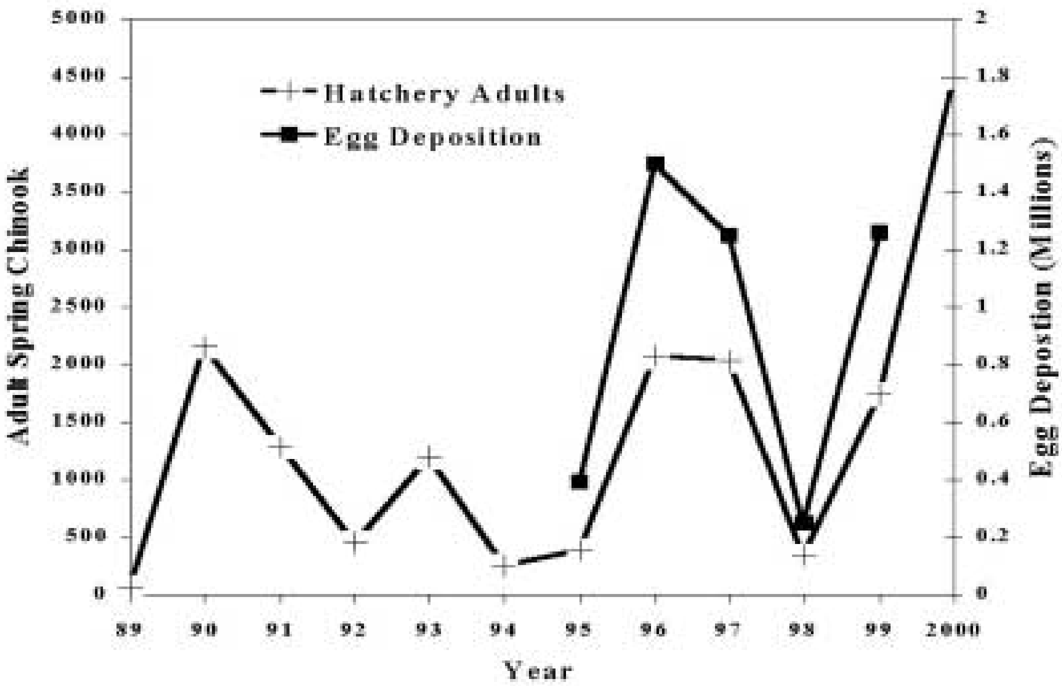

Figure 30. Umatilla spring chinook adult returns and the estimated number of eggs deposited in redds.

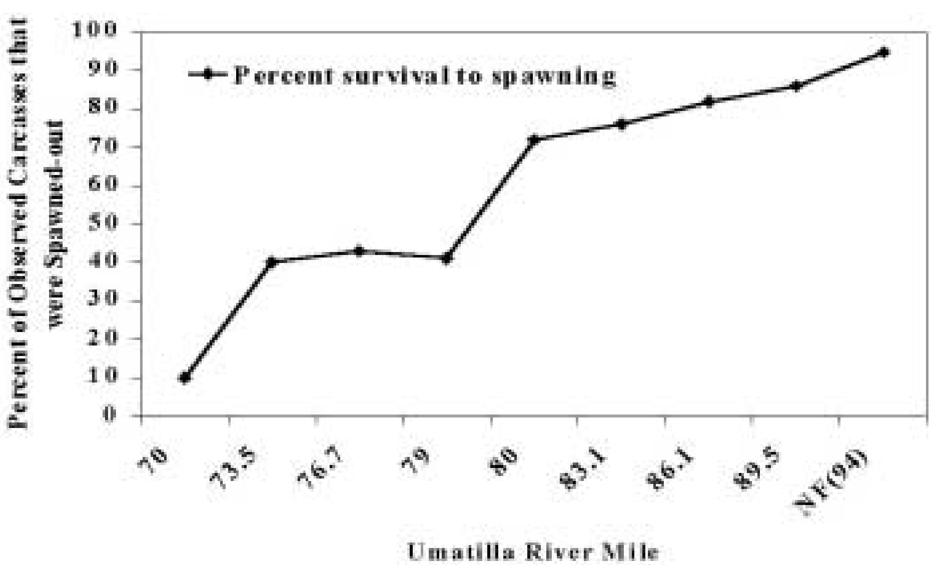

Figure 31. Percent of observed Umatilla adult spring chinook carcasses that had spawned successfully plotted by river mile from 1991-1997.

Estimates of juvenile spring chinook rearing in the Umatilla Subbasin were based on the amount of suitable rearing habitat estimated during basin-wide habitat surveys, densities observed at annual index sites and intensive biological sampling in primary rearing areas. CTUIR estimated only 50,000 naturally produced juvenile chinook reared annually during the summer low flow periods from 1993-1996 (Contor et al. 1996).

Only in 1993 did significant adult spawning escapement occur during the brood years from 1992 to1995. In 1999 and 2000 spawning escapement and success was greater and the abundance of juvenile chinook has been much higher than normally observed (Contor, CTUIR, report in process). From natural population estimates (1993-1996), biologists identified that the areas with the highest densities of spring chinook were from RM 64.2 to RM 81 of the Umatilla River, in the North Fork Umatilla and in North Fork Meacham (Contor et al. 1998). (Table 21).

Table 21. Juvenile spring chinook abundance estimates in the Umatilla subbasin (Contor et al. 1996).

Reach	**Length (mi)**	**Suitable Miles**	**Chinook/ Mile**	**Total Chinook**
Umatilla River (RM 64.2-81.8)	17.6	17.6	1250	22,000
Umatilla River (RM 81.8-89.6)	7	7	1441	10,087
N.F. Umatilla River	10	3	1500	4500
N. F. Meacham Creek	10	4	1000	4000

The distribution of the majority of juvenile spring chinook rearing habitat is limited to the North Fork Umatilla River and the mainstem of the Umatilla River above the mouth of Meacham Creek (Figure 29); however, juvenile spring chinook are also found in low numbers in the more favorable reaches of many of the tributaries used by juvenile steelhead (Contor et al. 1998). Residualization by juvenile hatchery spring chinook occurs at low levels and fewer than ten per year are observed at summer index sites. The abundance and distribution of naturally produced juvenile spring chinook during the summer is variable. The number of successful spawners the previous year and the extent of stream habitat with suitable water temperatures has varied considerably during the 1990s. Suitable stream habitat during cool wet years is considerably greater than during drought years (Contor et al. 2000).

Spring chinook expand their distribution during the fall, winter and spring and use habitat outside of the summer refuge areas (Figure 32). In April of 1997, when water temperatures were cooler and flows were higher, surveyors found low numbers of juvenile chinook lower in the watershed and in intermittent streams such as Thorn Hollow Creek, Saddle Hollow and Shaplish Canyon Creek (Contor et al. 1998)

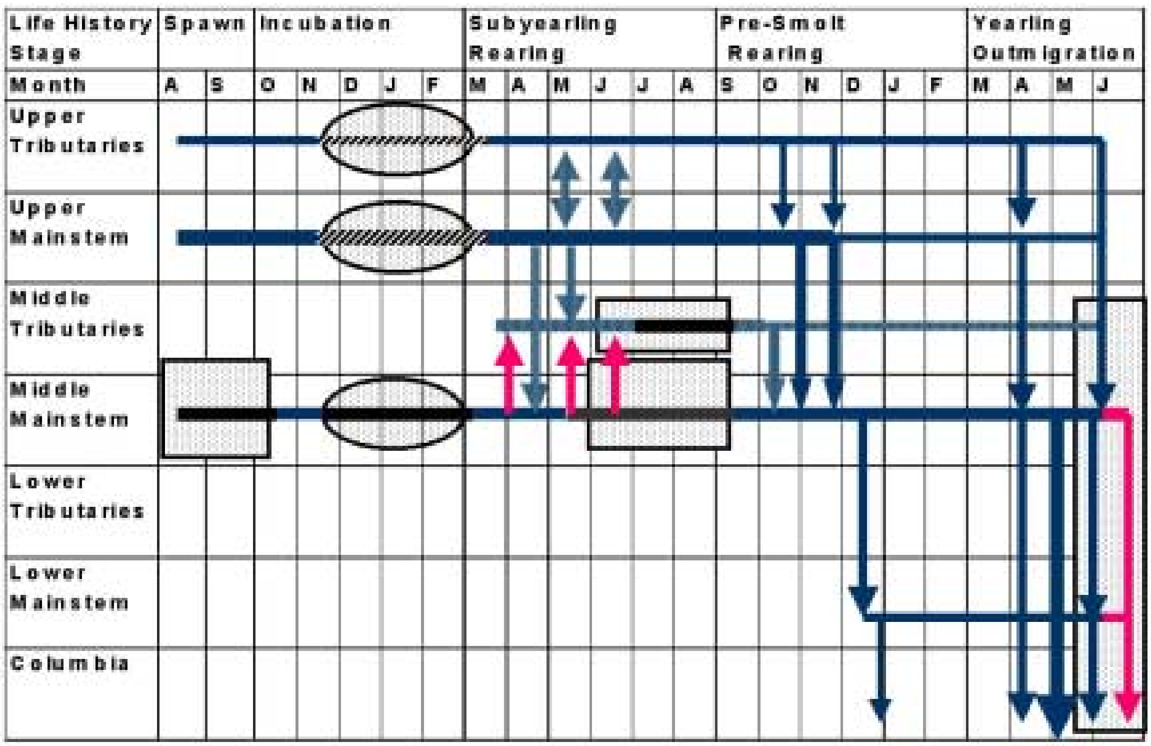

Figure 32. Life history chart of naturally produced Umatilla spring chinook salmon; shaded ovals represent areas and times where redds are at risk from scouring and/or sedimentation during high flows; shaded rectangles and red arrows represent times and areas where high water temperatures may be limiting (Contor et al. 1998).

Harvest of adult spring chinook is closely monitored and controlled by the timing and length of season as well as the location of the fishery. Harvest levels are set depending on the number of returning adults. Harvest is prohibited in prime spawning areas (above RM 81.7). Quotas are established based on the run size and seasons are closed when quotas are met. Adult returns have been sufficient to allow harvest during five of the last eight years. In 2000, tribal and sport anglers harvested and estimated 1279 adults spring chinook salmon from the Umatilla River (Table 22).

Table 22. Harvest estimates of Umatilla subbasin spring chinook (Contor et al. 1998).

Year	Tribal Harvest	Sport Harvest	Columbia and Snake River Harvest
1988	N/D	N/D	418
1989	0	0	127
1990	N/D	20	351
1991	82	23	49
1992	0	0	10
1993	176	18	29
1994	0	0	31
1995	0	0	46
1996	167	206	0
1997	187	31	N/D
1998	0	0	N/D
1999	110	11	N/D
2000	695	584	N/D

Fall Chinook Salmon

Fall chinook salmon were believed to return to the Umatilla subbasin as salmon were known to be captured from spring through the fall by Native Americans and early settlers. Natural production potential is theoretically large based on the juvenile life history patterns of fall chinook.

State and tribal authorities began hatchery releases of fall chinook salmon in 1982 with Tule stock, and switched to Upriver Bright stock in 1983 (Evans 1984). The suitability of the Umatilla subbasin for the natural production of fall chinook in its current condition has remained a critical uncertainty. Returns of hatchery produced adults has often been low with the largest adult return in 1999 of 737 adults. Low returns and the need for broodstock has limited harvest and natural spawning in most years (Table 23). However, outplanting of adult hatchery fall chinook from other mid-Columbia hatcheries has produced good survival to spawning and good redd numbers (Contor et al. 2000). Production of fry has also been documented, even though redds have been scoured by high flow events and impacted with fine sediment (Contor et al. 2000). ODFW (Knapp et al. 2000) estimated that 141,000 fall chinook fry migrated from the Umatilla River in 1998. Fry survival has been severely compromised by warm water temperatures during outmigration below Westland Dam, where most of the early summer flows are extracted. Additional water has been released into July during the last several years to assist down stream migration and enhance survival (Figure 33).

Fall chinook spawning has been observed primarily from the mouth of the Umatilla to the confluence of Meacham Creek (RM 79.0) with most of the spawning in the Barnhart (RM 42) to Yoakum (RM 37.0) reach. CTUIR estimates that most of the spawning occurs just below Barnhart where the majority of adult spawners are released.

Table 23. Umatilla fall chinook adult returns, disposition and spawning escapement, 1988-2000.

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Adult CHF Enumerated at TMD	91	271	329	522	225	368	692	595	646	354	286	737	643
Jack CHF Enumerated at TMD	195	267	113	468	79	29	230	291	80	207	154	137	437
Subjack CHF Enumerated at TMD	1268	65	618	273	0	15	367	343	606	189	230	152	4948
CHF Sacrificed or Mortalities at TMD	921	333	192	731	6	8	166	195	95	159	78	67	409
CHF Taken for Brood Stock	0	0	0	348	211	385	0	0	576	300	201	465	603
Adult Female CHF Released above TMD	?	?	?	57	7	6	305	213	9	30	5	133	59
Adult Male CHF Released above TMD	?	?	?	112	29	27	288	302	79	12	84	147	10
Total Adult CHF Released above TMD	58	192	168	169	36	33	593	515	88	42	89	280	69
Jack CHF Released above TMD	138	78	89	18	51	7	213	255	53	131	114	99	298
Subjack CHF Released above TMD	0	0	611	0	0	12	317	264	520	118	188	115	4647
Adult Female CHF Outplanted in Umatilla	0	0	0	0	0	0	0	0	423	483	74	433	-
Maturing Male CHF Outplanted in Umatilla	0	0	0	0	0	0	0	0	285	457	126	458	-
Total Females Available for Spawning	-	-	-	57	7	6	305	213	432	513	79	566	-
Total Males Available for Spawning	-	-	-	130	80	46	818	821	937	718	512	819	-
CHF Redds Observed		0	0	0	0	0	82	9	170	301	6	89	-
Unidentified Redds Observed		92	50	18	0	0	7	1	1	22	24	25	-

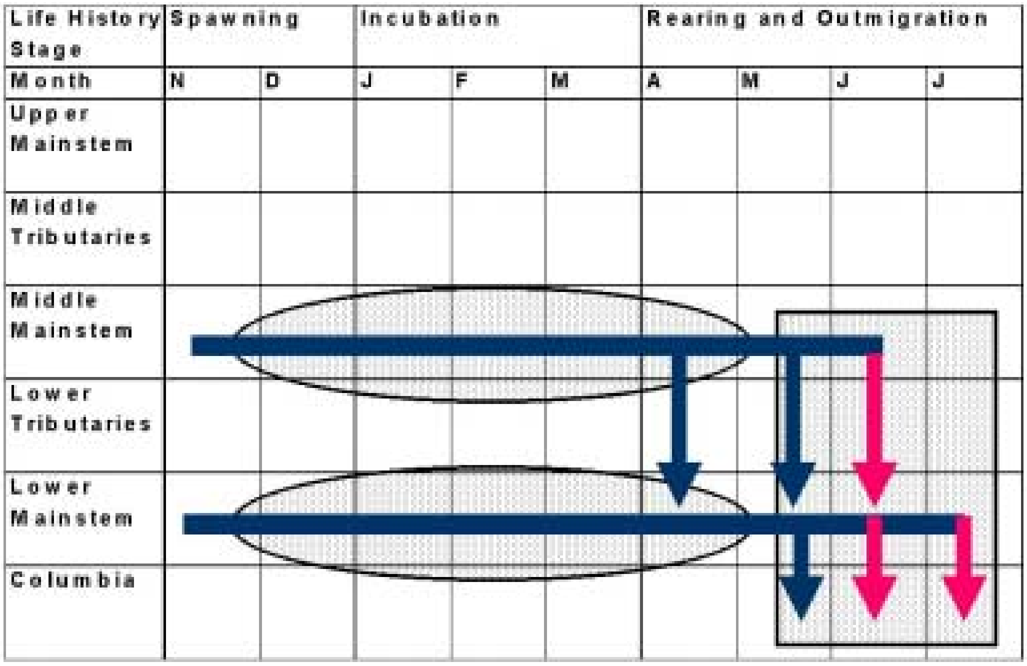

Figure 33. Life history chart of naturally produced Umatilla fall chinook salmon; shaded ovals represent areas and times where redds are at risk from scouring and/or sedimentation during high flows; shaded rectangles and red arrows represent times and areas where high water temperatures may be limiting (Contor et al. 1998).

Coho Salmon

Coho salmon were released from 1966 through 1969 and from 1987 to the present, and have been primarily Tanner Creek stock. Broodstock for the program are collected at Bonneville Hatchery and reared at Cascade and Lower Herman Creek Hatcheries. Some broodstock have been collected from the Umatilla River at Three Mile Falls Adult Trap during several recent years due to broodstock shortages at Bonneville. Smolt releases have been variable but the current program releases 1,500,000 smolts annually into the mainstem Umatilla River

Adult returns to Three Mile Dam have been variable and have ranged from 356 adults in 1992 to 4654 adults in 2000. More than 3000 adults returned in both 1998 and 1999 (Table 24).

Table 24. Summary of Umatilla coho salmon adult returns, disposition and spawning escapement, 1988-2000.

YEAR	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Adult Coho Enumerated at TMD	936	4154	409	1732	356	1533	984	947	618	670	3081	3702
Jack Coho Enumerated at TMD	746	479	515	189	173	16	62	52	24	137	191	205
Coho Sacrificed or Mortalities at TMD	0	4001	110	445	0	79	113	0	20	42	222	236
Coho Taken for Brood Stock	0	0	0	0	0	580	0	860	0	0	0	0
Adult Female Coho Released above TMD	?	?	?	387	141	395	398	29	293	337	1464	1595
Adult Male Coho Released above TMD	?	?	?	612	201	486	481	76	305	301	1406	1873
Total Adult Coho Released above TMD	936	580	364	999*	342	881	879	105	598	638	2870	3468
Jack Coho Released above TMD	746	52	450	91	168	13	54	34	24	127	180	196
Coho Redds Observed		0	0	0	12	44	24	1	18	51	90	42
Unidentified Redds Observed		92	50	18	0	0	7	1	1	22	24	25

Spawning survey crews have observed many coho redds and spawned-out adult carcasses through the years in the Umatilla River from the mouth to Meacham Creek. Water conditions often prevent extensive and accurate counts, but redds and carcasses are observed each year. Coho have been observed in low numbers in some of the mid-basin tributaries such as Squaw Creek, Buckaroo Creek and Meacham Creek. Naturally produced juvenile coho have been observed throughout the lower mainstem and in the lower portions of many of the mid-basin tributaries (McKay Creek, Mission Creek, Moonshine Creek, Buckaroo Creek, Squaw Creek, Tutuilla Creek and others).

Figure 34 summarizes the habitat utilization of naturally produced coho salmon in the Umatilla Basin. Prior to 1999, summer rearing conditions in the Umatilla in and around the coho spawning areas was unsuitably warm for a number of weeks each summer. Juvenile coho were frequently observed in the lower reaches and were always associated with spring seeps or other thermal refuge. Fish were often in poor condition. However, since the summer of 1999, additional summer rearing habitat has been available from the mouth of McKay Creek (RM 50.5) downstream approximately 20 miles (depending on water temperatures). Cool water is released from McKay Reservoir for irrigation use during most of each summer. In the past, water released from McKay Reservoir fluctuated during early and late summer depending on irrigation needs. Water temperatures were often suitable for juvenile coho throughout the reach during all but one or two weeks during the summer. Beginning in 1999, flows were augmented during those times so that water temperatures remained suitable. This represents a significant increase in suitable mainstem summer rearing habitat. Monitoring in 1999 and 2000 indicates the areas were utilized by many juvenile coho salmon. Coho juveniles have been in excellent health and are of large size for a given age (Contor et al. Report in progress). The management of lower McKay Creek has also been changed and now flows perennially since July of 2000. In the past many juvenile coho were stranded, lost and salvaged from the lower six miles of McKay Creek after McKay dam was shut off in the fall to store water for the following irrigation season. A minimum flow of 10 cfs is now maintained and flows are ramped down to encourage outmigration and reduce stranding of salmonids.

Harvest has been minimal as harvest conditions have been poor and coho are often difficult to catch. Variable returns have limited the interest of dip net fisheries by Tribal Fishermen.

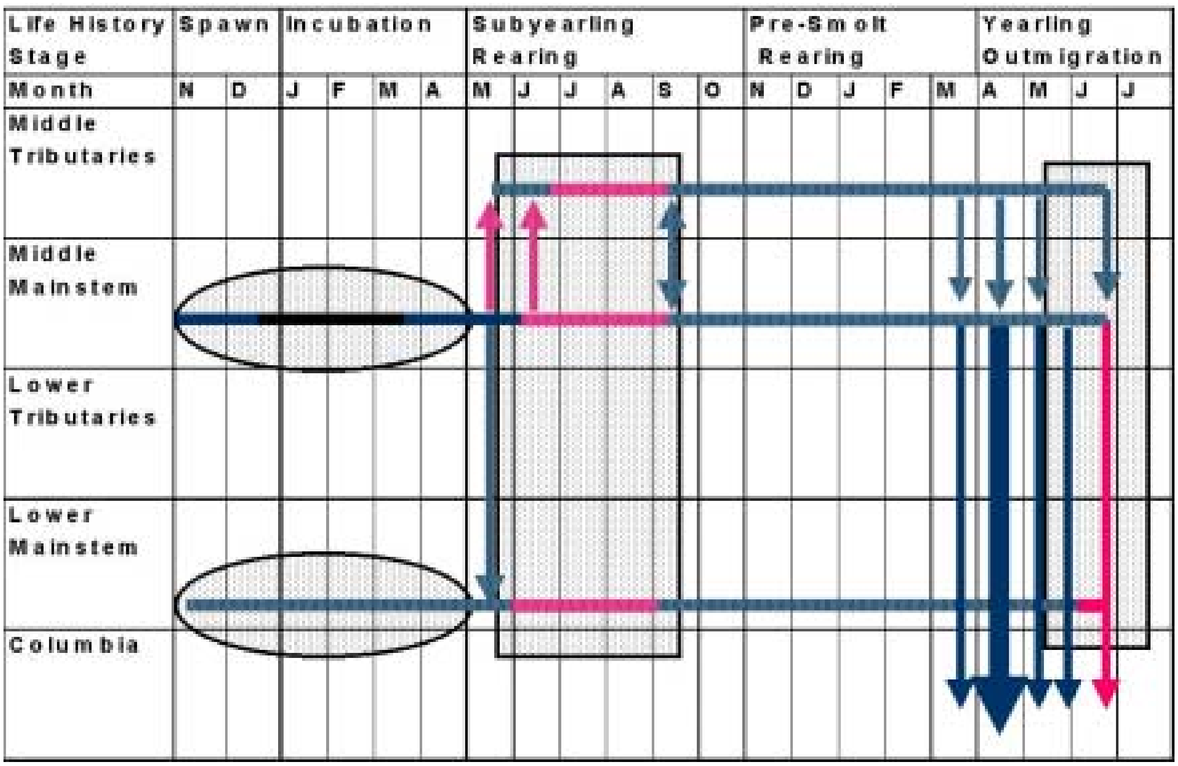

Figure 34. Life history chart of naturally produced Umatilla coho salmon; shaded ovals represent areas and times where redds are at risk from scouring and/or sedimentation during high flows; shaded rectangles and redd arrows represent times and areas where high water temperatures may be limiting (Contor et al. 1998).

Bull Trout

The U.S. Fish and Wildlife Service considers the bull trout population in the Umatilla subbasin a part of the Columbia River Distinct Population Segment, which represents an evolutionarily significant unit (Umatilla/Walla Walla Bull Trout Working Group 1999). Historically, fluvial bull trout would have had access to the Columbia River and its tributaries and been connected to populations in the adjacent basins, forming a larger metapopulation (Buchanan et al. 1997). Construction of Three-Mile Dam and McKay Dam has impacted the fluvial bull trout population and has prevented access to and from the Columbia River. Construction of mainstem dams further isolated the Umatilla bull trout from neighboring populations in the Walla Walla River (Buchanan et al. 1997).

Because of poor water quality conditions in much of the Umatilla subbasin, bull trout are isolated in the headwaters of the Umatilla River and Meacham Creek (Figure 35). Currently, bull trout are found in the mainstem Umatilla River upstream of Thorn Hollow, at elevations above 1600 feet. Spawning and rearing occurs in the North and South Forks of the Umatilla River and in North Fork Meacham Creek. Annual comprehensive spawning surveys conducted between 1994 and 1996 by ODFW, USFS and CTUIR in known or suspected areas of spawning indicate that the majority (81 to 92 percent) of redds are in the North Fork Umatilla River between Coyote and Woodward Creeks (Northrop 1997). Suitable spawning habitat also exists in the East Fork of Meacham Creek, but to date bull trout have not been found there (Buchanan et al. 1997). Year-round use also occurs in Squaw Creek, Ryan Creek, North Fork Umatilla River, Coyote Creek, Shimmiehorn Creek and Meacham Creek, although no spawning has been identified in these areas (Germond et al. 1996, cited in Buchanan et al. 1997). On occasion, bull trout have also been observed at Three Mile Dam, Echo and Mission.

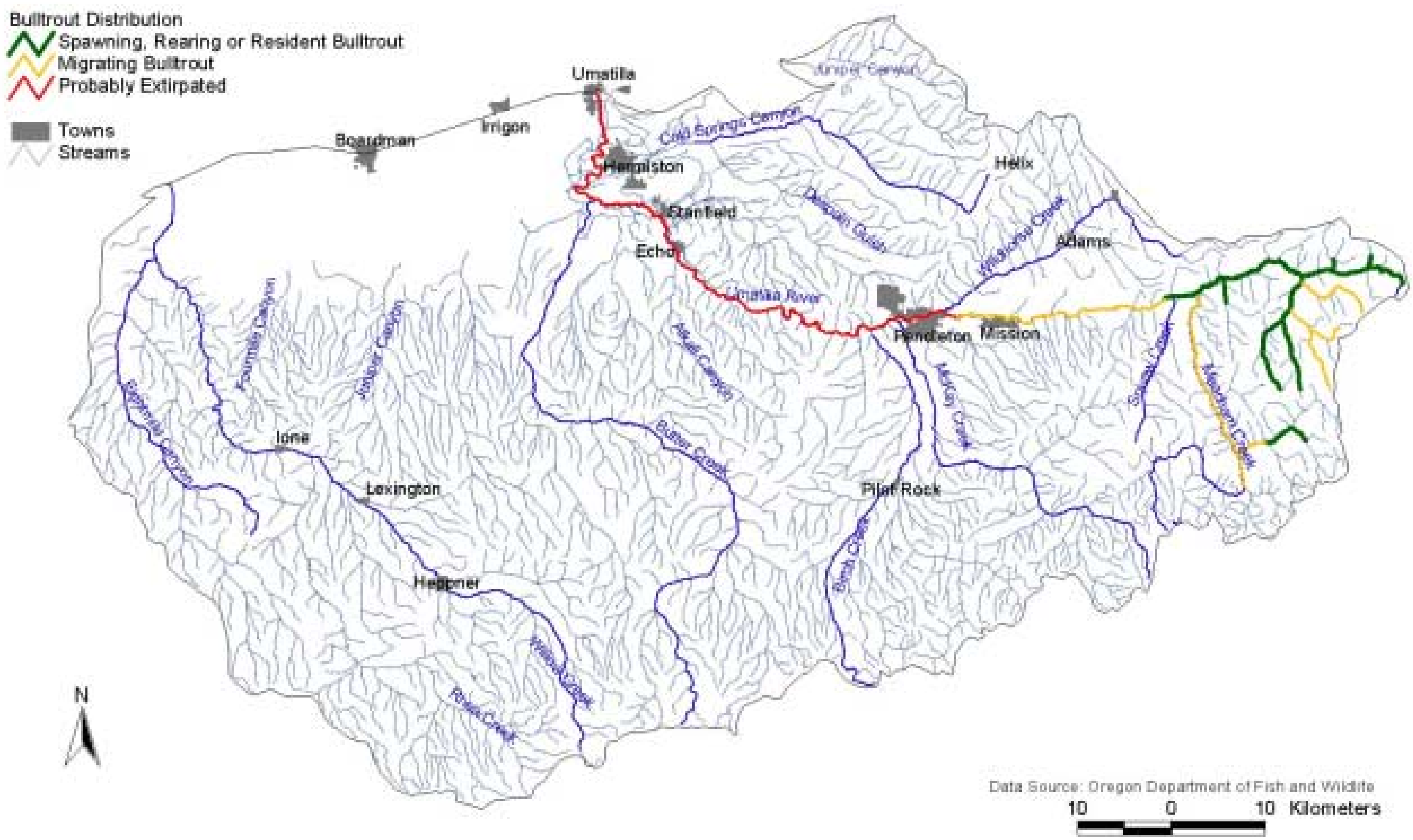

Figure 35. Bull trout distribution, spawning and rearing areas in the Umatilla subbasin

Northrop (1997) defined the bull trout populations in the Umatilla subbasin as comprised of the North Fork and South Fork sub-population and the Meacham Creek sub-population. Buchanan et al. (1997) identified three bull trout populations within the Umatilla subbasin: the North Fork Umatilla, South Fork Umatilla and Meacham Creek populations. The South Fork and Meacham populations have declined from the 1991 status report (Buchanan et al. 1997) and the persistence of bull trout in the Umatilla was considered tenuous by biologists from USFS, CTUIR, and ODFW (Table 25; Northrop 1997). Protective angling regulations have been in place since 1989 and the harvest of bull trout closed since 1994. Tribal angling accounts for some harvest, but most tribal members release bull trout (Buchanan et al. 1997).

Table 25. Status of bull trout populations in the Umatilla subbasin (1991 status: Ratliff and Howell 1992; 1996 Status: Buchanan et al. 1997).

Population	1991 Status	1996 Status
North Fork Umatilla River	Low Risk	Of Special Concern
South Fork Umatilla River	Of Special Concern	High Risk
Meacham Creek	Not Identified	High Risk

No adequate population estimates are available for bull trout at this time (Buchanan et al. 1997). The spawning surveys conducted between 1994 and 1998 found less than 100 redds in the Umatilla subbasin, for all areas combined (Table 26). Biologists attribute the marked increase in bull trout redds in 1998 in part to fishing regulations, introduction of spring chinook (a historic prey of bull trout), public education and changing locations for stocking rainbow in the upper Umatilla River (Umatilla/Walla Walla Bull Trout Working Group 1999). Recent redd count surveys of North Fork populations reflect a significant increase in the past three years (Figure 36). In 1994 spawning ground surveys, thirty-one 250-500 mm fish and one fish greater than 500 mm were located in the Umatilla subbasin, with no available data from subsequent years (Northrop 1997).

Table 26. Bull trout redd counts from 1994-1998 spawning ground surveys (ODFW data cited in Umatilla/Walla Walla Bull Trout Working Group 1999; Northrop 1997).

<table>
<tr><th rowspan="2">Year</th><th colspan="2">Number of Redds</th></tr>
<tr><th>Umatilla River</th><th>Meacham Creek</th></tr>
<tr><td>1994</td><td>39</td><td>3</td></tr>
<tr><td>1995</td><td>22</td><td>1</td></tr>
<tr><td>1996</td><td>37</td><td>0</td></tr>
<tr><td>1997</td><td colspan="2">32</td></tr>
<tr><td>1998</td><td colspan="2">84</td></tr>
<tr><td>1999</td><td colspan="2">154</td></tr>
<tr><td>2000</td><td colspan="2">143</td></tr>
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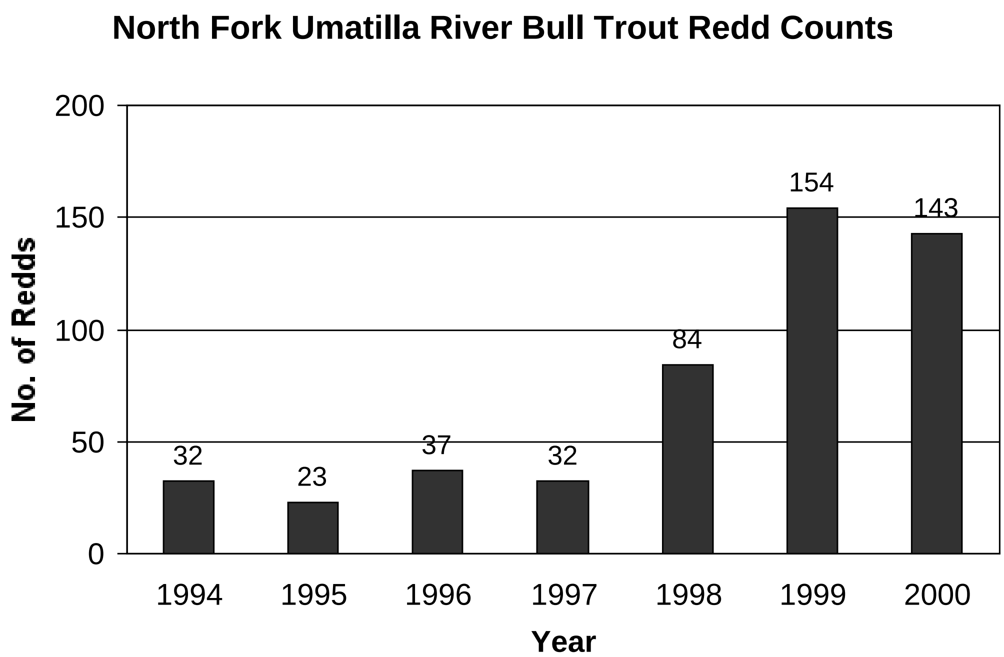

Figure 36. North Fork Umatilla bull trout redd survey data for the years 1994-2000 (ODFW data).

Of these, surveyors found the majority (90%) between Coyote Creek and Woodward Creek in the North Fork Umatilla River (ODFW data cited in Umatilla/Walla Walla Bull Trout Working Group 1998). The remaining fish were located in the North Fork Umatilla below Coyote Creek and in the South Fork between Thomas Creek and Shimmiehorn Creek.

Important information pertaining to the status and production of bull trout in the Umatilla subbasin are limited or absent. Identified data gaps for bull trout include fecundity and sex ratios measures, and survival rates (egg-to-adult). No adequate population estimates are available for bull trout at this time (Buchanan et al. 1997). The spawning surveys conducted between 1994 and 1998 showed less than 100 redds in the Umatilla subbasin, for all areas combined (Table 26). Biologists attribute the marked increase in bull trout redds in 1998 in part to fishing regulations, introduction of spring chinook (a historic prey of bull trout), public education and changing locations for stocking rainbow in the upper Umatilla River (Umatilla/Walla Walla Bull Trout Working Group 1999). Recent redd count surveys of North Fork populations reflect a significant increase in the past three years (Figure 36).

Mountain Whitefish

CTUIR monitoring and evaluation crews have observed mountain whitefish throughout the mainstem of the Umatilla River in low abundance (RM 0-90). Mountain whitefish comprised 6% of salmonids collected during electrofishing surveys during the summer of 1995 from the upper portion of the Umatilla River (RM 82-90). CTUIR has also observed a low abundance (<0.2% of salmonids) in Meacham Creek and the Umatilla from RM 60 to 82 during the summer of 1993. During the winter and spring, several mountain whitefish have been observed at Westland Dam (RM 29) and in backwaters near the mouth. Some adult mountain whitefish remain in the lower river during the summer in cool water refuge areas as 12 (267-408 mm) were collected during surveys in 1996 from RM 1 to RM 52 during June, July and August of 1996 (Contor et al. 1994-2000).

Lamprey

Historically, Pacific lamprey (*Lampetra tridentata*) were abundant in this subbasin (Close et al. 1995, Jackson et al. 1997, 1998). The Umatilla River was primarily utilized for fishing by the Umatilla, Cayuse, Nez Perce and Columbia River Tribes (Swindell 1941; Lane and Lane 1979). Much of the lamprey harvest occurred at the current site of Three Mile Dam prior to construction of the dam. Harvest also occurred in the North and South Forks of the Umatilla River (Swindell 1941; Lane and Lane 1979). The historic use of lamprey by the Tribes has been well documented. For example, in 1812, Wilson Price Hunt led members of the Astor party down the Umatilla River on a voyage to the Columbia River. In July of 1812, Hunt and his party traded with the Indians for lamprey. The following is a quote from Robert Stuart's Narratives: "Saturday 25th- This day we found intolerably hot, and after coming 15 miles stopped at an Indian Village where traded 4 horses having in the course of our [today's] journey procured 5 others- Here we got some Lamper Eels, which with a Kind of Chub seem peculiar to these waters above the Falls- Stayed here the 26th".

A photographer, Lee Moorehouse, took photos of Umatilla Indians in 1903 near the mouth of the Umatilla River drying lamprey during the summer months (Close et al. 1995).

Pacific lamprey populations in the Umatilla River basin are depressed. Currently, the Umatilla River basin does not support a tribal harvest of Pacific lamprey. Data from systematic surveys of lamprey abundance in the past are unavailable, but screen-trap records from the Umatilla Basin for several years were reviewed as an indicator of abundance. In 1986, 1988-90, and 1992-94 records show that no juvenile lamprey were captured at any of the screen-trap boxes in this subbasin. Brian Kilgore, current ODFW screen trap operator, stated that no lamprey were captured in 1997 and 1998 in the Umatilla River basin. From December 1994 to May 1996, eleven adults and 57 juveniles were sampled by ODFW (S. Knapp, ODFW, personal communication 1997) at a rotary-screw trap (RM 1.0) below Three Mile Falls Dam, and at West Extension Irrigation District canal at Three Mile Falls Dam (RM 3.7). In 1997, ODFW (C. Kern, ODFW, personal communication 1997) captured 298 juvenile Pacific lamprey in the rotary-screw trap. Lamprey were keyed to species and length measurements were taken. Lengths ranged from 65 to 170 mm. In addition, electrofishing for salmonids by the Umatilla Basin Natural Production Monitoring and Evaluation Project produced one live, one dead, and one near dead adult Pacific lamprey below Three Mile Falls Dam in June 1996 (Contor et al. 1998). From September through October 1998, CTUIR staff captured nine ammocoetes below RM 6. In 1997 and 1998, CTUIR did not capture any adult Pacific lamprey at the Three Mile Falls Dam adult trap (B. Zimmerman, CTUIR, personal communication 1997, 1998). Zimmerman observed one adult Pacific lamprey at Westland Irrigation Diversion (RM 27) in July of 1996, and 12 adult Pacific lamprey in the ladder at Three Mile Falls Dam during dewatering in April 1996. Technicians have observed one or two adult Pacific lamprey several times per year in the viewing window and ladder at Three Mile Falls Dam during spring operations. To monitor adult counts of Pacific lamprey, CTUIR staff installed video recorders at the viewing window at Three Mile Falls Dam (RM 3.7) in June 1998. To date, 5 upstream migrating lamprey have been observed at the window. However, the existing bar space could allow upstream migrating lamprey to go behind the fish ladder and avoid detection.

Shellfish

Shellfish were an important food for tribal peoples of the Columbia River. Native Americans in the interior Columbia River Basin harvested freshwater mussels for at least 10,000 years (Lyman 1984). Ethnographic surveys of Columbia Basin tribes reported that Native Americans collected mussels in late summer and in late winter through early spring during salmon fishing (Spinden 1908, Ray 1933, Post 1938). A few tribal elders from the Columbia and Snake River basins recalled that mussels were collected whenever conditions of the rivers were favorable (Hunn 1990). Tribal harvesters collected mussels by hand and, when wading was not possible, they used forked sticks (Post 1938). They prepared mussels for consumption by baking, broiling, steaming, and drying (Spinden 1908, Post 1938). A Umatilla tribal elder remembered his parents trading fish for dried mussels as late as the 1930s (Eli Quaempts, CTUIR tribal member, personal communication 1996). Ray (1942) also reported that the Umatilla tribe ate boiled freshwater mussels and clams.

Museum records indicate four species were historically present in the Umatilla River (T. J. Frest, personal communication 1998). These species are the western pearlshell (*Margaritifera falcata*), western ridgemussel (*Gonidiea angulata*), Oregon floater (*Anodonta oregonensis*), and California floater (*Anodonta californiensis*).

Wildlife

The Umatilla/Willow subbasin is inhabited by approximately seven amphibian species, 251 bird species, 72 mammal species, and 14 reptile species during all or part of the year (Appendix C). The list of wildlife species present in the subbasin was constructed using the coarse scale (1:2,000,0000) species maps developed by ICBEMP and updated based on the experience of local wildlife biologists. The list may not include all vertebrate species ever observed in the subbasin and may contain species that rarely or no longer occur in the subbasin.

Of the 344 wildlife species listed in Appendix C, many are of special concern to the wildlife managers in the subbasin. Thirty-two have listed status in Oregon or at the federal level (Table 27; Oregon Department of Fish and Wildlife 2000a). The subbasin is also home to many valuable game species. Game species harvested in the Umatilla/Willow subbasin in 1999 included mule and white-tailed deer, Rocky Mountain elk, black bear, cougar, turkey, pheasant, California quail, chukar, Hungarian partridge, forest grouse, snipe, morning dove, and multiple waterfowl species. Trapped furbearers include badger, beaver, coyote, mink, muskrat, otter, skunk and weasel.

Table 27. Listed wildlife species of the Umatilla/Willow subbasin

Species Name	Common Name	Status
Accipiter gentilis	northern goshawk	OR-SC, US-SC
Ammodramus savannarum	grasshopper sparrow	OR-SV
Antrozous pallidus	pallid bat	OR-SC
Amphispiza belli	sage sparrow	OR-SC
Bartramia longicauda	upland sandpiper	OR-SC
Bufo boreas boreas	western boreal toad	OR-SV,US-SC
Buteo regalis	ferruginous hawk	OR-SC, FS-S
Buteo swainsoni	Swainson's hawk	OR-SV, FS-S
Cervus elaphus	rocky mountain elk	FS-MIS
Chrysemys picta	painted turtle	OR-SC
Coccyzus americanus	yellow-billed cuckoo	OR-SC
Contopus borealis	olive-sided flycatcher	OR-SV, US-SC
Dryocopus pileatus	pileated woodpecker	OR-SV, FS-S
Glaucidium gnoma	northern pygmy-owl	OR-SC
Grus canadensis tabida	greater sandhill crane	OR-SV
Gulo gulo	Wolverine	OR-T, FS-S
Lanius ludovicianus	loggerhead shrike	OR-SV, US-SC
Lynx canadensis	Lynx	US-T
Martes americana	American marten	OR-SV, FS-MIS
Myotis thysanodes	fringed myotis	OR-SV,US-SC
Numenius americanus	long-billed curlew	OR-SV
Otus flammeolus	flammulated owl	OR-SC, US-S
Pelecanus erythrorhynchos	american white pelican	OR-SV
Picoides albolarvatus	white-headed woodpecker	OR-SC, FS-MIS
Picoides arcticus	black-backed woodpecker	OR-SC
Picoides tridactylus	three-toed woodpecker	OR-SC, FS-MIS
Plecotus townsendii	Townsends's big-eared bat	OR-SC, FS-S
Sceloporus graciosus graciosus	sagebrush lizard	OR-SV, US-SC
Sitta pygmaea	pygmy nuthatch	OR-SC
Speotyto cunicularia	burrowing owl	OR-SC
Spermophilus washingtoni	Washington ground squirrel	OR-E
Strix nebulosa	great gray owl	OR-SV, FS-S

Key:

Oregon (OR) Classifications	Forest Service (FS) Classifications	Federal (US) Classification
SC- Sensitive Critical	S-Sensitive	E-Endangered
SV-Sensitive Vulnerable	MIS-Management Indicator Species	T-Threatened
T-Threatened		SC-Species of concern
E-Endangered		

Landbirds include all migratory and resident birds in the subbasin. These birds account for a significant portion of the biological diversity in the Umatilla/Willow subbasin. Approximately 207 species of landbirds occur in the subbasin; making up about 69% of the terrestrial fauna species (Appendix C). Fire suppression, timber management, and the resulting changes in the structure and distribution of vegetation communities have influenced the distribution and abundance of many avian species (Marcot et al. 1997). Some species that have declined in abundance regionally include white-headed woodpecker, flammulated owls, and Columbian sharp-tailed grouse (Saab and Rich 1997; Andelman and Stock 1994; Table 28). Conversely, past practices have increased habitat suitability for some species. Species that have increasing or stable trends in the region include Wilson's warbler, chipping sparrow, varied thrush, and western tanager (Saab and Rich 1997; Andelman and Stock 1994). Implementation of the conservation recommendations for priority habitats and species defined by Altman and Holmes (2000a, 2000b) in the Conservation Strategy's for Landbirds of Oregon and Washington is considered the best strategy for conservation of the subbasin's landbird populations.

Table 28. Landbird species inhabiting the Umatilla/Willow subbasin with declining population trends

Species	Primary Habitat for Breeding
American kestrel[1]	Coniferous forest, grassland
Mourning dove[1]	Coniferous forest, riparian
Vaux's swift[1]	Coniferous forest, riparian
Rufus hummingbird[1]	Coniferous forest, riparian
Belted kingfisher[1]	Riparian
Lewis's woodpecker[2]	Coniferous forest, riparian
Williamson's sapsucker[1]	Coniferous forest, riparian
Olive-sided flycatcher[3]	Coniferous forest
Western wood-pewee[1]	Coniferous forest, riparian
Violet-green swallow[1]	Coniferous forest, riparian
Barn swallow[1]	Riparian
Rock wren[1]	Grassland, cliff, rock, talus
Swainson's thrush[1]	Coniferous forest, riparian
Varied thrush[1]	Coniferous forest
Orange-crowned warbler[1]	Riparian
Wilson's warbler[1]	Riparian
Western tanager[1]	Coniferous forest, riparian
Chipping sparrow[1]	Coniferous forest
White-crowned sparrow[1]	Riparian
Dark-eyed junco[1]	Coniferous forest, riparian
Western meadow lark[3]	Grassland
Pine siskin[2]	Coniferous forest
American goldfinch[1]	Riparian

[1]Species identified as having a significant declining population trend by Andleman and Stock 1994
[2]Species identified as a high concern to management by Saab and Rich 1997
[3]Species identified by Andleman and Stock 1994 and Saab and Rich 1997

Focal Species

Focal species were selected to represent groups of species of management concern in the subbasin (Table 29). Target species used for the McNary and John Day hydroelectric facility Habitat Evaluation Procedure (HEP) loss assessment were selected to represent measured losses previously amended into the NWPPC program (Childs et al. 1997; U. S. Fish and Wildlife Service 1980). Focal species also were selected based on forest, shrub steppe, and wetland/riparian habitat requirements, since habitat loss is the primary factor in the population declines of many of the subbasin's wildlife species.

Table 29. Target Species Selected for the John Day and McNary Projects

EVALUATION SPECIES	RATIONALE FOR SELECTION
Spotted Sandpiper (Actitis macularia)	A representative of migratory shorebirds, which use the sparsely vegetated islands, mudflats, shorelines, and sand and gravel bars associated with the John Day and McNary Project areas. This habitat comprised the third largest loss of terrestrial acreage resulting from hydropower development in the John Day and McNary project areas.
Canada Goose (Branta canadensis)	A migratory bird of national significance. Sensitive to island nesting habitat and associated shoreline brooding areas. Cultural significance.
Great Blue Heron (Ardea herodias)	Carnivore, which forages on a variety of vertebrates in shallow water. The sand/gravel/cobble/mud shorelines of the reservoirs are commonly used as foraging areas. Existing HEP model available, which is sensitive to changes in these habitats. Cultural significance.
Yellow Warbler (Dendraica petechia)	Represents species, which reproduce in riparian shrub habitat and make extensive use of adjacent wetlands. Existing HEP model, which is sensitive to the targeted habitats - riparian shrub and adjacent wetlands.
Black-Capped Chickadee (Parus atricopillus)	Representative of species utilizing mature forest canopies. Forest cavity nesters. HEP model available.
Mink (Mustela vison)	Carnivorous furbearer, feeds on wide variety of vertebrates. Utilizes shoreline and adjacent shallow water habitats. HEP model available. Cultural significance.
Western Meadowlark (Sturnella neglecta)	A species common to shrub-steppe/grassland habitat, the largest terrestrial habitat type flooded by the hydroelectric projects. This bird is well known for its melodious song, feeds primarily on insects and seeds.
California Quail (Lophortyx californicus)	A species commonly associated with the shrub-steppe/grassland habitat. This game bird feeds on seeds and greens in brushy and grassland areas.
Mallard (Anas platyrhynchgos)	The mallard utilizes a broad range of cover types including riparian herb, emergent wetlands, and islands for nesting, brood rearing, and wintering habitat. Recreational significance.
Downy Woodpecker (Picoides pubescens)	This woodpecker represents a species, which feeds and reproduces in a tree environment. The downy woodpecker HEP model was selected to measure the riparian tree cover type. Its diet is primarily insects with some seeds and fruits.

Extirpated species and managed species were also selected as focal species to address reintroduction and game management concerns. By managing for species representative of important components of the functioning ecosystem, many other species will also be conserved.

Forest-Dependent Focal Species

Approximately 21% of the subbasin consists of forested habitat (Figure 17). Changes in composition and structure of forested habitats has negatively impacted habitat suitability for many forest-dependent species. Listed species dependent on forest habitat types that may inhabit the subbasin include Northern goshawk, olive-sided flycatcher, pileated woodpecker, northern pygmy owl, wolverine, lynx, black-backed woodpecker, and three-toed woodpecker (Csuti et al. 1997). White-headed woodpecker, Lewis's woodpecker, flammulated owl, MacGillvray's warbler, Canada lynx, and wolverine were selected as focal species; these species depend on a variety of forest types and structures.

White-Headed Woodpecker

The current status and distribution of the white-headed woodpecker in the Umatilla/Willow subbasin is undetermined. However, the woodpecker occurs throughout the Blue Mountains Ecological Reporting Unit (ERU) (Wisdom et al. 2000). Gabrielson and Jewett (1940) reported this bird was a regular permanent resident of the large structure ponderosa pine forests of eastern Oregon. More recently, however, Gilligan et al. (1994) found that severely degraded habitats in the Blue Mountains have resulted in this bird being "now quite scarce." 19 of the 54 5th field HUCs in the Umatilla/Willow subbasin historically contained source habitat for the white-headed woodpecker according to ICBEMP analysis. Source habitats in 14 of these 19 HUCs have declined, in 12 HUCs by $\geq$ 60% (Wisdom et al. 2000). The woodpecker has been occasionally observed in the mid to upper elevations of the subbasin since 1985 (Charles Gobar, USFS, personal communication January 2001).

Flammulated Owl

The current status and distribution of the flammulated owl in the Umatilla/Willow subbasin is unknown. Flammulated owls are broadly distributed throughout the Blue Mountain ERU, although the availability of source habitats for the species has declined (Wisdom et al. 2000). Flammulated owls have been documented in or adjacent to the Umatilla/Willow subbasin (Charles Gobar, USFS, personal communication January 2001). Flammulated owls depend on late seral ponderosa pine forests with high densities of snags, typically nesting in cavities abandoned by northern flicker and pileated woodpecker (Marshall et al. 1996). The flammulated owl was selected as a focal species to represent species dependent on late seral ponderosa pine.

MacGillivray's Warbler

Regionally, the MacGillivray's warbler has exhibited a non-significant short-term (1980-1996) declining trend of 2.1% per year (Altman and Holmes 2000a, 2000b). The current population status and distribution of MacGillivray's warbler in the Umatilla/Willow subbasin is undetermined. However, the warbler has been documented numerous times in or adjacent to the subbasin over the last few years (Pyle et al. 1999). Preferred habitat for the warbler includes mixed conifer forests with a dense shrub layer in openings or understory (Altman and Holmes 2000a, 2000b). The MacGillivray's warbler is vulnerable to cowbird parasitism in areas where habitat fragmentation has allowed cowbirds to colonize. Reductions in shrub cover due to grazing intensity, wildfires, herbicide treatments, and prescribed burns can reduce the suitability of habitats for the MacGillivray's warbler (Altman and Holmes 2000a, 2000b).

Canada Lynx

The current population status and distribution of the Canada lynx in the Umatilla/Willow subbasin is unknown. Surveys failed to detect the lynx within and adjacent to the subbasin in 1999 and the species may have been extirpated from the area (Stinson 2000). The secretive nature of the lynx makes it difficult to conclusively establish its presence or absence. The lynx was recently listed federally as threatened and is naturally rare in the subbasin (Stinson 2000). Three unconfirmed sightings of lynx have occurred west of Tollgate along State Route 244 within the last five years (Charles Gobar, USFS, personal communication January 2001). Preferred habitat for the lynx consists of high elevation (>4500') stands of cold and cool forest types with a mosaic of structural stages for foraging and denning. Primary habitat consists of subalpine fir, Englemann spruce, and lodgepole pine (Ruediger et al. 2000; Ruggiero et al. 1999). Lynx habitat occurs at higher elevations in the forested areas of the subbasin. Portions of USFS Lynx Analysis Units (LAU) #2, #3, #5, and #6 occur in the Umatilla/Willow subbasin.

Wolverine

Current population status and distribution of wolverine in the Umatilla/Willow subbasin is unknown. Winter snow track surveys were conducted in 1991 and 1992 for wolverine just east of the subbasin. Miscellaneous unconfirmed sightings have occurred near the western edge of the Wenaha-Tucannon Wilderness area within the last five years (Charles Gobar, USFS, personal communication January 2001). The wolverine prefers high elevation conifer forest types with a sufficient food source and limited exposure to human interference. Although occurrence was never common, the wolverine inhabited mountainous regions throughout the subbasin. Connectivity of boreal forest habitats and seclusion for winter den sites are key factors for this wilderness species (Marshall et al. 1996).

Shrub Steppe-Dependent Focal Species

Shrub steppe communities consist of one or more layers of perennial grass with a conspicuous but discontinuous layer of shrubs above (Daubenmire 1988). A number of wildlife species associated with shrub steppe and grassland habitats are listed as Oregon Sensitive Species. These include the long-billed curlew, loggerhead shrike, sage sparrow, grasshopper sparrow, burrowing owl, ferruginous hawk, Swainson's hawk, black-throated sparrow, sagebrush lizard, Washington ground squirrel, and white-tailed jackrabbit (Table 27). The loggerhead shrike ferruginous hawk, grasshopper sparrow, sage sparrow, and

Washington ground squirrel and pronghorn were selected as focal species for this habitat type (Altman and Holmes 2000a, 2000b; Leu 1995).

Loggerhead Shrike

Data from USFWS breeding bird survey shows a highly significant decline (p < .01 of 2.7% a year for the species in the Columbia plateau region from 1968 to 1998 (Sauer et al. 1999). The loggerhead shrike is associated primarily with sagebrush and juniper steppe, particularly high-density tall sagebrush plants with a variety of understory conditions (Altman and Holmes 2000a, 2000b). However, bare soil understory (including that with cryptogrammic crust) is favored by feeding shrikes (Leu 1995). According to ICBEMP analysis, the big sagebrush habitat type has declined approximately 50% in the Columbia plateau (Wisdom et al. 2000). Remaining large big sagebrush patches in the Umatilla/Willow subbasins are confined to the Navy bombing range near Boardman and the adjacent undeveloped state-owned lands at the Boeing Agri-Industrial Complex. Virtually all remaining sagebrush habitats in the subbasin are dominated by a cheatgrass understory that further reduces shrike use and increases fire frequency and intensity. A three year nesting study (Holmes and Geupel 1998) of loggerhead shrikes near Boardman showed a 36% nest success rate.

Ferruginous Hawk

The ferruginous hawk is listed as a state threatened species and is dependent on large areas of shrub steppe and grassland habitat (Marshall et al. 1996). Rabbits and hares, ground squirrels, pocket gophers, and kangaroo rats make up 94.6% of the prey base for ferruginous hawks (Olendorff 1993). Gabrielson and Jewett (1940) found 28 nests in northern Morrow and Umatilla Counties. Only a fraction of that number occurs today in the low elevation habitat portion of the subbasin (Russ Morgan, ODFW, personal communication February 2001). Foothill grassland portions of the subbasin continue to harbor ferruginous hawks, but their stability is unknown. Declining populations and a reduction in breeding range is attributed to conversion of habitat to cultivated agriculture, nest site losses, decline in prey populations (i.e. ground squirrels), off-road vehicle use, and other forms of human disturbance (Marshal et al. 1996).

Grasshopper Sparrow

The grasshopper sparrow occurs throughout the Umatilla/Willow subbasin. Holmes and Geupel (1998) showed this bird is positively correlated with perennial bunchgrass cover and negatively associated with shrub cover and density in the lower elevation portion of the Columbia plateau. Janes (1983) showed the species was most abundant in the foothill grassland areas of the subbasin and preferred north-facing slopes with undisturbed bunchgrass and lupine (*Lupinus leucophilus*). Highly fragmented and poor condition small habitat areas provide little value to this species. Cultivated and irrigated lands in the Umatilla/Willow subbasin represent a loss of habitat except on CRP lands where bunchgrasses are well established (Altman and Holmes 2000a, 2000b). However, it is unknown whether these CRP fields support viable populations of grasshopper sparrows.

Sage Sparrow

Once abundant in northern Morrow and Umatilla Counties (Gabrielson and Jewett 1940), this bird occurs only on a few small remaining habitat tracts today. The sage sparrow is a sagebrush obligate that prefers large tracts of dense sagebrush. Within these areas its presence is negatively correlated with cheatgrass and other dense ground-covering plants in the sage understory (Holmes and Geupel 1998). In Washington it was absent on patches of sagebrush smaller than 130 ha (325 ac) (M. Vanderhaegen unpubl. data). Habitats with dense sagebrush and native bunchgrass, cryptogamic crust, and/or bare soil in the understory are among the rarest in the Umatilla/Willow Creek subbasins (Russ Morgan, ODFW, personal communication February 2001). Of the 86% loss of big sagebrush habitat in the subbasin, most has been lost in the lower elevation areas to farming (Kagan et al. 2000). The only remaining area supporting nesting sage sparrows in the Umatilla/Willow Creek subbasins is the Navy Bombing Range near Boardman. In 1998, a large fire (and the post-fire cheatgrass invasion) at that facility eliminated approximately 60% of the known sage sparrow habitat.

Washington Ground Squirrel

The entire range of the Washington ground squirrel in Oregon occurs within the Umatilla/Willow subbasins and a small portion of the Walla Walla subbasin (Oregon Department of Fish and Wildlife 2000c). The squirrel was listed as endangered by the Oregon Fish and Wildlife Commission in January of 2000 and has been petitioned for federal listing across its entire range. It inhabits undeveloped shrub steppe and grassland habitats, particularly those with deep loam soils. The primary causes of decline in the subbasin are loss of habitat, primarily the conversion of shrub steppe habitat areas to agriculture. Fragmentation and isolation of remaining habitat blocks presents further threats to the species. It is estimated that fewer than 200 independent colonies exist in the Oregon portion of the Columbia plateau today (Oregon Department of Fish and Wildlife 2000c). Remaining critical habitats for this species are lands at the Boardman Naval training facility, adjacent habitats at the south end of the Boeing Lease Lands, and BLM and private lands around Horn Butte (Oregon Department of Fish and Wildlife 2000c).

Pronghorn

The pronghorn was historically distributed throughout the Columbia basin. Its range is currently limited to large grassland tracts (primarily privately owned) in the southern foothills of the Umatilla/Willow subbasin. Several hundred pronghorn are estimated to inhabit the subbasin, with approximately 45 hunting tags available during an October season (Oregon Department of Fish and Wildlife 2000b). The Umatilla Army Depot includes a fenced-in population of more than 100 pronghorn that have been used since the 1990s for a trap and transplant program in eastern Oregon (Kevin Blakely, ODFW, personal communication February 2001).

Wetland and Riparian-Dependent Species

Declines in the quality and quantity of wetland habitat in the subbasin have negatively impacted the wildlife populations that depend on this habitat type. Of the eight amphibian species in the subbasin (Appendix C), the northern leopard frog (*Rana pipiens*), spotted frog (*Rana pretiosa*), western toad (*Bufo boreas*), and Woodhouse's toad (*Bufo woodhousii*) are listed as sensitive by ODFW. Of these, the northern leopard frog and spotted frog are sublisted as critical, while the western toad and Woodhouse's toad are considered vulnerable and peripheral or naturally rare, respectively (Marshal et al. 1996).

Spotted Frog

The current status and distribution of the spotted frog in the Umatilla/Willow subbasin is undetermined. However, the frog occurs sporadically throughout the Blue Mountains. The spotted frog has occasionally been observed in the middle and lower elevations of the subbasin since 1995. Preferred habitat for the frog consists of marsh, permanent ponds, and slow streams with abundant aquatic vegetation (Marshal et al. 1996). Suitable habitat for the spotted frog can be found in the Umatilla/Willow subbasin along numerous streams and a few wet meadows or seeps. The spotted frog was formerly considered threatened in western Oregon by ODFW, but subsequently sublisted to critical due to lack of documentation on its disappearance. It is currently a Category 2 species on USFWS' Notice of Review for its entire range (Marshal et al. 1996).

Painted Turtle

The current status of painted turtle populations in the subbasin is unknown, although a declining trend due to unsuccessful recruitment throughout Oregon has been documented. A study of the Irrigon Wildlife Area population found that recruitment of young turtles was poor. On a statewide basis over 75% of turtles found exceeded 10 years of age (Oregon Natural Heritage Data Base). Factors contributing to turtle declines include the introduction of bullfrogs, which predate on young turtles (Crogan n.d.) and possibly wetland and riparian habitat succession.

Bald Eagle

Currently, the bald eagle is not known to nest in the Umatilla/Willow subbasin. Wintering eagles are occasionally observed in the subbasin, but their population status and distribution is undetermined. Preferred nesting habitat for bald eagles is predominately coniferous, uneven-aged stands with a late seral component near a large body of water that supports an adequate food supply (Marshall et al. 1996). Wintering and potential nesting habitat occurs along the larger streams and rivers in the subbasin.

Lewis's Woodpecker

The current status and distribution of Lewis's woodpecker in the Umatilla/Willow subbasin is undetermined, as breeding bird survey information is inadequate to assess the status of this species. However, the woodpecker has been known to occur in or adjacent to the subbasin. Preferred habitat for the woodpecker includes open riparian cottonwoods with a brush understory. It is an excellent focal species for large structure riparian cottonwood stands with associated large snags (Altman and Holmes 2000a, 2000b). Habitat for Lewis's woodpecker occurs in the riparian woodlands of the Umatilla/Willow subbasin. However, Wisdom et al. (2000) reported a decline of source habitat for this species in the

Columbia Plateau of 97%. Bock (1970) reported that this species is also highly dependent on insect abundance in riparian habitats.

Red-Eyed Vireo

Altman and Holmes (2000a, 2000b) identified the red-eyed vireo as a riparian woodland canopy foliage focal species. The red-eyed vireo is an obligate for mature, riparian deciduous forest with high canopy closure and foliage volume. Regional breeding bird surveys indicate the red-eyed vireo has experienced a highly significant long-term (1966-1996) declining trend of 3.1% per year and a highly significant short-term (1980-1996) declining trend of 3.0% per year (Altman and Holmes 2000a, 2000b). The vireo is known to occur in the subbasin along low elevation streams. Preferred habitat for the vireo includes mature, riparian deciduous forest with high canopy closure and foliage volume. Protection of habitat for the red-eyed vireo should provide habitat for many of the riparian-dependent wildlife species in the subbasin.

Managed Species

Elk

Based on nationwide forest statistical reports, the UNF supported one of the largest Rocky Mountain elk herds in the country during the 1970s and 1980s (U. S. Forest Service 1990). Elk densities in the subbasin are still among the highest in Oregon state (Oregon Department of Fish and Wildlife 1986). The Umatilla/Willow subbasin contains portions of the Mt Emily, Ukiah, and Heppner Wildlife Management Units (WMU). Currently the Umatilla/Willow watershed supports approximately 8,400 elk (Mark Kirsch, ODFW, personal communication February 2001). Approximately 1,500 of these elk summer in the Grande Ronde subbasin, but winter in the McKay and East Birch Creek portions of the Umatilla subbasin (Mark Kirsch, ODFW, personal communication February 2001).

In the Umatilla/Willow watershed, elk primarily summer in high elevation, publicly owned forest lands (Mark Kirsch, ODFW, personal communication February 2001). In the winter, elk move into the lower elevation foothills (Mark Kirsch, ODFW, personal communication February 2001) (Figure 29). The Umatilla/Willow subbasin contains approximately 690 sq/mi of winter elk range and 680 sq/mi of summer elk range (Figure 37). A GIS comparison of the winter elk range and subbasin ownership coverage indicates that 82% of the winter elk range in the Umatilla/Willow assessment area is privately owned. The limited availability of publicly owned winter elk range may force elk to feed in agricultural areas, causing increasing conflicts with landowners.

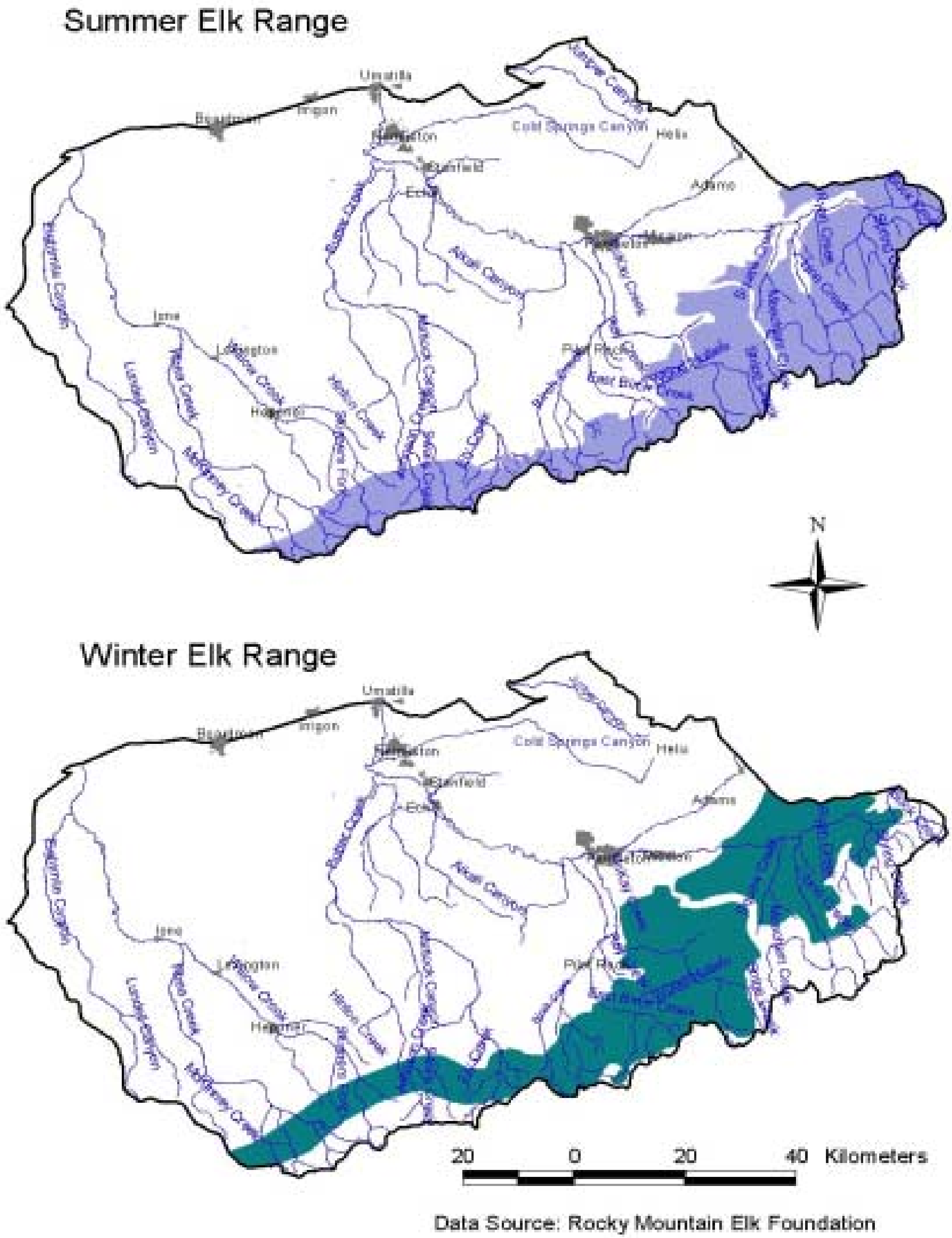

Figure 37. Winter and summer elk ranges in the Umatilla/Willow subbasin

Deer

Two *Odocoileus* species occur in the subbasin, the mule deer (*Odecoileus hemionus*) and the white-tailed deer (*Odecoileus virginianus*). Mule deer dominate in upper elevation forested habitats and arid lowland areas. White-tailed deer are the dominant deer species in riparian areas with a constant flowing water source and in foothill areas with hawthorn groves in the draws and hillsides (U. S. Army Corps of Engineers 1997). However, the extreme susceptibility of white-tailed deer to the disease Blue Tongue contributes to a separation between habitats used by the two species. White-tailed deer are usually not found in arid habitats due to the prevalence of Blue Tongue in these environments (Davis et al. 1981).

Mule deer populations for the Umatilla/Willow subbasin are below the ODFW's management objective of 1,900 animals. Mule deer populations in Oregon peaked during the mid-1950s and early 1960s, but have declined since then. Overgrazing of domestic livestock and increases in large predator populations are considered factors in the decline (Oregon Department of Fish and Wildlife 1990).

Cougar

Cougar are prevalent in the Umatilla/Willow subbasin. The number of cougar hunters and cougars harvested has increased steadily since hunting seasons were authorized in 1970 (Oregon Department of Fish and Wildlife 1993b). Complaints of cougar damage in the region have increased since 1986. This is considered a reflection of both increasing cougar populations and increasing human encroachment into cougar habitat. Open mixed-conifer type forests are thought to be the best habitat types for supporting cougar in eastern Oregon (Oregon Department of Fish and Wildlife 1993a). Cougar densities are around 1 per 8 square miles in the forested region of the subbasin (Akenson et al. 1993).

Black Bear

The black bear is an indicator of ecosystem health (Oregon Department of Fish and Wildlife 1993a) and among the nine species determined by Cederholm et al. (2000) to have a strong consistent link to salmon. High levels of bear predation on elk calves may be a factor in poor calf recruitment rates (Oregon Department of Fish and Wildlife 1993a).

The Umatilla/Willow subbasin provides high quality black bear habitat and sustains a relatively large black bear population. Bear distribution is widespread from the forested summits, through the riparian areas, and down slope to the dryland wheat fields of the foothills. Bear densities in and around the subbasin are estimated at 0.3 bears per square mile (Oregon Department of Fish and Wildlife 1993a).

Furbearers

Consistent annual harvest of beaver, river otter, mink, muskrat, raccoon, badger, red fox and bobcat reported by licensed fur takers indicates a healthy population throughout the subbasin in appropriate habitats (Oregon Department of Fish and Wildlife 2000b). Beaver and river otter activity and distribution occurs from the Columbia River to mid-elevation forested regions throughout the Umatilla/Willow subbasin drainage (Mark Kirsch, ODFW, personal communication January 2001). Private landowner damage (agriculture and residences) from beaver is a major component of ODFW activities. The red fox population probably originated as feral animals from several abandoned fur farms. Bobcat harvest is regulated through mandatory reporting on harvest cards and season bag limits; annual harvest is analyzed for sex/age structure (Kevin Blakely, ODFW, personal communication January 2001).

Migratory Game Birds

Numerous migratory game bird species are common in the subbasin including mourning dove, common snipe, ducks, mergansers, coots, and geese. Mourning dove and snipe populations in the region are considered stable, while waterfowl populations have experienced a significant increase (Oregon Department of Fish and Wildlife, 1999). Waterfowl population increases have been attributed to the increase in habitat as a result of the advent of irrigated agricultural practices following the construction of the John Day and McNary hydroelectric facilities. More recently the increasing popularity of corn as a crop in the subbasin has increased the food available to waterfowl. The Umatilla National Wildlife Refuge is estimated to support between 200,000-460,000 waterfowl each winter. As waterfowl populations in the Umatilla/ Willow subbasin have increased, those in neighboring areas including the Hanford reach and the northern Columbia Basin have declined (Lloyd 1983). In an attempt to redistribute waterfowl populations in the subbasin wildlife managers have increased the area where waterfowl hunting is permitted.

Upland Galliformes

Forest Grouse

Ruffed grouse, blue grouse, and spruce grouse are native galliformes that inhabit forested areas in the subbasin. Surveys indicate annual variations in harvest numbers for ruffed grouse and blue grouse (Oregon Department of Fish and Wildlife 1999). Analysis of grouse wings collected from hunters (1980 to present) documented timing and variations for mean hatch date, hatching range, and sex/age ratios in the harvest (Crawford and Coggins 2000). Ruffed grouse are closely associated with riparian areas throughout the entire year. Blue grouse breed in open foothills and are closely associated with streams, springs, and meadows. Much of the food they require comes from the succulent vegetation or insects in these areas. During spring and summer, blue grouse use stream bottoms and areas with gentle slopes. In the fall they migrate to higher elevations where they spend the winter feeding on fir needles. Large fir trees are a food source for wintering blue grouse and are required for roost sites. Blue grouse exhibit strong site fidelity to their wintering areas in true fir (*Abies spp*.) and Douglas fir (*Pseudotsuga menziesii*) forests (Larsen and Nordstrom 1999). Winter habitat is the most limiting to blue grouse in the Umatilla/Willow subbasin. Source winter habitats have been identified in the headwaters of Butter, Bridge, Birch and Meacham Creeks, but their availability has declined by around 60% since the turn of the century (Wisdom et al. 2000).

Mountain Quail

Mountain quail are uncommon game birds in the subbasin. Populations in the region are thought to have declined in recent years largely from declining habitat quality. Mountain quail are secretive and rely on brushy habitats that are usually associated with riparian zones. Degradation of riparian corridors is of particular concern for this species. Without well-developed corridors, mountain quail are unable to move between habitat patches and become isolated (Larsen and Nordstrom 1999).

Introduced-Game Birds

Wild turkey, ring-necked pheasant, California quail, chukar partridge, and Hungarian partridge are galliformes that have been introduced to the Umatilla/Willow subbasin to provide recreational activities. These species are popular game species that have effectively naturalized in the Umatilla/Willow subbasin and wildlife managers in the basin work to maintain their populations. The industrialization of agricultural practices and the reduction in cheatgrass prominence due to yellow star thistle invasion has reduced the subbasin's suitability for these species and their populations over the last two decades (Oregon Department of Fish and Wildlife 1999).

Pheasant

Based on surveys and harvest data, pheasant populations have declined significantly in the past 30 years (Oregon Department of Fish and Wildlife 1999). Pheasant populations in Oregon have most likely declined due to agricultural changes to the landscape. Pheasant harvest in the Columbia basin is still an important game bird recreation in the fall, along with quail hunting

Chukar and Hungarian Partridge

Chukar populations in the region have declined dramatically since the early 1980s due to habitat deterioration, primarily due to weather variability and the spread of noxious weeds. Nesting chukar have been exposed to poor nesting conditions for many years, consisting of drought or wet cold weather during the nesting season. Both conditions contribute to poor nesting success and survival of young.

Extirpated Species

Sharp Tailed Grouse

Historically the Columbian sharp-tailed grouse inhabited most of eastern Oregon, including the Umatilla/Willow subbasin. Excessive hunting in the mid- to late 19th century caused an initial reduction of the Columbian sharp-tailed grouse population and range (Crawford and Coggins 2000). In 1899, L. B. Quimbly of ODFW noted that sharp-tailed grouse were declining rapidly. He ascribed the decrease in abundance to over harvest during winter and expressed the need for hunting restrictions (Crawford and Coggins 2000). Since the turn of the century, the conversion of native habitats to crop production and habitat degradation from livestock grazing has contributed to further population declines and range reduction (Hays et al. 1998). In response to continuing declines in sharp-tailed grouse populations, the Oregon hunting season closed in 1929 and never reopened. Columbian sharp-tailed grouse were extirpated from Oregon in the 1960s. The only population of sharp-tailed grouse currently in Oregon was reintroduced to Wallowa County in 1990 (Crawford and Coggins 2000). Due to improved grazing practices and programs like CRP, habitat for sharp-tailed grouse in the subbasin has improved since extirpation. The Umatilla/Willow subbasin is being considered as a potential site for additional sharp-tailed grouse reintroduction efforts (Mark Kirsch, ODFW, personal communication January 2001).

Gray Wolf

The wolf was extirpated from the region by the early 1900s. Successful reintroduction and management programs in Idaho and Montana have increased wolf populations in the northern Rocky Mountains, allowing wolves to disperse into and potentially propagate in Oregon. Potential wolf habitat occurs in the forested lands of the subbasin and it is assumed wolves will soon reoccupy the area. Wolf sightings have already occurred in the subbasin but genetic purity has not been established; a high probability exists that most of the animals observed were wolf-dog hybrids (Mark Kirsch, ODFW, personal communication February 2001). The wolf is a habitat generalist that inhabits a variety of plant communities containing a mix of forested and open areas with a good ungulate population. Wolves prefer areas with few roads, avoiding areas with a road density greater than one mile per square mile (Charles Gobar, USFS, personal communication January 2001).

Rocky Mountain Bighorn Sheep

Rocky Mountain bighorn sheep were native to the Umatilla/Willow subbasin, but were extirpated from Oregon by the 1940s (Umatilla National Forest, 1990). Over hunting, unregulated domestic livestock grazing, and parasites and disease carried by domestic livestock are all considered factors in the extirpation of bighorn sheep. Rocky Mountain bighorn sheep were reintroduced to the Wenaha river drainage in 1983, this area borders the Umatilla/Willow subbasin on the east. The Umatilla/Willow subbasin contains suitable habitat for big horn sheep but is not currently scheduled to receive a transplant due to almost certain contact with domestic sheep grazed on forest service allotments in the subbasin. Domestic sheep carry bacterial pneumonia (Pasturella), which is easily transferred to and fatal for bighorn sheep. At this time bighorn sheep strays that occasionally wander into the subbasin are destroyed by wildlife managers to prevent Pasturella transmission.

Habitat Areas and Quality

Fish

Salmonid habitat in the Umatilla subbasin has been considerably reduced over the last century. Since the late 1800's, habitat has been fragmented and degraded from increasing land use and disturbance (Oregon Department of Environmental Quality 2000). Approximately 70% of the Umatilla River has been levied or channeled (observation, aerial photography, CTUIR habitat survey), effectively disconnecting major portions from the floodplain (Shaw and Sexton 2000). Similarly, it is estimated that 70% of all Umatilla tributaries are in need of riparian improvement (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife 1990).

Extensive vegetation removal and disturbance associated with urban development, cultivation, forestry, transportation corridors, flood control and navigation has occurred and continues to occur in the subbasin (Oregon Department of Environmental Quality 2000). This results in an aquatic landscape which suffers from inadequate streamflows, excessive temperatures, structural impediments, inadequate riparian corridors, simplified and reduced instream habitat, and excessive erosion (e.g., CTUIR 1996; Crabtree 1996; Shaw and Sexton 2000; ODFW 1990). These factors have jeopardized stronghold habitats, reduced the number of adult spawners and have contributed to decreased smolt-to-adult returns in anadromous species. According to the Oregon Statewide Assessment for the Umatilla River Basin, "[t]he most commonly cited causes of beneficial use degradation were vegetation removal along streambanks, removal of thermal cover over streams, and surface erosion. The land uses most commonly cited in connection with these problems were irrigated and non-irrigated agriculture, grazing, and associated vegetation management within grazing and agriculture" (Oregon Department of Environmental Quality 1988; Purser, 1994). Habitat alterations have often resulted in negative fish and wildlife habitat impacts due to lack of enforcement of environmental regulatory requirements. Examples of regulations include Section 404 Fill and Removal Permits, Water Quality Standards, local land use planning regulations and ESA Take Prohibitions.

Despite these problems, limited high quality salmonid habitat continues to persist in the subbasin. Habitat conditions generally follow an elevational gradient, with higher quality habitat in the upper portion of the subbasin, while lowland portions contain the most degraded habitat. Subwatersheds with high to moderate-high quality habitat are shown in Table 30.

Table 30. Characterization of the "best remaining salmonid habitat" in the Umatilla subbasin (Umatilla National Forest 2000).

Subwatersheds with high quality salmonid habitat	**Subwatersheds with moderate-high quality habitat**
Lower North Fork Umatilla	Ryan Creek
Upper North Fork Umatilla	Shimmiehorn Creek
Buck Creek	Camp Creek
Middle North Fork Meacham	Owsley Creek
Upper North Fork Meacham	
Pot Creek	
Bear Creek	

The Umatilla National Forest (2000) recommends that the lower North Fork of the Umatilla, Coyote Creek, upper North Fork of the Umatilla, upper North Fork of Meacham Creek, Pot Creek, Ryan Creek and Bear Creek be managed as salmonid refugia because of their high quality habitat. They also suggest that Buck Creek, Shimmiehorn Creek, Camp Creek and Owsly Creek could provide high quality habitat given time and restoration efforts.

Comparisons of habitat variable averages (Table 31) show that woody debris number and volume per 100m of channel rank lowest among all variables, and that width:depth ratios rank third lowest (Contor et al. 1995-1998). In addition to other factors, the poor width:depth ratios of many stream segments in the Umatilla subbasin may be due to the absence of habitat-forming and bank-stabilizing woody material. The Oregon Department of Fish and Wildlife summarized key habitat parameters within the Umatilla Basin and compared those values to measurable benchmarks (Table 32).

Table 31. General habitat conditions throughout the Umatilla subbasin. Data provided and summarized from surveys conducted by the Confederated Tribes of the Umatilla Indian Reservation over the years 1992-1997 (Confederated Tribes of the Umatilla Indian Reservation 1994; Contor et al 1995; 1996; 1997; 1998).

Stream Segment (RM)	**Survey Year**	**General Condition[1]**	**Habitat Feature Ranking**							
			Pool Area (%)	**Dry Channel (%)**	**Width: Depth**	**Fines (%)**	**Open sky (%)**	**Canopy Closure (%)**	**Woody Debris (#/100m)**	**Woody Debris (m^3/100m)**
Buckaroo	1992-93	1.5 (poor-fair)	Fair	Poor	Poor	Good	Fair	Poor	Poor	Poor
Meacham	1992-93	2.0 (fair)	Good	Poor	Poor	Good	Poor	Poor	Poor	Poor
Boston Canyon	1992-93	2.1 (fair)	Fair	Fair	Fair	Good	Good	Good	Poor	Poor
Boston Canyon trib.	1992-93	2.0 (fair)	Fair	Fair	Poor	Good	Good	Good	Poor	Poor
Line	1992-93	2.1 (fair)	Fair	Fair	Fair	Good	Good	Good	Poor	Poor
Umatilla (RM 56.1-81.8)	1993-94	1.2 (poor)	Fair	Fair	Poor	Fair	Poor	Poor	Poor	Poor
Squaw	1993-94	1.7 (poor-fair)	Fair	Poor	Poor	Good	Fair	Good	Poor	Poor
Camp	1993-94	2.1 (fair)	Fair	Fair	Fair	Fair	Fair	Good	Poor	Good
Camp trib.	1993-94	1.8 (poor-fair)	Fair	Poor	Fair	Good	Fair	Good	Poor	Poor
Umatilla (RM 81.8-89.6)	1994-95	1.6 (poor-fair)	Fair	Fair	Poor	Fair	Good	Poor	Poor	Poor
Moonshine	1994-95	1.5 (poor-fair)	Fair	Poor	Fair	Poor	Good	Poor	Poor	Poor
Mission	1994-95	1.3 (poor)	Fair	Poor	Poor	Poor	Good	Poor	Poor	Poor
Cottonwood	1994-95	1.5 (poor-fair)	Fair	Poor	Fair	Poor	Good	Poor	Poor	Poor
Coonskin	1994-95	1.6 (poor-fair)	Fair	Fair	Fair	Poor	Good	Poor	Poor	Poor
Umatilla (RM 0-56.1)	1995-96	1.8 (poor-fair)	Good	Good	Fair	Fair	N/A	Poor	Poor	Poor
Average condition of habitat features:			2.1	1.6	1.5	1.8	2.3	1.8	1.0	1.1

[1] General habitat condition was derived using an average of the eight categorical habitat feature ratings (poor, fair, good) expressed in numerical format (1,2,3) respectively.

Table 32. Summary of key habitat parameters relative to benchmarks developed by the Oregon Department of Fish & Wildlife Aquatic Inventories Program. Habitat data was collected by the Oregon Department of Fish & Wildlife Aquatic Inventories Program from 1992 through 1996.

Stream	Pool Area	Pool Frequency	Complex Pools	Wood	% Shade		W/D Ratio	% Silt/Sand	
					>12m	<12m		>1.5%	<1.5%
Desirable	>35	5-8	>2.5	>20	>50	>60	<10	<8	<12
Undesirable	<10	>20	<1.0	<10	<40	<50	>30	>15	>25
Upper Meacham	14	NA	NA	5		46	32	22	3
N. Fk. Meacham	11	NA	NA	10	45	57	32	11	
Beaver Creek	79	NA	NA	22		50	20	61	40
Little Beaver	10	NA	NA	13		65	NA	77	
Mill Creek	5	NA	NA	14		67	25	28	
Sheep Creek	2	NA	NA	17		75	17	56	
Twomile Creek	19	NA	NA	9		55	15	76	61
N. Fk. McKay	10	21	0	6	49	71	39	17	
Bell Cow	4	22	0	9	72	72	34	14	
Calamity	5	26	0	2		62	28	3	
Darr	5	32	0	3		78	17	16	
Lost Pin	NA	55	0	10		73	21	17	
Rail	4	40	0	3		56	28	17	
Wood Hollow	3	49	0	3		54	26	8	
East Birch	9	NA	NA	2	33	64	29	3	6
West Birch	10	8	0	3		47	29	15	

Definition of Parameters (for further definition see Moore et al. 1997):

Pool Area: Percentage of wetted stream channel identified as pool habitat.

Pool Frequency: The distance between pools in bankfull channel widths

Complex: The percentage of pools determined to be complex.

Wood: Pieces of wood per 100 meters of stream channel

% Shade: Percentage of canopy closure for stream widths wider or narrower than 12 meters

Width/Depth Ratio: The ratio of bankfull width to mean depth.

% Silt/Sand: The percentage of wetted channel substrate classified as silt and sand for channel gradients greater than or less than 1.5%.

In 1984, the CTUIR established riparian area restoration priorities, totaling more than 130 miles (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife 1990; Shaw 1996-1997). The following are priority streams for restoration:

- Meacham and lower North Fork Meacham Creeks
- South Fork Umatilla River and Thomas Creek
- Mainstem Umatilla River (Meacham Creek to North and South Forks of Umatilla River)
- Squaw Creek
- East Fork, West Fork and mainstem Birch Creek
- Buckaroo Creek
- Ryan Creek
- Mainstem Umatilla River (Pendleton to Meacham Creek)
- Spring Creek and Shimmiehorn Creek

Relative habitat quality in the Umatilla subbasin will be discussed using eight broad habitat parameters. These include instream flow, water temperature, water quality (chemical), passage condition (structural impediments), channel condition (bank stability, sinuosity, channelization), instream habitat diversity, sedimentation and riparian condition. Based on similarities in land use and stream character, the subbasin was divided into thirds. The lower third includes the mainstem Umatilla River and all associated tributaries from its confluence with the Columbia River to McKay Creek (referred to hereafter as "below McKay"). The middle third consists of the mainstem and tributaries from McKay Creek upstream to Meacham Creek (referred to hereafter as "McKay to Meacham"), while the upper third consists of everything above Meacham (referred to hereafter as "above Meacham").

Below McKay

The Umatilla River downstream of McKay Creek measures about 51 river miles in length. Through this reach, the river is intensively managed for irrigated agriculture. During the summer irrigation season, the hydrology of the river is largely influenced by a constant flow release from McKay Reservoir. These releases are removed downstream by irrigation diversions. A portion of these irrigation withdrawals are returned to the river as runoff or through groundwater percolation.

Discharge drops considerably and temperatures rise with the reduction in flow volume at the diversion points. Where irrigation drains enter the river, discharge increases moderately and often temperatures show a slight decline. In addition to McKay Creek, several other major tributaries join the Umatilla River in this reach including Birch Creek and Butter Creek, neither of which contributes substantially to the summer flow of the Umatilla River.

The primary factors limiting habitat quality throughout this reach are flow and temperature. Poor water quality, periodic passage problems, and channel straightening also negatively impact habitat quality and salmonid use. Because of the intensity of land use in this area, instream habitat diversity and riparian conditions are considered to be poor.

Flow

Seasonally inadequate streamflows persist throughout much of the lower Umatilla River. Low flows in the Umatilla River naturally coincide with periods of reduced precipitation and are compounded by irrigation withdrawals during summer months. The Umatilla Basin Project supplements flow to this historically dewatered reach. With the completion of Phase I and Phase II of the Umatilla Basin Project, target instream flows in the Umatilla River below McKay Creek (Table 33) can be met from September 16th to June 30th. Between the end of June and September 15, flows are limited in this section because the river is fully appropriated for irrigation withdrawals after the storage allocated for fish flows in McKay Reservoir are depleted. During July, August and much of September, low flow in the Umatilla River below Westland Dam continues to preclude habitat use in this area by all key species.

Table 33. Current Umatilla Basin Project target flows from McKay Creek to the Mouth of the Umatilla River (Bureau of Reclamation 1988).

Time of Year	Target Flow (cfs)
October 1 through November 15	300
November 16 through June 30	250
July 1 through September 15	0
September 16 through September 30	250

During irrigation season, the primary inflows are from irrigation return flows and drains, with the larger tributaries contributing little to the Umatilla River below Westland Dam. The irrigation withdrawals completely dewater much of the Umatilla River, resulting in an average daily flow over a 14-day period of less than 1 cfs (Table 34). The change in the low-flow statistics from Yoakum to the city of Umatilla demonstrates the impacts of irrigation on the lower portion of the Umatilla River. The one-year, one-day low flow at Yoakum is 129.8 cfs, versus 0.2 cfs near the city of Umatilla (Oregon Department of Environmental Quality 2000).

Table 34. Low-flow statistics for the Umatilla River below McKay Creek (Oregon Department of Environmental Quality 2000).

Return Period	Umatilla River at Yoakum (cfs)			Umatilla River near Umatilla		
	1-Day	7-Day	14-Day	1-Day	7-Day	14-Day
1-year	129.8	138.1	143.7	0.2	0.7	0.7
2-year	36.2	38.8	40.9	0.1	0.4	0.6
5-year	25.7	27.8	29.5	0.0	0.1	0.3
10-year	22.0	24.0	25.4	0.0	0.1	0.3
25-year	19.0	20.9	22.2	0.0	0.1	0.2
50-year	17.4	19.2	20.4	0.0	0.1	0.2
100-year	16.2	17.9	19.0	0.0	0.1	0.2

The Umatilla River downstream of McKay Creek is currently only used seasonally for migration and over wintering by key species (Table 35). Studies near Echo indicate this reach is only usable by bull trout during the months of November to early May (Bull Trout Working Group 1999). Historically, coho and fall chinook salmon used this reach for spawning and rearing, but native populations of both species are now extinct. The hatchery populations of coho and chinook have yet to establish sizeable natural populations and natural reproduction is limited for both species. At least one of the reasons for limited success with these species is because instream habitat quality in this reach has been compromised by insufficient flow, creating an environment unconducive to their full recovery.

Table 35. Key species season of use for the Umatilla River below McKay Creek

Key Species	Type of Use	Season of Use
Steelhead	Adult Migration	September-June
	Juvenile Migration	March-June
	Juvenile Wintering	December-February
Spring Chinook	Adult Migration	December-February
	Juvenile Migration	April-July
Bull Trout	Overwintering	November-May

Temperature

Similar to flow, temperatures in the Umatilla River below McKay Creek are also seasonally limiting, reaching in excess of 28˚C at Three Mile Dam (RM 4) in August of 1998 (Boyd et al. 1999). As water temperatures increase in summer months, more of the subbasin becomes temperature limiting to fish

In the summer of 1998, temperature increased from RM 47 to RM 5 by nearly 5 degrees Celsius during the temperature-limited period. Temperatures rise above the 21ºC threshold for increasingly longer times progressively downstream. At RM 47 the river stayed below the threshold, due to cool water input from McKay Creek. Downstream at RM 42, the river was above the threshold value from early July to early August. By RM 5, the Umatilla River rose above the threshold before monitoring began in June until mid-September. The temperature limitations come from a variety of impacts including high width-to-depth ratios, low percent riparian shading, limited interaction between the stream channel and the flood plain during high flow recharge periods and reduced flow volume (Purser 1994).

In addition to problems in the mainstem Umatilla River, Birch Creek, East Birch Creek, North Fork McKay Creek, West Birch Creek and Westgate Canyon are listed on the 1998 303(d) list for failing to meet the salmonid rearing criterion of 17.8° C (Boyd et. al 1999).

Water Quality (*chemical*)

The lower portion of the Umatilla subbasin is subject to the greatest amount of land use disturbance. Habitat degradation resulting from urban runoff, pesticides and herbicides, excessive nutrient inputs, and a variety of other contributions are most prevalent throughout the lower 51 river miles of the Umatilla. Nitrates show up as a possible problem in the lower Umatilla subwatershed, ranging from 0.60-6.10 mg/l at Umatilla RM 2.1 (Purser 1994). Exceedingly high ($\geq$ 0.4 mg/L) levels of ammonia have been recorded in Butter Creek (Purser 1994), further reducing habitat use by key species. A "threshold" value of 0.1 mg/L total phosphorous (California cold freshwater habitat criteria) is exceeded in the lower mainstem and McKay Creeks (Purser, 1994). Furthermore, the Butter Creek subwatershed has been documented as having water quality problems related to agricultural chemicals (Purser 1994). Very high levels of coliform bacteria are recorded at the Umatilla River at Reith Station (just below the Pendleton Sewage Plant).

Passage

Key fish species in the Umatilla subbasin may encounter a combination of passage impediments when migrating up the lower mainstem Umatilla River, McKay Creek or other tributaries in this portion of the subbasin. In addition to thermal barriers, a number of structural barriers exist downstream of McKay (Table 36). These impediments may severely limit fish movements.

Table 36. Known Fish Passage Barriers below McKay (A. Sexton, CTUIR, personal communication, February, 2001)

STREAM	RIVER MILE	BARRIER TYPE	COMPOSI-TION	STEP HEIGHT (m)	DEGREE	RECOM-MENDED ACTION
Umatilla River	1.5	Channel Modification	Concrete	0.7	Partial	Modify
Umatilla River	2.4	Irrigation Dam	Concrete	1.0	Partial	Modify
Umatilla River	28.8	Feed Canal Irrigation Dam	Concrete	1.5	Partial	Modify / Remove
Umatilla River	49.0	Vacated Irrigation Dam	Unknown	1.2	Unknown	Remove
Jungle/Windy Spring	0.1	Culvert	Steel	0.15	Partial	Modify
McKay Creek	6.0	Earthen Dam	Earth/Concrete	40	Complete	Leave
Butter Creek	7.9	Flash Boards	Wood	2.3	Complete	Modify
Butter Creek	27.2	Irrigation Dam	Concrete	1.4	Complete	Modify
Butter Creek	43.0	Irrigation Dam	Concrete	1.2	Complete	Modify
Johnson Creek Tributary of Butter Creek	0.3	Culvert	Wood	0.8	Partial	Modify
Stewart Creek	0.6	Bridge	Concrete	0.4	Partial	Modify
Birch Creek	0.5	Pipe Casing	Concrete	1.4	Partial	Modify
Birch Creek	5.0	Irrigation Dam	Concrete	1.2	Partial	Modify/ Remove
Birch Creek	10.0	Irrigation Dam	Concrete	1.0	Partial	Modify
Birch Creek	15.0	Irrigation Dam	Concrete	1.0	Partial	Remove/ Modify

STREAM	RIVER MILE	BARRIER TYPE	COMPOSITION	STEP HEIGHT (m)	DEGREE	RECOMMENDED ACTION
W. Birch Creek	3.8	Bridge	Concrete	1.2	Partial	Modify
W. Birch Creek	3.5	Irrigation Dam	Concrete	2.1	Partial	Modify
W. Birch Creek	5.5	Irrigation Dam	Concrete	1.4	Partial	Modify
W. Birch Creek	8.5	Irrigation Dam	Concrete	Unknown	Partial	Modify/ Remove
W. Birch Creek	9.0	Irrigation Dam	Concrete	Unknown	Partial	Modify/ Remove
W. Birch Creek	?	Culvert	Steel	Unknown	Unknown	Unknown
E. Birch Creek	9.0	Irrigation Dam	Concrete	0.8	Partial	Modify/ Remove
Stewart Creek	0.6	Bridge	Concrete	0.4	Partial	Modify

Channel Conditions

The geomorphological assessment of channels at a basin-wide level currently represents a data gap. Seventy-nine of the lower 90 miles of the mainstem Umatilla River, from the mouth to the forks, were determined to have undergone human-caused channel alteration, restriction and/or diking (Close 1999). Extensive channel modification has occurred throughout this portion of the subbasin for more than a century. Railroad surveys from 1913 of lower Birch Creek indicated that portions had already been channelized (Nagle 1998). Aerial photos taken by the USDA in 1939 revealed that some tributaries within the Umatilla subbasin were channelized prior to 1939 (Nagle 1998). Nagle (1998) speculates that these stream manipulations occurred before the advent of heavy equipment. However, Harper et al. (1948) indicates that steam-powered tractors were available in Umatilla County in 1904 and 1905, caterpillar-type gasoline-powered tractors were introduced from 1907 to 1909, and diesel oil-burning caterpillar type tractors could be purchased in 1932. Perhaps, early farmers used such machinery to channelize streams in the lower Umatilla subbasin. An early account by a farm wife from Butter Creek mentioned that her husband was straightening the creek prior to 1920 (Nagle 1998).

Instream Habitat Diversity

The diversity of instream habitat in the lower portion of the Umatilla subbasin is ranked as poor-fair. Over the past several years, the CTUIR and ODFW have collected biological and physical data in an ongoing effort to monitor and evaluate natural salmonid production in the Umatilla subbasin. Included in this data are a number of variables, which are used to evaluate habitat complexity as it relates to key species use. This information is presented in Table 31 and Table 32, which include evaluation of habitat in various portions of the basin.

Instream habitat diversity in the lower subbasin, which may be coarsely evaluated using the parameters ‘percent pool area’, ‘width:depth’ and ‘woody debris’, is variable (Table 31). During 1995-1996 surveys of mainstem river miles 0-56, CTUIR found the percentage of the reach comprised of pools was good. The lack of instream large woody debris, which received a 'poor' rating, was attributed to the sparse amount of streamside vegetation throughout the reach, and throughout the majority of upstream reaches. Analyses of habitat parameters in the Birch Creek system (refer to Table 32) suggest that the streams are lacking habitat diversity as indicated by the low number of in-channel wood, low pool area and lack of complex pools. Very few of the variables assessed by ODFW were considered "desirable," while most were classified as undesirable.

Because habitat diversity is intrinsically linked to other factors, such as stream sinuosity, floodplain connectivity and input of organic material, it is not surprising to see a relatively homogenized aquatic ecosystem throughout these lower reaches. Of primary concern is the lack of hydraulically active woody debris. The role of large wood in lower gradient areas is important for gravel bar stabilization and vegetation establishment. Woody material also provides off-channel and back channel areas where juvenile fish rearing occurs (Webster 1998). Based on historical accounts, habitat heterogeneity in lower portions of the Umatilla may have once been considered high, due to larger volumes of in-channel wood. Wilson Price Hunt's overland trip to Astoria, Oregon passed down the Umatilla River in January 1812 and noted while descending the Umatilla River that "*beaver must be common because many places are full of their dams*." Hunt's trip proceeded from just below Pendleton down the Umatilla River to the Columbia River (Rollins 1935). Beaver still occupied nearly every body of water when whites showed up in the Blue Mountains in 1811, but thirty years later they had all but vanished (Langston, 1995).

The absence of beaver in the lower Umatilla subbasin is evident. The hydrologic retention in the basin is short in duration, a condition that would likely be more prolonged with the presence of instream beaver dams (Langston 1995). The lack of backwater areas throughout the lower reaches indicates a noticeable absence of flow shunting structures. The result is fewer rearing areas, reduced nutrient dispersal, and subsequent reductions in riparian zone succession (Langston 1995).

The areas downstream of the McKay Creek portion of the subbasin, East and West Forks of Birch creeks, and North Fork McKay Creek are listed on the 303(d) list for habitat modification. The listing is based on comparison of in-field measurement of habitat elements (pool frequency, pool quality, pieces of wood per 100 meters, width/depth ratio) to the ODFW habitat benchmarks (Oregon Department of Environmental Quality 2000).

Sedimentation

While background sedimentation levels in the lower subbasin have likely always been high, current rates in the lower subbasin are deemed excessive. Composite samples of turbidity, collected at various stations during the winter of 1997-1998, show that Tutuilla, Birch, and five sites on the Umatilla River mainstem exceeded standards on numerous occasions (Oregon Department of Environmental Quality 2000). The West Fork Birch Creek, North Fork McKay Creek and the mainstem Umatilla River in this section are on the 1998 303(d) list for sedimentation. The primary sources of sediment are from raw and eroding streambanks, unstable stream channels, and upland sources (T. Bailey, Oregon Department of Fish and Wildlife, personal communication, February 2001).

Riparian Condition

Lack of a sufficiently functioning riparian corridor, most notably throughout lower portions of the mainstem, affects instream temperatures and limits salmonid abundance and distribution (Contor et al. 1997). Riparian areas in poor condition are numerous. According to ODFW 70% of the Umatilla River tributaries need riparian improvement (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife 1990).

The lower ten miles of the Butter Creek Drainage are almost devoid of woody riparian vegetation (Nagle 1998). Pioneer accounts mention that no trees existed along the creek where the Oregon Trail crossed it, but plenty of willow that could be used for fuel (Nagle 1998). And while the upper portion of the North Fork of Butter Creek has deeply incised channels, General Land Office survey records for Umatilla County mention that historically, some riparian trees and a number of springs occurred in this locality (Nagle 1998).

Although riparian shading throughout the wider sections of the Umatilla River is generally low, it has never entirely ameliorated mainstem temperatures (S. O'Daniel, Confederated Tribes of the Umatilla Indian Reservation, personal communication, February 2001). Many small springs, seeps, and hyporheic groundwater enter the surface flow, providing thermal refuges for salmonids during portions of the year (Confederated Tribes of the Umatilla Indian Reservation 1994).

The thermal refugia created by groundwater is not, however, considered a surrogate for the degraded riparian corridor bordering the lower 51 miles of the Umatilla River. Grazing, among other land uses, has had major impacts on riparian vegetation throughout the basin. Grazing intensity within riparian and floodplain areas has resulted in loss of surface cover, causing increased soil wash and wind erosion (Shelford and Hanson 1947).

Because much of the native vegetation bordering streams along the lower subbasin also borders agricultural ground, riparian areas commonly have been converted to cultivation. Indications are strong that Wildhorse, Tutuilla, McKay and Butter Creeks along with the lower Umatilla River contribute the major portion of suspended sediment to the Umatilla River (Purser, 1994). This is thought to result from soil left bare in grain farming operations or through overgrazing, streambanks denuded of vegetation for the purpose of agriculture or range management, and the lack of opportunity (due to channelization) for floodwater to spread over the floodplain and drop sediment (Purser, 1994).

McKay to Meacham

This reach extends for approximately 28 river miles upstream from McKay Creek. It includes the City of Pendleton and the Umatilla Indian Reservation. Two of the primary tributaries of the Umatilla River, Meacham Creek and Wildhorse Creek, enter the river in this reach. The lower portion of this reach is used solely for migration and overwintering, with steelhead spawning occurring above RM 65 (Contor et al. 1996). The Umatilla River between Meacham and McKay Creeks is outside of the influences of the Umatilla Basin Project and has no target instream values set for the reach. The river maintains relatively constant flow through this reach with no major diversions for irrigation. The largest water withdrawal comes from the City of Pendleton, which has 10.5 cfs water rights. The City also has a series of infiltration galleries that lie in the alluvium from about half a mile downstream of Thorn Hollow to just above Squaw Creek.

Flow

Flow continues to be a problem in this section of the mainstem Umatilla River. While the Umatilla River between McKay and Meacham Creeks generally meets instream flow recommendations (

Table 37) from November through June (Figure 38), flows are documented as being as much as 130 cfs below recommended levels during summer months (Table 38; U.S. Geological Survey data). Whether the Umatilla River can regularly meet 130 cfs during the summer, given that little flow reduction occurs in this reach, is debatable. Only during high flow years was the Umatilla River above the recommended flow during the summer months.

Table 37. Instream Flow Recommendations (CTUIR 1999; OWRD 1988) for the Umatilla River Upstream of McKay Creek.

Agency	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
CTUIR	200	240	310	310	430	500	500	490	270	200	180	180
OWRD/ODFW	200	200	200	200	240	240	240	240	200	100	60	60

Summer flow in the mid-Umatilla River relies heavily on the portion of the basin above Meacham Creek, with losses from streamside irrigation, seepage and evaporation often exceeding local inflows (Towle 1935). The portion of the Umatilla River above Meacham Creek represents about 20% of the area above Pendleton, but in instances, the flow above Meacham Creek was 200% greater than that at Pendleton during the summer months. During flood events, the Meacham and Wildhorse watersheds contribute a larger part to the volume at Pendleton. During smaller floods, 45% of the water reaching Pendleton originates upstream of Meacham Creek, while during larger events the percentage decreases and may be as low as 30% during the highest flows (Towle 1935). This implies that one of the key areas for maintaining sufficient habitat-sustaining summer flow in the Umatilla River above McKay Creek lies in the watershed above Meacham Creek.

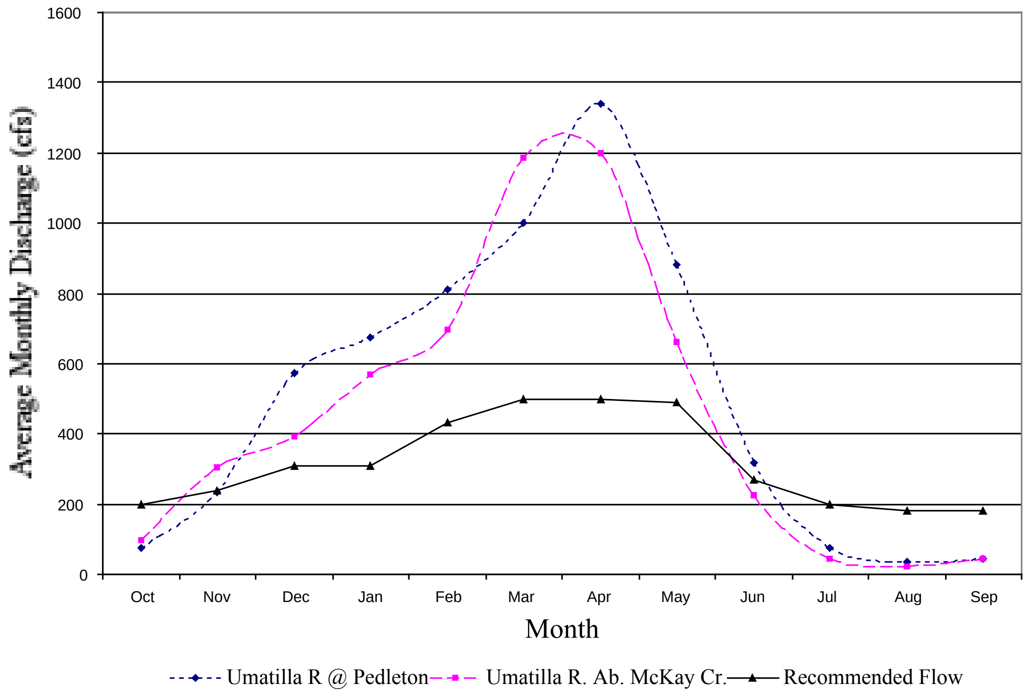

Figure 38. Mean Monthly Discharge vs. Instream Flow Recommendations between Meacham and McKay Creeks

Table 38. Low-flow statistics for the Umatilla River between Meacham and McKay Creeks (Oregon Department of Environmental Quality 2000).

Return Period	Umatilla R. upstream of McKay Creek			Umatilla River at Pendleton			Umatilla River Near Cayuse		
	1-Day	7-Day	14-Day	1-Day	7-Day	14-Day	1-Day	7-Day	14-Day
1-year	33.5	39.8	44.8	64.4	69.2	72.5	56.7	57.2	58.1
2-year	17.5	18.7	19.4	25.7	28.8	30.8	40.5	41.5	42.0
5-year	14.2	16.8	17.7	20.7	23.5	24.9	38.4	38.8	39.2
10-year	13.0	16.2	17.3	18.9	21.6	22.6	37.4	37.7	38.2
25-year	N/A	N/A	N/A	17.4	20.1	20.6	N/A	N/A	N/A
50-year	N/A	N/A	N/A	16.5	19.2	19.4	N/A	N/A	N/A
100-year	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Instream Temperatures

The Oregon Department of Environmental Quality (1999) reported results of thermographs placed in the Umatilla River at RMs 59.5 and 67.5. The instrument at RM 67.5 recorded slightly higher temperatures than the one at RM 59.5, which broke the trend of warming in the downstream direction. The probe located at RM 78.8 was limited from June to August.

The entire Wildhorse Creek drainage regularly experiences excessive summertime stream temperatures. Headwaters often exceed 20°C for long periods in the summer, while lower Wildhorse Creek can often experience stream temperatures exceeding 30°C (Boyd

1999). Unfortunately, Wildhorse Creek has the distinction of regularly producing some of the highest summertime stream temperatures observed in Oregon. Wildhorse Creek drains the cultivated foothills of the Blue Mountains and enters the Umatilla River at Pendleton. Wildhorse Creek produces considerable run-off, particularly in years of deep snow or heavy winter rains (Bureau of Reclamation 1954).

The confluence of the Umatilla River with Meacham Creek represents an area of thermal mixing. Meacham Creek adds warmer water to the mainstem Umatilla River partly from the presence of the Union Pacific Railroad corridor throughout its length. The railroad has had a major impact on the stream zone through shade reduction and channel simplification (Umatilla National Forest 2000).

Buckaroo Creek, Squaw Creek, Wildhorse Creek and the Umatilla River between McKay Creek and Meacham Creek are listed on the 1998 303(d) list for temperature for not meeting salmonid rearing criterion of 17.8°C (Boyd et. al 1999). These areas are suspected thermal barriers to migration

Water Quality (chemical)

Either one or both of the state water quality criteria for fecal coliform bacteria and enterococcus are frequently exceeded for the Umatilla River below the Umatilla Indian Reservation and parts of Wildhorse Creek (Purser, 1994). Very high levels of coliform bacteria are recorded at the Umatilla River at Reith Station (just below the Pendleton Sewage Plant). Sources include municipal wastewater treatment facilities, individual septic/drain field systems, confined animal feeding areas, soil from surface or streambank/bed erosion (Purser, 1999). A "threshold" value of 0.1 mg/L total phosphorous (California cold freshwater habitat criterion) is exceeded for the Umatilla River from below Gibbon to the mouth of the Umatilla River and in Wildhorse Creek (Purser, 1994).

Passage

In addition to thermal barriers, a number of structural barriers inhibit movement in the McKay to Meacham portion of the subbasin. These barriers are summarized in Table 39.

Channel Conditions

In the mid and lower portions of the Umatilla subbasin, entrenched channels are found in the valley bottoms, which are characterized by deep alluvial deposits. Entrenched streams in this area include, among others, Wildhorse and Tutuilla Creeks (Nagle 1998). These entrenchment levels are less prominent in gravel and cobble bedded streams, such as in Meacham and McKay Creeks, because these systems are more resistant to incisions and tend to exhibit hydrologic responses by widening (Nagle 1998; T. Shaw, Confederated Tribes of the Umatilla Indian Reservation, personal communication, February 2001). Historical accounts indicate that most entrenchment processes began around the turn of the century, immediately after the elimination of beaver populations. These periods also coincided with the highest livestock densities (Nagle 1998).

Table 39. Known Fish Passage Barriers from McKay to Meacham (A. Sexton, CTUIR, personal communication, February, 2001))

STREAM	RIVER MILE	BARRIER TYPE	COMPOSI-TION	STEP HEIGHT (m)	DEGREE	RECOM-MENDED ACTION
Wildhorse Creek	0.1	Vacated Irrigation Dam	Concrete	0.7	Partial	Modify
Wildhorse Creek	18.8	Road Bridge Structure	Concrete	1.0	Partial	Modify
Greasewood Creek	0.4	Irrigated Dam	Concrete	0.6	Partial	Modify
Mission Creek	0.9	Channel Shift	Bedrock	0.5	Partial	Modify
Mission Creek	3.3	Bridge/Culvert	Steel	0.7	Partial	Modify
Coonskin Creek	0.3	Road Bridge	Concrete	0.5	Partial	Modify
Coonskin Creek	0.9	Water Pipe Protection	Concrete	1.1	Partial	Modify
Whitman Springs	0.1	Culvert	Steel	0.5	Complete	Modify
Red Elk Canyon Creek	0.2	Culvert	Steel	0.8	Partial	Modify
Un-Named Tributary at Minthorn effluent	0.1	Culvert	Steel	0.5	Partial	Modify

Stream channelization is also considered to be partially responsible for reducing natural stream channel morphology. Channel diking and levee construction to protect adjacent roads is common throughout portions of the mainstem Umatilla River and Wildhorse Creek (Shaw and Sexton 2000). Channel migration is further limited in Wildhorse Creek and the mainstem Umatilla River due to abandoned or active railroads, which have confined stream channels along the majority of their lengths (Shaw and Sexton 2000).

Instream Habitat Diversity

Contor et. al (1994) found that the abundance and volume of woody debris in this portion of the subbasin were at undesirable levels in riparian and channel inventory locations (Table 31). Portions of riparian areas in the upper reaches of mainstem Buckaroo Creek lack sufficient levels of downed woody debris and coarse woody debris complexes to function properly in terms of flow energy dissipation and sediment routing. Channel widening is occurring in specific areas as sediment, mainly in the form of bed load, overwhelms available stream energy and is deposited throughout the active channel profile. These deposits remain unstable and move with each bankfull event. Streambanks are not being built which decreases opportunities for riparian vegetation establishment (Webster 2000).

Several tributaries to McKay Creek, such as Bell Cow, Calamity, Darr, Lost Pin, and Rail Creeks are listed on the 303(d) list for habitat modification. Coonskin, Mission, and Moonshine Creeks, are also listed for habitat modification. The listing is based on comparison of in-the-field measurements of habitat elements (pool frequency, pool quality, pieces of wood per 100 meters, width/depth ratio) to the ODFW habitat benchmarks (Oregon Department of Environmental Quality 2000).

Sedimentation

One of the sediment-impaired stream segments that significantly deviated from the target standard was Wildhorse Creek (at its confluence with the Umatilla River), which had a peak turbidity value of over 5,000 Nephelometric Turbidity Units (NTU's) measured on April 23, 1997. Wildhorse Creek turbidity is mainly due to later winter and early spring runoff events. At present the Wildhorse Creek Drainage is the most intensively cropped tributary to the Umatilla River, and it appears to be the largest sediment producing system within the subbasin (Nagle 1998). Coonskin Creek, Cottonwood Creek, Line Creek, Mission Creek, Moonshine Creek and the Umatilla River in the Meacham Creek to McKay Creek reach are listed on the 1998 303(d) list for sediment.

Habitat surveys conducted by CTUIR in June 1994 found that fine sediments comprised 20% of the streambed substrate and that 12% of the streambank length was eroding in this reach (Contor et al. 1994).

Riparian Condition

Below Meacham Creek, the Umatilla River is wider and flows through cultivated lands, with minimal shade provided by shrubs, deciduous trees and grasses (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife 1990). These areas have moderate-low quality salmonid habitat.

Above Meacham

Flow

Flow is not cited in main documents as a problem in this portion of the subbasin. Five water diversions were documented at private residences (Contor et al. 1995). The impact of these diversions on aquatic habitat has not been documented.

Temperature

The North Fork and South Fork Umatilla River, Shimmiehorn Creek and North Fork Meacham Creek are listed on the 1998 303(d) list for temperature not meeting the Oregon Bull Trout Criterion (10° C). East Fork Meacham Creek and Meacham Creek are listed on the 1998 303(d) for temperature not meeting the salmonid rearing temperature of 17.8° (Boyd et. al 1999). None of the stream reaches for which full season data were available in the above Meacham Creek area met PACFISH or Oregon state standards for water temperature. Temperatures were generally better in the North Fork than in the South Fork Umatilla River. Temperatures in mainstem Meacham Creek exceeded PACFISH maxima by wide margins in all years of record, exceeding lethal limits for salmonids at times (Umatilla National Forest 2000). Thermal loading from two hot springs at Bingham and at Buck Creek may be a factor in warming the lower South Fork (Umatilla National Forest

2000), which, at its confluence with the Umatilla, may increase mainstem temperatures to as much as 18ºC.

Water Quality (*chemical*)

The chemical constituents of streams and rivers above the confluence of Meacham Creek are, for the most part, within the natural range of conditions. Oregon Department of Environmental Quality (2000) identified aquatic weeds or algae as an impairment to mainstem water quality from the confluence of Wildhorse to the Forks, which includes this upper river reach. Potential nutrient additions from rural areas may cause localized problems.

Passage

Known passage problems in and above Meacham Creek are summarized in Table 40.

Table 40. Known Fish Passage Barriers In and Above Meacham (A. Sexton, CTUIR, personal communication, February, 2001)

STREAM	RIVER MILE	BARRIER TYPE	COMPOSITION	STEP HEIGHT (m)	DEGREE	RECOMMENDED ACTION
Un-Named Tributary at RM 1.5 of SF Umatilla River	0.1	Culvert	Steel	0.5	Complete	Modify
Camp Creek	.25	Vacated Irrigation Dam	Concrete	1.3	Partial	Remove
Un-Named Tributary at Umatilla River RM 81.2	0.1	Culvert	Steel	0.6	Partial	Modify
Twomile Creek	1.25	Culvert	Steel	Unknown	Unknown	Modify

Channel Conditions

The channel from headwaters to Meacham Creek was classified as constrained during habitat surveys conducted by CTUIR in July-August 1995 (Contor et al. 1995). This channel however, is a “B-type” channel (Rosgen methodology), which is considered to be naturally constrained. Constrained waterways have reduced off-channel habitat, a determinant of smolt production. Only nine percent of the bank length had established undercutting, potentially valuable to fish, and seven percent of bank length was actively eroding (Contor et. al 1995).

Most tributaries upstream of and including Meacham Creek have been heavily impacted by adjacent roads, dikes, campgrounds, and trails which have lowered sinuosity and decreased shade, large wood and pools (Umatilla National Forest 2000). The Union Pacific Railroad corridor along Meacham Creek, for example, has significantly reduced channel complexity. Streams in roadless areas or wilderness areas have experienced few direct impacts (Umatilla National Forest 2000).

Instream Habitat Diversity

The Upper Umatilla River and Boston Canyon, Meacham, Mill, North Fork Meacham and Line Creeks are listed on the 303(d) list for habitat modification. The listing is based on comparison of in-field measurement of habitat elements (pool frequency, pool quality, pieces of wood per 100 meters, width/depth ratio) to the ODFW habitat benchmarks (ODEQ 2000).

Eighteen out of 19 stream reaches surveyed with PACFISH protocols met standards for large woody debris minimums of 20 pieces per mile in the above Meacham portion of the subbasin. Additional surveys by ODFW and CTUIR found more woody debris in the North and South Forks of the Umatilla River than in Meacham Creek. Logging in riparian areas, roads next to streams and intensive grazing practices, which slow down riparian tree regeneration, have reduced large woody debris inputs in to Meacham Creek and the upper Umatilla River headwaters (Umatilla National Forest 2000). CTUIR and ODFW surveys found that Camp Creek and upper Meacham Creek had the best overall fish cover—including bank undercutting, large boulders and large woody debris. Surveys in the North and South Fork Umatilla River found relatively high pool frequency in most subwatersheds. This is at least partly explained by the presence of constructed pools (Umatilla National Forest 2000).

According to Shaw (CTUIR, personal communication, February 2001), beaver populations appear to be increasing throughout the upper Umatilla River subbasin. Beavers now occur within nearly all of CTUIR's Habitat Enhancement Project Areas. However, landowners frequently do not realize the potential benefits that beavers provide and continue to destroy the animals.

Woody debris counts were low in the mainstem Umatilla River channel from headwaters to Meacham Creek. Only 1.5 pieces of wood per 100 meters met criteria and volume was very low. High flows had deposited the majority of the wood outside of the wetted channel where it was of little value to fish. As a result, instream wood complexity ratings pertaining to fish habitat ranked very low.

Sedimentation

Meacham Creek and its tributary Boston Canyon Creek, and the Umatilla River to the forks are on the 1998 303(d) list for sedimentation. ODFW and CTUIR habitat surveys found that 18 subwatersheds in the Meacham Creek drainage had fine sediment as the dominant substrate. Out of 42 subwatersheds sampled in the North and South Forks of the Umatilla River and Meacham Creek only two exceeded 35% embeddedness (Umatilla National Forest 2000). Surveys found that the Meacham Creek watershed has many reaches containing unsuitable rearing substrate. In 30 out of 50 reaches surveyed by the Umatilla National Forest; ODFW, and CTUIR above Meacham Creek, substrate appeared to be a good quality component of spawning habitat (Umatilla National Forest 2000).

Riparian Condition

Through much of the upper Umatilla subbasin, riparian vegetation is not a limiting factor. However, significant areas are degraded (Tim Bailey, Oregon Department of Fish and Wildlife personal communication February 2000). The mainstem Umatilla, between the Forks to Meacham Creek receives moderate rates of shading due to a mixture of deciduous trees and conifers. Patches of high to moderate-high quality habitat exist in these areas and are used by salmonids for spawning and rearing.

The North and South Forks of the mainstem Umatilla River are well shaded by conifer canopies. The North Fork Umatilla River and Ryan Creek had the highest levels of canopy cover upstream of and including Meacham Creek's portion of the basin, while the mainstem Umatilla River between the Forks and Meacham Creek had the lowest canopy cover. Low values were also found on the South Fork Umatilla River between Thomas Creek and the North Fork confluence (Umatilla National Forest 2000). The Umatilla National Forest (2000) found an inverse relationship between roads and canopy cover, with the highest canopy cover on unroaded streams. Habitat inventories and instream temperature monitoring of the Meacham Creek system show temperature, pool area, stream width-to-depth ratio, shading, large woody debris volume and amounts of fine sediment to be at less than desirable levels (Table 31and Table 32). From the Forks to Meacham Creek, low tree densities were recorded in riparian transects. Only three trees per 100m met minimum size criteria and only 15% were 30cm diameter at breast height (dbh) or more. Canopy closure was estimated at 30% and open sky was 50%--both ranked as poor (Contor et. al 1995).

Habitat Quality – Wildlife

Forest

Approximately 21% of the subbasin consists of forested habitat (Figure 17). The remaining area (79%) historically consisted of shrub and grassland habitats, but more recently has been converted to agricultural lands interspersed with shrublands. Forested habitat occurs primarily in the southern portion of the subbasin at mid and high elevations (Figure 17). In the mid-lower elevations, tree dominated areas primarily consist of cottonwood galleries and pine stringers along streams. The three primary forest vegetative groups are identified below as well as key habitat components.

Dry Forest

The dry forest group occurs predominately at the mid and lower elevations and on southerly aspects in the forested zone. Dry forest types are generally limited by low water availability and are often subject to drought. This group primarily consists of ponderosa pine as the cover type, but Douglas fir is also common at the upper elevations and moister sites (Quigley and Arbelbide 1997).

Timber harvest and fire suppression have reduced the prevalence of the dry forest group in the region (Quigley and Arbelbide 1997). Since ponderosa pine is a valuable timber species, large mature stands were among the first to be harvested after European settlement (U. S. Forest Service 1990). Fire suppression further reduced the extent of ponderosa pine in the subbasin. The thick bark of ponderosa pine allows it to withstand ground fires better than the thin-barked true firs**.** In areas with a short fire return interval, firs never had an opportunity to become established**.** Fire suppression allows the shade-tolerant forest fir species time to establish in the understory of ponderosa pine forest. In the continued absence of fire these species eventually become dominant when the canopy becomes dense enough that the shade-intolerant ponderosa pine seedlings cannot survive (Johnson 1994). Henjum et al. (1994) reported that remaining old growth ponderosa pine in the region has been reduced 75-80% and that most of the loss came from logging between 1936 and the mid-1960s. Flammulated owl, pygmy nuthatch, and white-headed woodpecker are dependent on late seral ponderosa pine forests (Csuti et al. 1997). Populations of these species have declined with the ponderosa pine forests of the subbasin.

Moist Forest

The moist forest group occurs primarily at mid to upper elevations and on all aspects in transitional areas between drier, lower elevation forests and higher elevation colder forests. This group primarily consists of grand fir and mixed conifer cover types. Mixed conifer types can include a variety of species including grand fir, Englemann spruce (*Picea engelmannii*), lodgepole pine (*Pinus contorta*), Douglas fir, western larch (*Larix oddidentalis*), and ponderosa pine. Some of the dry forest cover types occur in the moist forest group as well (Quigley and Arbelbide 1997).

The aerial extent of mixed conifer forests in the Blue Mountains has increased since European settlement, primarily due to their establishment in areas dominated by seral ponderosa pine under natural fire return intervals (Quigley and Arbelbide 1997). These forests are primarily comprised of Douglas fir and grand fir but also include western larch, Englemann spruce, and sub-alpine fir (*Abis lasicocarpa*) (Clarke and Bryce 1997). The expansion of this cover type has not resulted in healthy populations of the wildlife species dependent on mixed conifer cover types. Fire suppression has resulted in dense multi-storied forests of uniform age. These stands exhibit a higher degree of susceptibility to forest insects and disease and low suitability to species like the MacGillivray's warbler that prosper in uneven canopied forests (Johnson 1994; Csuti et al. 1997).

Cold Forest

The cold forest group occurs at the highest elevations and/or on north facing slopes. Cold forests are generally limited by a short growing season and by low moisture availability on some sites. This group consists of spruce fir cover types including subalpine fir, Englemann spruce, and lodgepole pine. There is some overlap in species composition between the cold forest types and the moist forest group. Due to the remote location of the cold forest habitat type, little loss to agricultural or urban development has occurred in the region. Fire suppression has resulted in a significant increase in the extent of mid seral shade tolerant species in this forest group (Quigley and Arbelbide 1997).

Grass and Scrubland

Historically, the majority of the subbasin was covered primarily by shrub steppe and grassland ecosystems. In the driest sections of the subbasin, big sagebrush (*Artemesia tridentata*), bluebunch wheatgrass (*Agropyron spiciatum*) and Sandberg's bluegrass (*Poa* *sandbergi*) were the dominant vegetation types. Areas that received slightly more precipitation were historically dominated by Idaho fescue (*Festuca Idahoensis*) (Clarke and Bryce 1997). Approximately 65% of the historic grass and shrublands of the Umatilla/Willow subbasin has been converted to agricultural cropland (Kagan et al. 2000) (Table 41). Most of the remnant shrub steppe ecosystems in the region occur on shallow soils or near rock outcroppings where farming is difficult. They are usually privately owned, relatively small fragments of land surrounded by agriculture (Dobler et al. 1996).

Remaining significant shrub steppe tracts include the undeveloped portion of the state of Oregon owned lands (known as the Boeing Agri-Industrial Company lands) and the contiguous Navy-owned property near Boardman (Boardman Bombing range) (Figure 18). Together these tracts form approximately 70,000 acres of steppe habitat and may serve as the only remaining source habitat for a number of declining wildlife species. However, from a landscape perspective these tracts are fragments of the former ecosystem. Introduced plant species, neighboring land activities, disease, predation, and low reproductive success of several wildlife species using these areas indicates that these tracts alone may not be capable of sustaining the shrub steppe ecosystem in the Umatilla/Willow subbasin. Other remaining shrub steppe habitats in the subbasin tend to be small isolated patches and in private ownership. Fragmentation reduces habitat value to wildlife species and increases susceptibility to noxious weeds and other outside influences.

Table 41. Habitat losses of lowland vegetation types within the Umatilla/Willow subbasin (Kagan et al. 2000)

Cover	Existing km^2	Historic km^2	Losses km^2	% Habitat lost
Quaking Aspen	0	3.1	3.1	100%
Big Sagebrush Steppe	174.6	1226	105.4	86%
Bluebunch Wheatgrass	3730.4	6708.4	2978.0	44%
Riparian	44.6	330.3	285.7	87%
Idaho Fescue	1324.7	1723.6	398.9	23%
Western Juniper	0	73	73	100%
Tufted Hairgrass Wet Prairie	0	11.7	11.7	100%
Sandy Grassland	346.5	721.3	374.8	52%

Wetlands

Wetland habitats in the subbasin have decreased in the past 100 years, but it is difficult to quantify by how much. Many wetlands in agricultural areas have been filled to increase the amount of farmable acres (Quigley and Arbelbide 1997). Based on limited analysis conducted by the Confederated Tribes of the Umatilla Indian Reservation (1997), wetland losses in the upper Umatilla River range from 30 to 35%, while in the Umatilla/Echo Meadows complex losses are as high as 90%. Although wetlands are distributed throughout the Umatilla River subbasin, the majority are associated with riparian corridors and floodplains of the Umatilla River and its tributaries. These wetlands are primarily classified in the palustrine and riverine systems. The CTUIR analysis identified Minthorn

Springs on the Umatilla Indian Reservation, a braided portion of the Umatilla River downstream of Pendleton, and the Echo/Umatilla Meadows complex as important wetland communities.

The Minthorn Springs area (RM 65) represents a riverine and palustrine (forested/emergent) wetland complex formed by the interface of the springs and the Umatilla River. According to NWI maps, the area contains approximately 19 acres of palustrine wetlands and 11 acres of riverine wetlands. Historically, the wetland received water inputs from intermittent tributaries. Input from those streams has now been reduced because upland farming has either eliminated or rechanneled the stream channels. Additionally, cottonwood forest stringers that once existed along the upland channels have either been reduced or completely removed, resulting in intermittent streams drying up earlier in the year. This area is important for water quality, quantity and fish and wildlife habitat (Confederated Tribes of the Umatilla Indian Reservation 1997).

The second focus area is located in the mid-lower river corridor west of Pendleton (RM 47). This area contains braided river channels and a cottonwood gallery with approximately eight acres of palustrine wetlands and five acres of riverine wetlands, according to NWI maps. This portion of the Umatilla River has been channelized for transportation routes (roads and railways), agricultural development, and diking. This focus area represents a habitat that was once much more common prior to these impacts, and still serves as a corridor for fish and wildlife (Confederated Tribes of the Umatilla Indian Reservation 1997).

The Echo-Umatilla Meadows complex is located lower in the Umatilla River corridor (between RM 18 and 24). This meadow complex results from the broadening of the river's floodplain to nearly 10 times its upstream width. Examination of aerial photos reveals numerous side channels and oxbows that are now dry. These dry channels are generally within a mile of the existing high water mark. The area historically held palustrine emergent and open water wetlands that abated floods, trapped sediment, stored water, provided recharge to the river, and provided fish and wildlife habitat. Based on the results of the NWI map analysis, the area contains an estimated 862 acres of palustrine wetlands and 152 acres of riverine wetlands. Primary impacts to this area include conversion to farmland, channelization for agriculture, roadways, railways, diking, and urbanization (Confederated Tribes of the Umatilla Indian Reservation 1997).

Riparian

Riparian areas contain the most biologically diverse habitats in the subbasin because of their variety of structural features (including live and dead vegetation) and proximity to water bodies. This combination of habitat features provides a wide array of habitats that support more species than any other habitat (Quigley and Arbelbide 1997). Common deciduous trees and shrubs in riparian areas include cottonwood, alder, willow, and red-osier dogwood (U. S. Forest Service and Bureau of Land Management 2000).

Many riparian habitats in the subbasin have been converted to agriculture, degraded by livestock grazing, or cleared for timber harvest. Habitat has also been altered by 1) hydrological diversions and flood control structures (e.g., dams) which have resulted in reduced stream flows and reduced area of riparian habitat, loss of vertical stratification in riparian vegetation, and lack of recruitment of young cottonwoods, willows, and other riparian species, 2) streambank stabilization which narrows stream channels, reduces the flood zone, and reduces riparian vegetation (Altman and Holmes 2000a, 2000b)

Especially important is the virtual elimination of large cottonwood galleries that existed along most of the larger waterways. This habitat type, along with various subcanopy structural riparian classes associated with it, is critical for a number of riparian landbird species including Lewis's woodpecker, Bullock's oriole, yellow warbler, yellow-breasted chat, yellow-billed cuckoo, willow flycatcher, and lazuli bunting (Altman and Holmes 2000a, 2000b).

A GIS-based comparison of historic and current vegetation data shows losses to riparian communities of 87% in the lowland areas of the Umatilla/Willow subbasin. This is likely an underestimate since early documentation is limited to large contiguous riparian communities. The actual loss of riparian habitat in the subbasin is probably closer to 95% (Kagan et al. 2000).

Confederated Tribes of the Umatilla Indian Reservation (1997) analysis of the Echo/Umatilla Meadow area along the lower Umatilla River revealed that approximately 5,730 of 6,340 acres (90%) has been stranded or cut off from the current Umatilla River flood plain. The area's numerous oxbows and dry channels used to be surrounded by wetland and riparian habitats.

Agriculture

The greatest change to the wildlife habitat in the Umatilla/Willow subbasin since historic times has been the introduction of agriculture. While human-induced impacts on vegetation began in the last century, the more recent availability of electric power and pivot-type sprinkler systems has resulted in the expansion of cropland along the Columbia River in Morrow County (Puchy and Marshall 1993). These areas support relatively limited wildlife populations but some species thrive here. Agricultural areas support many small birds and mammals, and their predators, including coyotes and red-tailed hawks (Csuti et al. 1997). Ring-necked pheasants are common in agricultural areas within the subbasin, but recently their numbers have decreased (Washington Department of Fish and Wildlife 2000b). Possible explanations for this decline include a reduction in shrub and tree cover surrounding fields and the negative effects of pesticides (Larsen and Nordstrom 1999). Deer and elk sometimes feed in agricultural lands, which occasionally leads to conflict between private landowners and wildlife management agencies. The CRP lands in the subbasin have increased dramatically in recent years. Wildlife habitat and native vegetation have increasingly become priorities of the program. A corresponding increase in deer populations in the subbasin has been attributed to this increase in available habitat.

Watershed Assessment

Several watershed assessments have been completed for the Umatilla subbasin. These assessments together have addressed many of the resource issues in the subbasin. These issues include sediment delivery, fish production, landbird conservation, ecological processes, and forest management, among others. Some reports also cover public involvement and agency interactions with regard to implementation of management plans. An annotated list of these assessments is presented below.

Altman, B., and A. Holmes (2000a) *Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington.* Documents the history of habitat loss and existing conditions of habitats for landbirds in the Columbia Plateau of Oregon and Washington with restoration and conservation strategies targeting the long-term maintenance of healthy populations of native landbirds.

Altman, B., and A. Holmes (2000b) *Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington.* Documents the history of habitat loss and existing conditions of habitats for landbirds in the Blue Mountains of Oregon and Washington with restoration and conservation strategies targeting the long-term maintenance of healthy populations of native landbirds.

Boyce, R.R. (1986). *A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin*. Confederated Tribes of the Umatilla Indian Reservation; Oregon Department of Fisheries and wildlife; U.S. Department of Interior; National Marine Fisheries Service; U.S. Bureau of Reclamation; U.S. Forest Service. Proposes rehabilitation objectives that include increasing CRP, improving flow timing and quantity, hatchery production, passage improvements, trap and haul programs, screening of diversions, and habitat restoration.

Columbia River Inter-Tribal Fish Commission (1996a). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. I.* Emphasizes cultural, legal, biological, and institutional contexts for fish restoration in the Columbia Basin and provides recommendations.

Columbia River Inter-Tribal Fish Commission (1996b). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. II: Subbasin Plans*. Specific subbasin breakdown for fish population status/goals, problems impacting fish, ongoing actions, and recommended actions including law enforcement, instream flow and passage, watershed management for water quality, riparian restoration, range management, forest management, mining impact reduction, and artificial production.

Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife (1990). *Umatilla River Subbasin Salmon and Steelhead Production Plan*, *Pendleton*. This plan provides the basis for production strategies, documents current and potential production, summarizes agency and tribal management efforts, goals, and objectives, and identifies problems, opportunities, and strategies. These include subbasin geology, climate, vegetation, water resources, land use, habitat protection needs, constraints, opportunities, and implementation.

Confederated Tribes of the Umatilla Indian Reservation (1984). Report contains prioritized site specific initiatives for rehabilitations of anadromous salmon and steelhead populations in the Umatilla subbasin. Includes fish reestablishment and habitat improvement recommendations developed through consensus among staffs of Confederated Tribes of the Umatilla Indian Reservation, Oregon Department of Fish and Wildlife, and the Umatilla National Forest.

Confederated Tribes of the Umatilla Indian Reservation (1999). *Flow Needs for Salmonids and Other Aquatic Organisms in the Umatilla River*. Addresses the quantity and quality of stream flow necessary for salmonid survival during all life history phases in the mainstem Umatilla River. Sets goals for flows to meet the established fish restoration goals. These goals include rearing, migration, and channel-maintenance, temperature, stream flow, water quality, and adaptive management.

Harris, R.M. and C.F. Clifton (1999), Upper Umatilla River Sediment Analysis American Water Resources Association, http://www.awra.org/proceedings/Montana99/Harris.index.htm. This report summaries beneficial uses of the Umatilla River and discusses water quality issues include developing TMDLs for sediment and temperature. The report analyzes 34 years of streamflow records and 11 years of suspended sediment records, to quantify the annual and seasonal sediment loads and the relationships between suspended sediment and discharge. They found: 1) high spatial and temporal variability in annual sediment loads between stations, and at the same station year to year, and 2) a lack of correlation between streamflow and sediment indication complex streamflow and sediment supply relationships. Recommendations include future analysis to evaluate the reliability of automatic fixed point sampling by collecting concurrent depth integrated samples; future analysis to determine the frequency of sampling needed to characterize the sediment parameters; and, adding bedload sampling to determine bedload contribution to total load.

Johnson, D.R. and A. J. Makinson (1988). *Soil Survey of Umatilla County Area, Oregon*. U.S. Department of Agriculture, Soil Conservation Service. This soil survey provides information about the soil in Umatilla County, including a discussion of their suitability, limitations and management for specific uses such as farmland, rangeland, woodland, recreation, and wildlife habitat.

Oregon Water Resources (1988). Report contains description of Umatilla subbasin natural resource uses including water us and control. Water use, management issues, strategies and recommendations are included.

Umatilla National Forest (1999). *Draft Umatilla and Meacham Ecosystem Analysis.* This draft ecosystem analysis at the watershed scale analyzes 1) water, fish, and aquatic habitat, 2) vegetation sustainability, and 3) floristic and vertebrate biodiversity in terms so specific issues.

U.S. Forest Service (1990). *Forest Land and Resource Management Plan: Umatilla National Forest.* This plan covers use and protection of forest resources, legislative requirements, and local, regional, and national issues and concerns about forest management. It is intended to guide management activities within the context of the availability and suitability of lands for resource management. It includes economic and social environment, society, recreation, research needs, response to concerns, management direction, and implementation.

U.S. Forest Service (1997). *Monitoring and Evaluation Report: Umatilla National Forest, Forest Plan, Fiscal Year 1996*. This update to the 1990 UNF plan documents monitoring and evaluations of progress towards air quality, soil productivity, water quantity and quality, stream temperature, channel morphology, noxious weeds, and silviculture, stand management, threatened, endangered, and sensitive plant species, insect and disease control, wildlife, plant and animal diversity, recreation, wilderness, range, timber, minerals, transportation, fire protection, and cultural sites goals.

Limiting Factors

Fish

The primary limiting factors to salmonid abundance and distribution were defined by the Columbia Basin Fish and Wildlife Authority (Draft Annual Implementation Work plan 2000) as:

- Inter-related water quantity and quality problems (e.g., low flows/high temps. & pollutants) result in poor survival during juvenile rearing and migration in the lower Umatilla River.
- Low flows and diversion barriers restrict adult migration
- Riparian degradation and lack of pools reduces adult holding and juvenile rearing survival in the upper reaches of the Umatilla subbasin
- Water quantity, quality, and sediment problems limit salmonid spawning and rearing
- Mainstem passage problems and other habitat alterations as a result of Columbia River mainstem dams

Key species, such as bull trout, steelhead, spring and fall chinook, and coho have a narrow range of biological requirements and can persist only in areas of suitable habitat. In the Umatilla, these areas and conditions are often inaccessible to migrating and resident species. Limits to fisheries production outside the subbasin include incidental harvest during migration and poor ocean survival. Conditions in the Columbia River also cause significant mortality for both outmigrating juveniles and returning adults. This in-river mortality results from hydroelectric dams, low velocity pools formed by the dams, predation from piscivores, and warm water temperatures. This combination of out-of-basin and in-basin factors have reduced native anadromous fish populations within the subbasin to precipitously low levels. These factors are summarized in Table 42.

Table 43 identifies known and suspected limiting factors in the Umatilla subbasin at stream reach scale. Although not comprehensive, the list identifies primary factors known to limit key species production in various portions of the subbasin. The table is stratified into three general reaches, which correspond to similar land uses and channel type. Within each broad reach, a number of stream segments are evaluated. For each reach, key limiting factors are presented for the five salmonid species occurring in the subbasin. Each species is evaluated at one of three life history phases: migration (M), spawning (S) and rearing (R). An “X” denotes the presence of a limiting factor.

Life history limitations are highly variable depending on the reach and species considered. This is due in part to differences in environmental factors between reaches, and the specific biological requirements inherent to the respective species. For example, in the lower portion of the basin, from the mouth to RM50, the primary land use is irrigated agriculture. Therefore, flow limitations and passage impediments are common as a result of the numerous irrigation diversions. The species most affected in this area are fall chinook, which commonly use the lower reach for rearing; however, coho, spring chinook and steelhead use this section of river for migration purposes during peak irrigation periods.

Table 42. General Characterization of Non-Habitat and Out-of-Subbasin Factors Limiting Salmonid and Lamprey Production in the Umatilla Basin

Limiting Factor	**Description**
Out-of-basin mortality (low smolt-to-adult return rates)	Ranks as high limiting factor. Anadromous fish must migrate past three mainstem Columbia River dams twice during their downstream and upstream migration. Columbia River passage, water quality, and estuary conditions are the major concerns.
Current low population size	Ranks as high limiting factor. Current spawning levels of fall chinook, coho, and steelhead are well below target objectives. This does not provide adequate parental base from which to build. Even if population replacement could be maintained, levels would still be far below natural production capabilities and numeric objectives. Spring chinook have, in some years, achieved target spawning escapement levels but total return and harvest objectives have not been met. Maintenance of hatchery supplementation (and addressing habitat factors) is recommended to increase and sustain parental population bases.
Low instream nutrient contribution from salmon and lamprey carcasses.	Ranks as a moderate limiting factor. Extirpated spring chinook runs have eliminated a major natural nutrient input source, which has reduced productivity in the aquatic ecosystem. Returning natural nutrient input will require successful reintroduction of natural spawning salmon and lamprey populations.
Lack of law enforcement for compliance with environmental protective requirements	Ranks as a moderate limiting factor. Environmental protective regulations such as Section 404 Fill and Removal Permits, Water Quality Standards, Local Land Use Planning Requirements and ESA Take Prohibitions are sometimes not followed and/or enforced resulting in negative impacts to fish and wildlife impacts.

Table 43. Key factors limiting fish production (species and life history) by stream segments in the Umatilla subbasin

Location	**Key Limiting Factors** [1/]	**STS Impacts**			**CHS Impacts**			**CHF Impacts**			**COHO Impacts**			**BT Impacts**		
		M	**S**	**R**	**M**	**S**	**R**	**M**	**S**	**R**	**M**	**S**	**R**	**M**	**S**	**R**
Umatilla Headwaters to Meacham Creek																
North Fork	None- Key stronghold area	All species and life histories benefited														
South Fork	TP, CH	--	--	X	--	X	X	--	--	--	--	--	--	--	X	X
Mainstem Umatilla – Forks to Meacham Cr.	IHD, CH	--	--	X	--	--	X	--	--	--	--	--	--	--	--	X
Ryan & Bear Creeks	FL	--	--	X	--	--	X	--	--	--	--	--	--	--	--	X
Meacham Creek	FL, TP, CH, IHD, RIP	--	--	X	X	X	X	--	--	--	--	--	X	--	X	X
Mouth of Meacham to Mouth of McKay Creek																
Mainstem Umatilla – Meacham Cr. to Cayuse	FL, TP, CH, IHD, RIP	--	--	X	--	X	X	--	--	--	--	--	X	--	--	X
Mainstem Umatilla – Cayuse to McKay Cr.	FL, TP, CH, IHD, RIP	--	--	X	--	X	X	--	--	X	--	--	X	--	--	--
Squaw and Buckaroo Creeks	FL, TP, IHD, RIP	--	--	X	--	--	X	--	--	--	--	--	X	--	--	X
Coonskin, Moonshine, Cottonwood, Mission	FL, TP, PAS, CH, IHD,SED	--	--	X	--	--	X	--	--	--	--	--	X	--	--	--
Wildhorse Creek	FL, TP, PAS, CH, IHD, SED, RIP	--	X	X	--	--	--	--	--	--	--	--	X	--	--	--
Tutuilla Creek	FL, TP, CH, IHD, SED, RIP	--	--	X	--	--	--	--	--	--	--	--	X	--	--	--
McKay Creek	FL, PAS, CH, IHD, RIP	--	--	X	X	X	X	X	X	X	X	X	X	--	--	X
Mouth of McKay to Umatilla River Mouth																
Mainstem Umatilla – McKay Cr. to Westland	FL, TP, CH, IHD, SED, RIP, PASS[2/]	--	--	X	--	--	--	--	X	X	--	X	X	--	--	--
Mainstem Umatilla – Westland to Mouth	FL, TP, WQ, PAS, CH, IHD, SED, RIP	X	--	--	X	--	--	X	X	X	X	X	X	--	--	--
Birch Creek	FL, TP, PAS, CH, IHD, SED, RIP	--	--	X	--	--	--	--	--	--	--	--	X	--	--	--
Butter Creek	FL, TP, PAS, CH, IHD, SED, RIP	X	X	X	--	--	--	--	--	--	--	--	--	--	--	--

1/ Key Limiting Factors: FL=flow : TP=water temperature ; WQ=water quality (chemical) ; PAS=passage ; CH=channel conditions ; IHD=instream habitat diversity ; SED=sedimentation ; RIP=riparian ; X=impact to specified life history stage

2/ With the exception of adult migration at Feed Canal Dam, fish passage conditions for all species are thought to be adequate following completion of Umatilla Basin Flow Project and Ladder/Screen projects.

Wildlife

Conversion and Fragmentation of Habitat

Loss of habitat is the primary factor limiting wildlife populations in the subbasin. Late seral ponderosa pine dominated forests in the region have declined by 75-80% (Henjum et al. 1994). Wetland losses of up to 90% are documented along sections of the Umatilla River corridor (Kagan et al. 2000). Approximately 65% of the historic grass and shrublands of the Umatilla/Willow subbasin has been converted to agricultural cropland (Kagan et al. 2000). This large-scale habitat loss limits the potential for the Umatilla/Willow subbasin to support the wildlife species dependent on these habitats.

Fragmentation of remnant habitats further reduces their suitability for wildlife and increases their susceptibility to noxious weed invasion and other outside influences. Accelerating fragmentation resulting from disturbances, such as the expansion of crop cultivation or range fire, reduces patch size/home range ratios, and increases the access of predators and parasites to remaining habitat as edge increases relative to core habitat area.

Fragmentation of shrub steppe has altered the dynamics of dispersal and immigration necessary for maintenance of some populations at a regional scale (Altman and Holmes 2000a, 2000b). In a recent analysis of neotropical migratory birds within the Interior Columbia basin, most species identified as a high concern to management were dependent on shrub steppe habitat (Saab and Rich 1997).

Habitat fragmentation and high edge densities are conducive to significantly increased parasitism of the nests of other bird species by cowbirds. Cowbirds forage in agricultural areas, and near livestock. Bird species nesting in habitat patches near these areas experience increased exposure to nest parasitism, and reduced reproductive success as a result. Nest parasitism by cowbirds has been documented for over 220 bird species, and at least 144 species have successfully fledged cowbird young. Source habitats for cowbirds have increased by ≥ 60% over historic conditions in all but two of the 54 fifth field HUCs in the Umatilla/Willow subbasin (Wisdom et al. 2000).

Table 44 and Table 45 illustrate some key habitat components for certain focal species and their respective limiting factors in the Umatilla/Willow subbasin for shrub steppe and riparian habitats. The loss of healthy riparian corridors is particularly problematic to the wildlife species of the subbasin as it limits their ability to disperse when habitat conditions change.

Table 44. Habitat relationships of focal species in riparian habitats of the Columbia plateau Landbird Conservation Planning Region (from Altman and Holmes 2000a, 2000b)

Conservation Focus	**Focal Species**	**Key Habitat Relationships**			
		Vegetative Composition [a]	**Vegetation Structure** [b]	**Landscape/ Patch Size**	**Special Considerations**
large snags	Lewis's woodpecker	cottonwood	>2 snags/ha >16 in dbh; >2 trees/ha >21 dbh; canopy cover 10-40%; shrub cover 30-80%		dependent on insect food supply; competition from starlings detrimental
large canopy trees	Bullock's oriole	cottonwood	canopy tree height >35 ft; canopy closure 30-60%; recruitment trees >10% cover		not area-sensitive; not landscape-sensitive; positive response to edge
subcanopy foliage	yellow warbler	willow, cottonwood,	>70% cover in shrub and subcanopy with subcanopy >40% of that; >70% cover native species		highly vulnerable to cowbird parasitism; grazing reduces understory structure
dense shrub layer	yellow-breasted chat	willow, snowberry, wild rose	shrub layer 1-4 m tall; 30-80% shrub cover; scattered herbaceous openings; tree cover <20%		vulnerable to cowbird parasitism; grazing reduces understory structure
large, structurally diverse patches	yellow-billed cuckoo	cottonwood, willow	3 or more layers with >20% cover in each layer; canopy closure >50%; patches wider than 100 m and >40 ha	>40 ha	close to extirpated; area-sensitive; susceptible to human disturbance
shrub density	willow flycatcher	willow	shrub patches >10 m sq; shrub cover 40-80%; shrub height >1 m; tree cover <30%	>8 ha	highly vulnerable to cowbird parasitism; grazing reduces understory structure
shrub-herbaceous interspersion	lazuli bunting	willow, snowberry, red-osier dogwood	interspersion shrub and herbaceous where neither >70%		highly vulnerable to cowbird parasitism

[a]Preferred species.
[b]Vegetative structure is a condensed version of the habitat objectives for each species. Refer to the text for more detailed description of habitat objectives.

Table 45. Habitat relationships of focal species in shrub steppe habitats of the Columbia plateau Landbird Conservation Planning Region (from Altman and Holmes 2000a, 2000b)

Conservation Focus	Focal Species	Key Habitat Relationships			
		Vegetative Composition [a]	Vegetation Structure [b]	Landscape Patch Size	Special Considerations
native bunchgrass cover	grasshopper sparrow	native bunchgrasses	bunchgrass cover >15% and >60% total grass cover; bunchgrass >25 cm tall; shrub cover <10%;	>40 ha (100 ac)	larger tracts better; exotic grass detrimental; vulnerable in agricultural habitats from mowing, spraying, etc.
interspersion tall shrubs and openings	loggerhead shrike	sagebrush, bitterbrush	patches shrubs >1 m tall; <15% tall shrub cover; shrub height >1 m; herb cover <20%; open ground >30%		prey base may be affected by pesticides; need low ground cover; invasion of exotic grasses detrimental
burrows	Burrowing owl		open ground cover >40%; native grass cover <40% and <40 cm tall		dependent upon burrow providers (e.g., ground squirrels, badgers); sensitive to nest disturbances; 200 m buffer zone around nest burrow
deciduous trees and shrubs	sharp-tailed grouse		canopy cover 15-35% >15 cm above ground; forb cover >10%; non-native herbaceous cover <5%		
large areas; diverse herbaceous understory	Sage grouse	big sagebrush	sagebrush cover 10-30%; forb cover >10%; bunchgrass cover >10%; open ground cover >10%; non-native herb cover <10%		area-sensitive
large, contiguous patches sagebrush	Sage sparrow	big sagebrush	sagebrush cover 10-25%; sagebrush height >50 cm; herb cover >10%; open ground >10%	>1,000 ha (2,500 ac)	area-sensitive, needs large blocks; patchy sage preferred over contiguous dense sage; vulnerable to cowbirds
sagebrush cover	Brewer's sparrow	big sagebrush	sagebrush cover 10-30%; sagebrush height >60cm; herb cover >10%; open ground >20%; non-native herb cover <10%		not area-sensitive, but sensitive to sage cover; vulnerable to cowbirds

Conservation Focus	Focal Species	Key Habitat Relationships			
		Vegetative Composition [a]	Vegetation Structure [b]	Landscape Patch Size	Special Considerations
sagebrush height	Sage thrasher	big sagebrush	sagebrush cover 5-20%; sagebrush height >80 cm; herb cover 5-20%; other shrub cover <10%; non-native herb cover <10%	>16 ha (40 ac)	not area-sensitive ; not impacted by cowbirds; high moisture sites with tall shrubs
ecotonal edges herbaceous, shrub, tree habitats	Lark sparrow	bitterbrush, sagebrush	edge habitat with mosaic of growth forms where none exceeds 50% cover; open ground cover >20%		dry upland sites with minimal exotic weed cover; vulnerable to cowbird parasitism
sparsely vegetated desert scrub	black-throated sparrow	shadscale, spiny hopsage, budsage	shrub cover <20%; herbaceous cover <25%; open ground >40%; non-native herb cover <15%		dry upland sites with minimal exotic weed cover
scattered, mature juniper trees	ferruginous hawk	juniper	isolated, mature juniper trees >1/1.6 km; herbaceous-low shrub cover 15-60 cm tall		dependent upon prey (e.g., ground squirrels, jackrabbits); sensitive to human disturbance; 1 km buffer zone around nests

[a] Preferred species.

[b] Vegetative structure is a condensed version of the habitat objectives for each species. Refer to the text for more detailed description of habitat objectives.

Changes in forest habitat components have reduced habitat availability and quality for wildlife species dependent on timbered uplands. In natural landscapes stochastic events produce more complex landscapes than those found in managed forests. Variations in susceptibility to disturbance, weather patterns, and soil moisture result in forest patches of a variety of shapes, sizes, and stand age classes (McKelvey et al. 2000). This heterogeneity has been reduced through timber harvest and fire suppression in the subbasin. Dense stands of mid-seral Douglas fir and grand fir have increased in prominence while old growth forests and species like ponderosa pine and aspen have declined. Fuel loads have also increased due to fire suppression (Figure 39).

Snags and Down Wood

The prominence of snags and downed wood is a particularly important element of forest diversity that has been reduced in the subbasin. In the Blue Mountains of Oregon and Washington, nearly 100 different wildlife species of birds and mammals use dead and downed trees as sites for nesting, feeding, and perching. Nearly 60 species depend on suitable wildlife trees and associated cavities for their survival. Primary excavators such as the pileated woodpecker create holes in dead and dying trees that may be used later by secondary cavity users such as owls, bluebirds, wrens, and flying squirrels (U. S. Forest Service 1990).

Snags and woody debris are most common in old and mature forests that have declined in the region (Quigley and Arbelbide 1997; U. S. Forest Service 1990). A comparison of the coarse scale historic and current structural stage GIS layers developed by ICBEMP, indicates a decline in old growth forests and woodlands in the Umatilla/Willow subbasin of almost 97%. An analysis of the Upper Umatilla and Meacham Creek area using satellite imagery collected in 1991 found that 96% of trees in the area fell into the small pole or sapling size classes (0-20.9 DBH) (Umatilla National Forest 2000). Declines in mature forest habitat in the subbasin have likely contributed to population declines in many species including the vaux swift which nests in large hollow trees, and the goshawk which requires large trees to support its sizeable nest (Csuti et al. 1997). The Umatilla/Willow area was found to contain snag densities that met or exceeded the Forest Service established snag density objectives. However, and most importantly, large snags and snags in ponderosa pine forests had a density below Forest Service objectives. Overall high snag densities are attributed to recent insect outbreaks. While total numbers of snags may meet the Forest Services snag density objectives, because of their small size, many of these snags do not provide the cavity nesting habitat required by most snag dependent wildlife.

Dead and down wood is more abundant in true fir and mixed conifer stands across the subbasin, but less abundant in fire-regulated pine communities. Large-diameter trees will remain longer on the landscape than small-diameter trees. Dead wood densities will fluctuate across the landscape as a result of natural mortality. Snag and down wood abundance is subject to the frequency and intensity of large and small-scale disturbances such as fires, insects, disease, ice storms, and drought that have historically occurred throughout the area (Quigley and Arbelbide 1997).

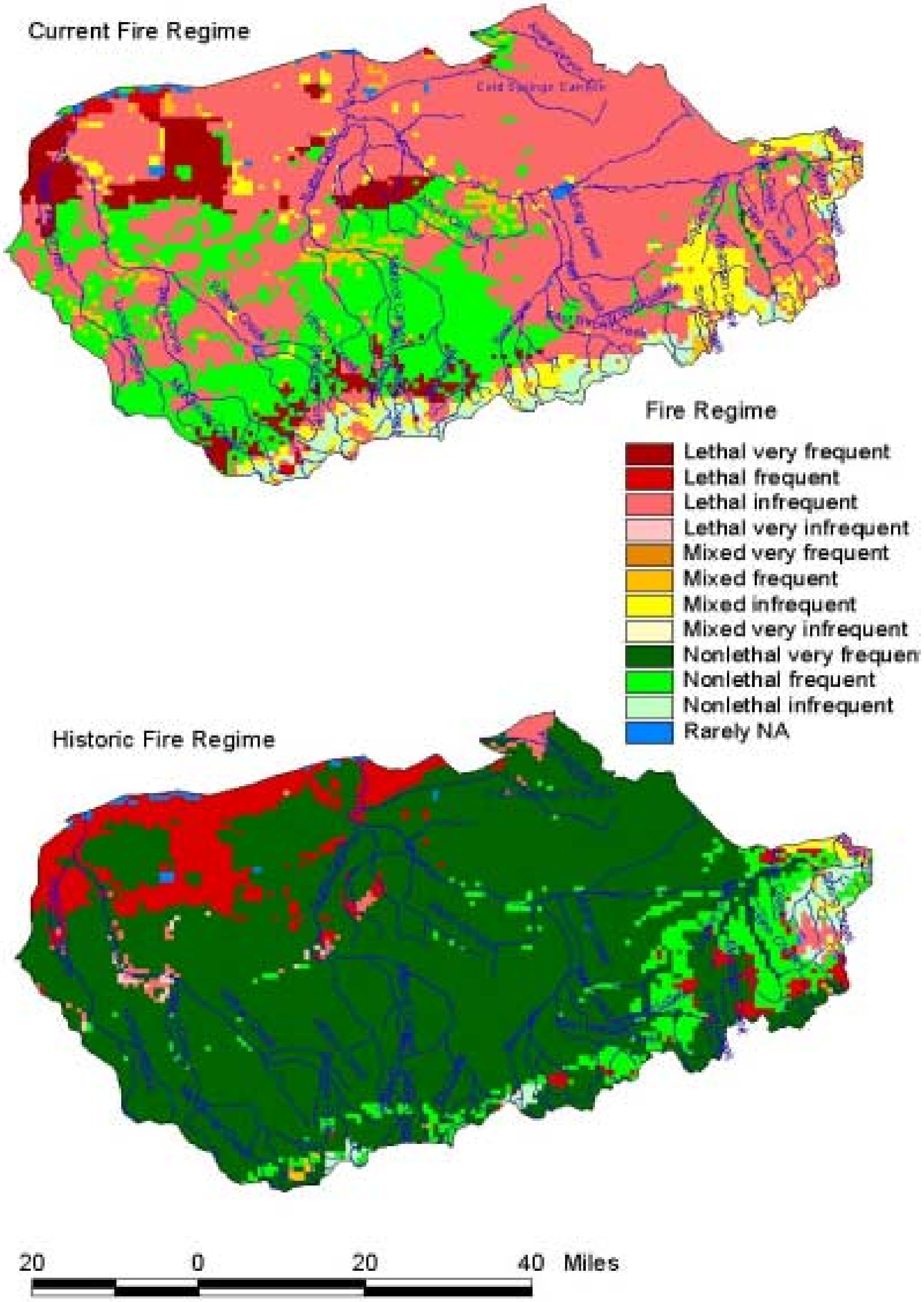

Figure 39. Changes in fire frequency and severity in the Umatilla/Willow subbasin

Nutrient Flow Reduction

Spawning salmon populations form an important link between the aquatic, riparian, and terrestrial communities. Anadromous salmon help to maintain ecosystem productivity and may be regarded as a keystone species. Salmon runs input organic matter and nutrients to the trophic system through multiple pathways including direct consumption, excretion, decomposition, and primary production. Direct consumption occurs in the form of predation, parasitism, or scavenging of the live spawner, carcass, egg, or fry life stages. Carcass decomposition and the particulate and dissolved organic matter released by spawning fish deliver nutrients to primary producers (Cederholm et al. 2000). Cederholm identified nine wildlife species that have (or historically had) a strong consistent relationship with salmon; of these the common merganser, harlequin duck, osprey, bald eagle, Caspian tern, black bear, and northern river otter occur in the Umatilla/Willow subbasin. Eighty-three other wildlife species were identified as having a recurrent or indirect relationship with salmon, and many of these also occur in the Umatilla/Willow subbasin (Cederholm et al. 2000). The golden eagle, bald eagle, peregrine falcon, and bank swallow are among those that are state or federally listed/candidate species.

Exotic Species

Cheatgrass and Noxious Weeds

Disturbance of the grass and shrubland ecosystems by livestock has contributed to the spread of introduced grasses and weeds including cheatgrass (*Bromus tectorum*) and yellow starthistle (*Centauria solstitialis*). Early newspaper accounts from 1902 through 1923 describe wheat farmers in the Adams area of the Wildhorse Creek drainage having difficulties with "Russian thistle", "tar weeds" and "Jim Hill Mustard" (Adams Ladies Club 1993 and 94). All 55 transects sampled by the WDFW on shrub steppe ecosystems in the Columbia basin contained exotic annual grasses and exotic forb species (Dobler et al. 1996). Kagan et al. (2000) reported that all shrub steppe and grassland habitats in the Lower Umatilla/Willow subbasin contained well-established populations of cheatgrass and/or medusahead (*Tanaetherum caput-medusae*).

The invasion of cheatgrass into shrub steppe habitats is especially problematic as it increases the frequency and severity of range fires (Paige and Ritter 1999). This change in fire regime is a result of cheatgrass growing at much higher densities compared to native vegetation (providing an unbroken flammable medium to carry fire), its property of drying out early in the season, and its ability to quickly reestablish itself after fire. In most instances, cheatgrass-dominated shrub steppe results in complete conversion to cheatgrass and other exotic weeds once the area burns. Sagebrush and other native shrubs take several years to decades to reestablish themselves after these intense fires. Since the cheatgrass returns quickly, and may burn as frequently as every five years, native shrubs have no opportunity to reestablish. The reestablishment of sagebrush in cheatgrass dominated rangelands is a major problem throughout the sagebrush zone of the Interior Western U.S., and no solution to the problem has been found. To date, the only method found for reestablishment is to plant individual sagebrush plants by hand, something that is not practical for any but the smallest areas.

Introduced plants in the subbasin often out compete native plant species, reducing the suitability of habitat available to the wildlife (Quigley and Arbelbide 1997). The most rapidly increasing exotic plants in the subbasin, and ones that are particularly problematic, are knapweed and yellow starthistle. These invader species are native to the Mediterranean, but have thrived in the subbasin due to similarities in climate between the two locations (Quigley and Arbelbide 1997). Both are widespread and rapidly invade areas that have been disturbed to replace native plant species. Other serious exotic species includes rush skeletonweed (*Condrilla juncae*), spikeweed (Hemizonia pungens), medusahead (*Taeniatherum caput-medusae*), and perennial pepperweed (*Lepidium latifolium).*

The diversity of terrestrial birds is positively correlated with plant diversity. Sage thrasher, sage sparrow, and white crowned sparrow occurrence is negatively correlated with percent cover of annual grass (Dobler et al. 1996). Columbian sharp-tailed grouse prefer eating native vegetation rather than introduced species, although cultivated grains supplement their diet (Hays et al. 1998)

Exotic plants are also a problem in riparian and wetland habitats. The most obvious of these is purple loosestrife (*Lythrum salicaria*), which is beginning to expand in wetlands along the Columbia River. Russian olive (*Elaeagnus angustifolia*) is a major problem in wet meadows and riparian areas to which it has escaped from residential plantings. While most rivers have lost all of their riparian tree and shrub cover, the few remaining areas have non-native forbs and grasses dominating the understory.

Bullfrogs

Bullfrogs are native to eastern North America. They were intentionally introduced to the western U. S as a game species. Bullfrogs have successfully colonized most of the lower elevation ponds marshes, rivers, and reservoirs of Washington and Oregon including many of those in the Umatilla/Willow subbasin. Numerous studies have shown that the bullfrog out competes native amphibians due to its aggressive behavior and rapid growth rate (Corkran and Thoms 1996; Charlotte Corkran personal communication February 2, 2001; Marc Hayes, WDFW, personal communication February 5, 2001). The bullfrog's preferred habitat is similar to that of many other amphibians native to the Umatilla/Willow subbasin, especially that of the Oregon spotted frog (Charlotte Corkran personal communication February 2, 2001; Mark Hayes, WDFW, personal communication February 5, 2001. Bullfrogs are voracious predators often eating the eggs, tadpoles, and adult members of native frog species. Bullfrog predation and competition is considered a major factor in the decline of many of these species (Csuti et al. 1997).

Virginia Opossum

The opossum is native to the eastern U. S.; they were introduced to Oregon between 1910 and 1920 and now occur within the Umatilla/Willow subbasin. Opossum are opportunistic feeders and consume a variety of small birds, mammals, and reptiles (Csuti et al. 1997). Opossum predation on bird eggs may be limiting native bird population and is a concern for wildlife managers in the subbasin.

Hydropower System Development and Operations

The development and operation of dams for hydropower, navigation, flood control, and irrigation in the Columbia River basin resulted in widespread changes in riparian riverine and upland habitats. Documented losses from studies conducted in the late 1980s associated with each hydropower facility are provided in Table 46 (Susan Barnes, ODFW, personal communication February 2001).

Table 46. Habitat losses associated with hydropower development

Hydropower Facility	Habitat Acres Inundated	Habitat Units Lost
Bonneville	20,749	12,317
The Dalles	1,923	2,230
John Day	27,455	14,398
McNary	15,502	19,397

Hydropower development has resulted in urban expansion, numerous roads and railways, and other structures. The creation of reservoirs has permitted the expansion of irrigation, thus resulting in extensive habitat conversion. The frequency and duration of water level changes has influenced vegetation succession on islands and along shorelines. In some cases these fluctuating water levels have created barren vegetation zones and exposed wildlife to increased predation. Low water levels create land bridges that provide predators access to nesting islands. For example, inundation of gravel bars and sandy islands reduced the available area for nesting and resting waterfowl. Other results of hydropower development and operation often include the draining and filling of wetlands, stream channelization, shoreline riprapping, construction and maintenance of transmission power corridors, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries.

The construction of McNary Dam made possible the irrigation of about 244,000 acres of land in Oregon and Washington, a portion of which falls within the Umatilla/Willow subbasin (Susan Barnes, ODFW, personal communication February 2001).

Land Protection Status

Eighty-nine percent of the subbasin is privately owned (Figure 18). This makes providing long term stable wildlife habitat challenging and increases interactions between wildlife and the public. For example 83% of the winter elk range in the subbasin is privately owned, and most of this land is grazed or farmed. Elk populations at target population levels (ODFW 1986) use privately owned winter range extensively (Table 47). Elk winter use of grazing and agricultural land often causes property damage (Oregon Department of Fish and Wildlife 1992b). Such damage results in pressure on ODFW to reduce the elk population. These pressures could largely be alleviated if winter range areas receiving high levels of use were in protected status and managed for wild ungulate winter range quality.

Table 47. Elk densities at management objective level in the Umatilla/Willow subbasin

Average Elk Density at Management Objective Level					
Winter Range			Summer Range		
Total	Public	Private	Total	Public	Private
18.9	22.9	16.7	11.1	11.5	10.0

Acquiring and protecting important wildlife habitat areas in the subbasin is a management priority. A large proportion of habitat within the Umatilla/ Willow subbasin is privately owned (Table 48). Maintaining and increasing the lands registered under the CRP program is crucial to this effort, particularly if sharp-tailed grouse are to be reintroduced to the subbasin, since most of their potential habitat is on privately owned lands (Kagan et al. 2000). Land acquisition efforts are hindered by the steadily rising cost of land in the subbasin. Opportunities to restore wildlife populations and improve habitat diminish over time as habitat loss and degradation continues (Susan Barnes, ODFW, personal communication February 2001)

Table 48. Percentages of privately owned habitat in the Umatilla/Willow subbasin (Kagan et al. 2000).

Cover Type	Percent of Total Area Privately Owned
Big Sage/Bluebunch Wheatgrass	66
Big Sage/Idaho Fescue	98
Big Sagebrush Steppe	77
Bitterbrush Shrub Steppe	54
Bluebunch Wheatgrass	92
Forest	95
Hawthorne-Snowberry/Fescue	100
Idaho Fescue	99
Needle-&-Thread Grassland	20
Rigid Sage/Sandberg Bluegrass	81

Species-Specific Limiting Factors

- MacGillivray's Warbler (Altman and Holmes 2000a, 2000b)
- Loss of brushy habitat in the understory of mixed conifer stands
- Reduced shrub cover due to grazing intensity, wildfires, and herbicide use

Flammulated Owl (Altman and Holmes 2000a, 2000b)

- Loss of mature and old growth trees and snags for nesting and roosting

- Loss of open understory because of invasion of exotics and fire intolerant species
- Reduction in the availability of small dense thickets for roosting

White-Headed Woodpecker (Wisdom et al. 2000)

- Declines in late seral ponderosa pine for nest cavities
- Loss of large diameter snags
- Decline in old aspen cottonwood and willow stands

Canada Lynx (Ruggiero et al. 1999)

- Lack of suitable foraging, denning, or travel habitat
- Inadequate juxtaposition of forage, denning or travel habitat
- Inadequate prey species availability
- Human interaction (trapping, highways, urbanization, etc.)

Wolverine (Witmer et al. 1998)

- Insufficient amounts of remote forest habitats.
- Insufficient rock and talus areas for natal dens
- Human interaction (trapping, highways, urbanization, etc.)

Wetland and Riparian-Dependent Species

Columbian Spotted Frog (Marcot et al. 1997, McAllister and Leonard 1997)

- Loss of wetlands and changes in plant community structure
- Insufficient aquatic vegetation for cover and foraging
- Limited amounts of down wood and woody debris in wetland habitats
- The spread of exotic aquatic predators like bullfrogs and warm water fishes

Northern Leopard Frog

- Loss of wetlands and changes in plant community structure
- The spread of exotic aquatic predators like bullfrogs and warm water fishes

Red-Eyed Vireo (Altman and Holmes 2000a, 2000b)

- Reduced shrub understory
- Livestock grazing in riparian habitat due to reductions in insect productivity and recruitment of young cottonwoods

Bald Eagle (Bureau of Land Management and U. S. Fish and Wildlife Service 1986)

- Reduced late and old structure along major tributaries.
- Disturbance around potential nesting and roosting habitat (riparian corridors)

Managed Species

Elk

- Winter range, particularly on publicly owned protected areas
- Noxious weeds and poor range conditions

Blue Grouse(Larsen and Nordstrom 1999)

- Reforestation practices that include high density replanting and herbicide application
- Intense grazing of open lowland forests in drier areas

Mountain Quail (Larsen and Nordstrom 1999)

- Intense grazing of open lowland forests in drier areas
- Inadequate food supply caused by habitat loss
- Loss of winter habitat from dams and water impoundments
- Loss of riparian connectivity

Extirpated Species

Sharp-Tailed Grouse

- Loss of riparian connectivity
- Loss of stable protected shrub steppe habitat (Crawford and Coggins 2000)
- Loss of shrub species such as serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), and hawthorn (*Crategus douglassi*) for food and cover

Big Horn Sheep

- Domestic sheep
- Loss of rocky outcroppings

Artificial Production

Artificial production within the Umatilla subbasin includes summer steelhead, coho, and spring and fall chinook salmon programs. The summer steelhead, spring chinook, and subyearling fall chinook programs are funded by BPA as part of the Northwest Power Planning Council Fish and Wildlife Program. The fall chinook yearling program is funded under the U. S. Army Corps of Engineers John Day Mitigation Program, and the coho are produced under the Mitchell Act.

The first releases of hatchery summer steelhead occurred from 1967 through 1970 and were of Skamania and Oxbow stocks (Appendix D). The first release of Umatilla stock steelhead occurred in 1975 and releases every year since have been of endemic stock. Broodstock for the program are collected at Three Mile Dam on the lower Umatilla River. Historically, numbers released and release locations have varied; however, the current program is to acclimate and release 150,000 smolts annually into Meacham Creek and the upper mainstem Umatilla River.

Coho salmon have been released from 1966 through 1969 and from 1987 to the present and have been primarily of Tanner Creek stock (Appendix E). Broodstock for the program are collected at Bonneville Hatchery. Historically, numbers released and release locations have varied, however, the current program is to acclimate and release 1,500,000 smolts annually into the mainstem Umatilla River.

Spring chinook salmon from Carson stock have been released since 1986 (Appendix F). Beginning with the 1998 releases, Carson stock spring chinook returning to the Umatilla River have been the primary broodstock source for the Umatilla River program. The goal for the program is to collect all broodstock at Three Mile Dam. Historically, numbers released and release locations have varied, however, the current program is to acclimate and release 710,000 yearling smolts annually into the upper mainstem Umatilla River.

Fall chinook salmon have been released in the Umatilla River Basin every year since 1982 (Appendix G). These releases have included both yearling and subyearling life history stages. The 1982 release was from Spring Creek tule stock. Since then, all releases have been of upriver bright stock. Upriver brights returning to the Umatilla River have been the primary broodstock source for the yearling John Day Mitigation Program since 1997. Broodstock for the program are to be collected at Three Mile Dam and Priest Rapids Hatchery. Historically, numbers released and release locations have varied, however, the current program is to acclimate and release 480,000 yearling and 600,000 subyearling smolts annually into the mainstem Umatilla River.

In addition to the juvenile release programs, an adult fall chinook-outplanting program was initiated in 1996. Surplus upriver bright stock from Priest Rapids and Ringold Springs hatcheries are released into natural production areas in the mid Umatilla River. The goal of the program is to release 1,000 adults annually. Actual releases have ranged from 200 to 970. (Table 49). There are also plans to outplant 100 surplus spring chinook from Ringold Springs Hatchery into Meacham Creek. This program has not been initiated to date.

Table 49. Fall chinook adult outplants released into the Umatilla River since 1996

Year	Number of adults released
1996	712
1997	940
1998	200
1999	970
2000	471

Historically, legal-sized rainbow trout were stocked throughout the Umatilla River basin. Stocking over the past decade however, has occurred only in the mainstem Umatilla River and lower McKay Creek. From 1990 through 1993, approximately 8,000 legal sized Cape Cod rainbow trout were stocked in the upper Umatilla River. In 1994, stocking of legal sized rainbow trout was relocated downstream to the Pendleton area to reduce interaction with wild redband rainbow/steelhead trout in the upper Umatilla River. In 1999, all stocking of rainbow trout within the Umatilla Basin was discontinued in an effort to protect wild stocks of redband rainbow/steelhead trout. Numbers of trout stocked in the Umatilla River is summarized in Table 50.

Table 50. Rainbow trout stocked in Umatilla basin streams, 1991 – 2000 (Oregon Department of Fish and Wildlife data).

Year	Stream	Location	Number
1991	Umatilla River	Forks Area	8,004
1992	Umatilla River	Forks Area	7,802
1993	Umatilla River	Forks Area	7,814
1994	Umatilla River	Pendleton Area	7,820
1995	Umatilla River McKay Creek	Pendleton Area Below Reservoir	3,401 2,000
1996	Umatilla River	Pendleton Area	4,991
1997	Umatilla River	Pendleton Area	5,008
1998	Umatilla River	Pendleton Area	4,597
1999	Umatilla River	Pendleton Area	3,800
2000			0

Umatilla Hatchery, constructed and operated under the Fish and Wildlife Program, is the central production facility for the Umatilla Basin Fish Restoration Program. It is operated by ODFW and currently produces summer steelhead, spring chinook, and subyearling fall chinook salmon. A number of out of basin hatchery facilities also produce fish for the program. Bonneville Hatchery produces yearling fall chinook, Little White Salmon Hatchery produces spring chinook, and Cascade Hatchery and Lower Herman Creek Ponds produce coho salmon.

There is also a hatchery facility proposed in the Umatilla Hatchery Supplemental Master Plan. This hatchery would be located at the same site as the existing South Fork Walla Walla adult holding facility. The hatchery would produce additional yearling spring chinook smolts for the Umatilla River in order to achieve natural production, broodstock and harvest objectives. The master plan for this project is scheduled to go through the NPPC review process later in 2001.

An integral part of the artificial production program for the basin also includes juvenile acclimation and adult holding and spawning satellite facilities. These facilities are all operated by CTUIR under the Umatilla Hatchery Satellite Facilities Operation and Maintenance project. There are five acclimation facilities in the basin; Bonifer Pond, Minthorn Springs, Imeques C-mem-ini-kem, Thornhollow, and Pendleton. The first acclimation facility (Bonifer) was constructed and began operations in 1983. With the completion of the Pendleton facility in 2000, all juvenile salmon and steelhead released into the basin are now acclimated.

There are also three adult facilities associated with the Fish Restoration Program. Summer steelhead are held and spawned at Minthorn, fall chinook at Three Mile Dam, and spring chinook at South Fork Walla Walla. Three Mile Dam may also be used for holding and spawning coho salmon. Broodstock for these facilities are collected and transported from the Three Mile Dam Adult Trapping and Handling Complex by the Umatilla River Fish Passage Operations project. The number of broodstock collected at Three Mile Dam and green eggs taken for each species is listed in Table 51.

Pacific Lamprey

CTUIR has been working cooperatively with the USGS-Biological Resource Division, Columbia River Research Lab (CRRL) in Cook, WA to develop and refine artificial propagation techniques for Pacific lamprey. Lamprey were collected from the John Day River in 1998 and manually spawned at CRRL in June 1998. Although, these techniques have not been finalized and are still under refinement, it is one option that the CTUIR is considering for reestablishment of lamprey in CTUIR's ceded areas.

Lamprey collected from the John Day River and the John Day Dam are being used to reestablish larval abundance in the Umatilla River by outplanting them in prime natural production locations close to spawning time. In 1999, CTUIR collected 100 adult lamprey by hand at Tumwater Falls on the John Day River approximately 16 km above the confluence with the Columbia River in July and August. An additional 500 adult lamprey were collected at the John Day Dam fish ladder during winter dewatering and maintenance. All lamprey were transported to the CRRL, and treated with oxytetracycline at a dose of 10 mg/kg for bacterial infections and treated with 37% formaldehyde (formalin) for external parasites. Fish were maintained in 0.9-m diameter tanks supplied with river water at a temperature of 6-8°C. To induce sexual development of lamprey, water temperature was increased from 6°C in May to 15°C by mid June 2000.

Table 51. Number of broodstock collected at Three Mile Dam and green eggs taken

Brood Year	Summer Steelhead		Coho		Fall Chinook		Spring Chinook	
	Number of Brood Collected	Number of Green Eggs Taken	Number of Brood Collected	Number of Green Eggs Taken	Number of Brood Collected	Number of Green Eggs Taken	Number of Brood Collected	Number of Green Eggs Taken
1983	161	132,000						
1984	52	100,000						
1985	104	150,000						
1986	69	166,000						
1987	148	239,760						
1988	133	121,980						
1989	150	214,712						
1990	92	130,274						
1991	202	410,356			347	601,548		
1992	225	476,871			211	195,637		
1993	128	255,441	580	676,171	347	352,320		
1994	135	234,432						
1995	154	223,525	860	945,828				
1996	133	215,408			576	778,058		
1997	110	209,639			299	641,961	597	1,029,237
1998	116	228,622			199	257,311	202	455,953
1999	128	224,716			464	541,821	631	942,988
2000	130	200,825			603		619	1,120,995
Total	2,370	3,934,561	1,440	1,621,999	3,046	3,368,656	2,049	3,549,173

Lamprey were checked weekly for ripeness and checked for disease before release into the Umatilla River. In May of 2000, 600 adult lamprey were released at river km 119 near Meacham Creek. In 2000, adult lamprey were collected only from the Columbia River mainstem at John Day Dam. The goal is to outplant 500 adults annually into the Umatilla River to begin restoration efforts. The numerous habitat enhancement actions ongoing and proposed for salmonids are also expected to benefit Pacific lamprey. Continual evaluation of adult outplanting will be necessary to determine success of restoration efforts.

Existing and Past Efforts

General subbasin activities to address fish and wildlife concerns include habitat enhancement planning, watershed assessment and coordination, and habitat improvements. Funding sources include BPA, USDA, USFS, USFWS, ODFW, and CTUIR.

Several in-basin, fisheries-specific restoration and habitat enhancement projects have been accomplished by the tribe and cooperating agencies (Table 52).

Table 52. Umatilla basin fisheries restoration program habitat enhancement components

PROJECT LOCATION	PROJECT LENGTH	PROJECT DESCRIPTION	IMPLEMENTING AGENCY
Lower Meacham Creek & tributaries	4.5 miles	CR, BS, IS, RF, RSP	CTUIR
Upper Umatilla River	3.2 miles	BS, IS, RF, RSP	CTUIR
Boston Canyon Creek	0.3 miles	RF, RSP, IS	CTUIR
Wildhorse Creek	2.0 miles	IS, RF, RSP	CTUIR
Greasewood Creek	1.5 miles	IS, RF, RSP	CTUIR
West Fork of Greasewood Creek	0.3 miles	RF, RSP	CTUIR
Spring Hollow Creek	0.6 miles	IS, RF, RSP	CTUIR
Mission Creek	0.4 miles	RF, RSP	CTUIR
Buckaroo Creek	1.6 miles	RF, RSP	CTUIR
Squaw Creek	4.0 miles	RF, LA	CTUIR
McKay Creek	0.6 miles	RF, RSP	CTUIR
Lower Umatilla River	0.15 miles	BS, RSP	CTUIR / NRCS
Moonshine Creek	Passage site	PI	CTUIR /Um. County
Cottonwood Creek	Passage site	PI	CTUIR/Um. County
Mission Creek	Passage site	PI	CTUIR/Um. County
Butter Creek	27 miles	BS, RF, RSP, OSW	SWCD
Lower Umatilla River	7 Passage sites	PI	ODFW
Birch Creek	6.0 miles	CR, BS, IS, RF, RSP, PI	ODFW
East Birch Creek	2.8 miles	CR, BS, IS, RF, RSP	ODFW
East Birch Creek	Passage site	PI	ODFW
Upper Meacham Creek	2.2 miles	RF, RSP, IS	ODFW
Upper Umatilla River	3.0 miles	BS, IS, RSP	ODFW
South Fork Umatilla River	3.5 miles	IS, CR, BS	USFS
Thomas Creek	2.5 miles	IS, BS	USFS
Spring Creek	6.6 miles	CR, BS, RSP	USFS
Meacham Creek	1.0 miles	IS	USFS
Upper Umatilla River	1.0 miles	IS, BS	USFS
Pearson Creek	3.0 miles	CR, BS	USFS
TOTAL RESTORED LENGTH	77.75 miles		

Channel reconstruction (CR); Bank stabilization (BS); Instream structures (IS); Riparian fencing (RF); Riparian seeding and planting (RSP); Passage Improvements (PI); Land Acquisition (LA); Off Stream Watering (OSW)

Records for the BPA Columbia River Basin Fish and Wildlife Program date back to 1980, covering planning activities, hatchery construction, outplanting, law enforcement, and fish habitat improvements as implemented by a variety of local, state, tribal, and federal agencies (Columbia Basin Fish and Wildlife Authority 1999). Specifics are listed in

Table 53.

Table 53. BPA-funded Columbia River Basin Fish and Wildlife Program activities (Columbia Basin Fish and Wildlife Authority 1999; Bonneville Power Administration and Northwest Power Planning Council 1999; Pacific States Marine Fisheries Commission 2001)

Project	BPA #	Sponsor	Duration
Passage Improvement			
Solve passage problems on Birch Creek by using weir and pool fish ladders	9607100	Montgomery Watson, ODFW	1996-1997
Fish passage flow augmentation	8902701	Stanfield Irrig. Dist.	1992
Passage improvements at Westland Diversion Dam	8710402	Westland Irrig. Dist.	1990-1993
Improved passage at the Stanfield Diversion	8710401	ODFW, USBR	1989-1993
Low-water fish passage in the lower Umatilla River	8802200	ODFW, CTUIR, NW Motorhome Center	1987-2004
Construct new fish ladders at the Westland Diversion	8710400	ODFW, USBR	1987-1991
Operate and maintain Umatilla River passage facilities	8343600	USBR, Westland Irrig. Dist.	1984-1988, 1991, 1993, 1995-2004
Fish passage on the lower three miles of the Umatilla River	8343400	USACE	1984-1986
Flow Enhancement			
Flow enhancement	8902700	USBR, Pacific Power & Light, Umatilla Electric Coop. Assoc.	1989-1990, 1992-2004
Flow enhancement in the lower three miles of the Umatilla River	8805000	ODFW	1988-1989
Enhance flows in the Umatilla River below Three Mile Dam	8740900	ODFW	1987

Project	BPA #	Sponsor	Duration
Habitat Enhancement			
Watershed enhancement in Squaw Creek	9506001	CTUIR	1998-1999
Instream and riparian habitat enhancement in Buckaroo, Mission, Wildhorse and McKay Creeks	9604500	CTUIR	1996
Construct a Tribal nursery at Mission Bridge for growing native plants	9606800	CTUIR	1996
Protect and restore the Squaw Creek subwatershed	9506000	CTUIR	1995-1998
Develop an acclimation site along the Umatilla River and manage the remaining land for wildlife	9307200	unknown contractor	1992, 1994
Anadromous habitat enhancement in the Umatilla subbasin	8710001	CTUIR, UNF, ODFW	1987-1999
Improve spawning and rearing habitat for salmonids	8710002	ODFW	1987-1999
Improve anadromous fish habitats in the South Fork Umatilla River and Thomas Creek	8710000	USFS	1987-1992
Artificial Propagation			
Operations and maintenance at Umatilla Fish Hatchery	8903500	ODFW	1995, 1997-2004
Operate artificial production facilities to raise chinook salmon and steelhead	8805300	Montgomery Watson	1991-1993, 1995-1997
Construct Umatilla Hatchery satellite facilities for acclimation and release of salmon and steelhead smolts	9101400	Montgomery Watson, David Evans & Associates	1991-1992, 1994, 1996-1998
Construct spring chinook juvenile acclimation, release, and adult capture facilities	8805302	CTUIR	1989-2000
Acclimate and release juvenile salmon and steelhead	8343500	CTUIR	1984-2004
Construct a juvenile acclimation site at Bonifer Springs and adult holding facility on Meacham Creek	8201800	CTUIR	1982-1984
Management Coordination			
Law enforcement protection of fish and habitat on reservation and ceded lands	9092	CTUIR	1999
Watershed management planning in the Birch, Buckaroo, Mission, Wildhorse, and McKay Creeks and upper Umatilla River	9608500	Umatilla County	1996
Address concerns about the structural integrity of the Westland Diversion	8741602	USBR	1989

Project	BPA #	Sponsor	Duration
Develop a plan for rehabilitating anadromous fish	8401000	ODFW, CTUIR, NMFS, USFWS, USBR, USFS	1984-1985
Education			
Educational projects in Umatilla subbasin school districts.	9202600	WCSWCD	1992-1993
Train Umatilla Tribal members as Hatchery Technicians	8403303	CTUIR	1988, 1990-1991
Develop materials for public awareness and involvement in fish and wildlife habitat protection and restoration	9301100	UW, USU, Multnomah Educ. Service Dist., Curtis Consulting	1993-1996
Prepare a slide show on Umatilla River fish projects	8741900	Dennis Maxwell	1987
Prepare a film on activities in the Umatilla River at or near Three Mile Dam	8741000	John Campbell	1987

Other projects in the subbasin have been funded and implemented independently or cooperatively by several national and/or regional agencies. These range from habitat restoration to regulatory planning. Overview details are provided in Table 54.

Table 54. Non BPA-funded fish and wildlife activities within the Umatilla River subbasin (Shaw 1997; Oregon Department of Environmental Quality et al. 2000; U. S. Forest Service 1990; Mark Kirsch, ODFW, personal communication January 11, 2001)

Project	Funding/Lead Agency	Status
Passage Improvement		
Culvert replacement	UBWC, landowners, ODF, ODFW, NRCS, UCSWCD	ongoing
Flow Enhancement		
Streamflow Restoration Prioritization. ODFW has established priorities for streamflow restoration needs in the Umatilla based on individual rankings of several factors.	OWEB-OWRD/ODFW, WRD	ongoing
Habitat Enhancement		
Subbasin-wide habitat enhancement	CTUIR, EPA	2000
Riparian vegetation improvement in Buckaroo and Butter Creeks	NRCS, CTUIR, BIA	1999 - ongoing
Watershed improvement, Butter Creek drainage	NRCS, Umatilla	1998 -

Project	Funding/Lead Agency	Status
	county, SWCD	ongoing
Improvement of 5.25 RM in Meacham, Mission, Wildhorse, Greasewood, and Spring Hollow Creeks		1993
Improvement of 7.45 miles of riparian habitat on lower Boston Canyon Creek, lower Meacham Creek, and upper Umatilla River	CTUIR	1988-1992
Spray winter range to control noxious weeds	ODFW	ongoing
Riparian enhancement through restrictive grazing, limits on timber harvesting, and correction of road problems	UNF	ongoing
Conservation agriculture	UCSWCD	ongoing
Tree planting, channel engineering, and instream structures on Birch Creek	ODFW	ongoing
Road maintenance and repair	ODT	ongoing
Riparian planting, conservation agriculture, and road improvement	UBWC, landowners, ODF, ODFW, NRCS, UCSWCD	ongoing
Forestry Incentive Program to reforest and treat forest stands	ODF	ongoing
Stewardship Incentive Program to treat forest stands, conduct fish and/or wildlife habitat improvements, soil conservation, and riparian and wetland improvements	ODF	ongoing
Environmental Quality Incentives Program to make stream, riparian, and vegetation improvements, provide grazing and water management, improve agricultural practices	NRCS	ongoing
Riparian area planting and instream projects	ODFW	ongoing
Implement BMPs and other water quality-specific standards and guidelines for federal forestlands	USFS	ongoing
On-site evaluation, technical project design, stewardship/conservation plans, and referrals for funding	ODF, ODFW, NRCS, USWCD	ongoing
Transportation system maintenance on private forestlands	ODF	ongoing
Water protection rules for non-federal forest operation BMPs	ODF	ongoing
Agricultural Water Quality Management Program	ODA	ongoing
Regulation of instream work and stream relocation	ODSL	ongoing
Enhance deer and elk habitat on private land in winter range and fund damage relief projects	ODFW	ongoing
Natural resource programs	CTUIR	ongoing
Forest Resource Trust to convert under-producing forestland into productive forests	ODF	ongoing
Umatilla Basin Project	BOR	ongoing
Oregon forest practices	ODF	ongoing
Storm water programs	EPA	ongoing

Project	Funding/Lead Agency	Status
Oregon agricultural management plans	ODA	ongoing
Management Coordination		
Annual blue and ruffed grouse wing collection from hunters	ODFW	ongoing
Hunter checks stations	ODFW, OSP	ongoing
Permit programs for wastewater	ODEQ	ongoing
Outreach and project coordination	UBWC	ongoing
Project development and coordination	UCSWCD	ongoing
Education		
Educate landowners on forest and agriculture-related topics	OSU	ongoing
Private Lands Forest Network to educate landowners/managers about reforestation and aforestation	PLFN	ongoing

Present Subbasin Management

Existing Management

Federal Government

U. S. Army Corps of Engineers

The USACE is responsible for planning, designing, building, and operating water resources and other civil works projects. The Federal Water Pollution Control Act of 1972 gave the USACE authority to enforce Section 404 of the Act dealing with discharge of dredged or fill material into waters. Amendments to the Act in 1977 exempted most farming, ranching, and forestry activities from 404 permit requirements (Dana and Fairfax 1980). The USACE is also responsible for flood protection by such means as building and maintaining levies, channelization of streams and rivers (also for navigation), and regulating flows and reservoir levels.

U. S. Bureau of Reclamation

The primary activity of the USBR is providing irrigation water. The USBR is involved with water management and irrigation in the Umatilla subbasin, as well as multiple use resource management on its lands and facilities, including recreation and wildlife conservation.

Bonneville Power Administration

The BPA is a federal agency established to market power produced by the federal dams in the Columbia River basin. As a result of the Northwest Power Act of 1980, BPA is required to spend power revenues to mitigate the damage caused to fish and wildlife populations and habitat from federal hydropower development. The BPA provides funding for fisheries enhancement projects to mitigate for the damage caused to the Umatilla River's fisheries from the completion of the four lower Snake River Dams. These funds are provided and administered through the Lower Snake River Compensation Plan (LSRCP).

Bureau of Land Management

Lands administered by the BLM consist primarily of dry grasslands and desert. These lands are currently managed for multiple use under authority of the Federal Land Policy and Management Act (FLPMA) of 1976. Grazing and mining are the primary commodity uses of these lands. Wildlife, wilderness, archaeological and historic sites, and recreation are also managed on BLM lands. The BLM is responsible for mineral leasing on all federal lands.

Columbia Basin Fish and Wildlife Authority

The CBFWA is made up of Columbia Basin fish and wildlife agencies (state and federal) and the Columbia Basin tribes. CBFWA's intent is to coordinate management among the various agencies and agree on goals, objectives, and strategies for restoring fish and wildlife in the Columbia Basin. The Columbia River Fish Management Plan (CRFMP) is an agreement among the tribal, state, and federal parties with jurisdiction over Pacific salmon originating in the Columbia Basin that provides procedures whereby the parties co-manage anadromous fish harvest, production, and habitat (Columbia River Inter-Tribal Fisheries Commission 1995). The CRFMP stems from the treaty fish rights lawsuit, *U.S. v. Oregon*. Management actions for the Umatilla artificial propagation program are often included in *U.S. vs. Oregon* agreements.

Environmental Protection Agency

The EPA was formed in 1970 and administers the federal Air, Water, and Pesticide Acts. EPA sets national air quality standards that require states to prevent deterioration of air quality in rural areas below the national standards for that particular area (depending on its EPA classification). The EPA also sets national water quality standards (total maximum daily load or TMDL) for waterbodies that the states must enforce. These standards are segregated into "point" and "nonpoint" source water pollution, with point sources requiring permitting. Although controversial, most farming, ranching, and forestry practices are considered nonpoint sources and thus do not require permitting by the EPA. The EPA provides funding through Section 319 of the CWA for TMDL implementation projects. Section 319 funds are administered in Oregon by the ODEQ.

Farm Services Agency

The FSA was set up when the USDA was reorganized in 1994 to incorporate programs from several agencies. Functions similar to the FSA have been part of USDA programs since the 1930s. Federal farm programs are administered through local FSA offices. Farmers who are eligible to participate in these programs elect a committee of three to five representatives to review county office operations and make decisions on federal farm program applications. Conservation program payments that FSA administers include the Conservation Reserve Program (CRP) and the Environmental Quality Incentives Program. Technical assistance for these programs is provided by NRCS.

Natural Resource Conservation Service

The NRCS provides technical support to landowners to design and implement conservation practices that reduce soil erosion, improve water quality, and provide wildlife habitat. Programs include the following: Conservation Reserve Program (CRP), Continuous Conservation Reserve Program, Wildlife Habitat Improvement Program, Environmental Quality Incentives Program, and Wetlands Reserve Program. The NRCS works closely with the FSA, as well as individual landowners.

National Marine Fisheries Service

The NMFS has ESA administration and enforcement authority for anadromous fish. NMFS reviews ESA petitions, provides regulations and guidelines for activities that affect listed species, and develops and enforces recovery plans for listed species in the subbasin. NMFS is also involved in primary research on anadromous and marine species to provide much of the knowledge required for anadromous fisheries management.

U. S. Fish and Wildlife Service

The USFWS administers the ESA for resident fish and wildlife species. The USFWS is also responsible for enforcing many other wildlife laws, including those resulting from the North American Migratory Bird Treaty Act (1900), which regulates harvest and coordinates management of migratory birds between Canada and the United States, and the Lacey Act (1900) to prevent interstate commerce in wildlife taken illegally. The USFWS distributes monies to state fish and wildlife departments raised through federal taxes on the sale of hunting and fishing equipment under the authority of the Pitman-Robertson Federal Aid in Fish and Wildlife Restoration Act (1937) and the Dingle-Johnson Act. The USFWS also manages a national system of wildlife refuges and provides funding that emphasizes restoration of riparian areas, wetlands, and native plant communities through the Partners in Wildlife Program.

U. S. Forest Service

The USFS is responsible for the management of all National Forests and National Grasslands in the U. S. The multiple use mandate of the USFS was emphasized in the Multiple Use Sustained Yield Act of 1960. The current forest planning process was established under the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 and the National Forest Management Act (NFMA) of 1976.

The USFS land allocation, management standards, and guidelines for the Umatilla subbasin are specified in the Umatilla National Forest land and resource management plan (U. S. Forest Service 1990) and the *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (U. S. Forest Service and Bureau of Land Management 1994). The 1994 document includes an aquatic conservation strategy with corresponding components on riparian reserves, key watersheds, watershed analysis, and watershed restoration to maintain and restore watershed and aquatic ecosystem health on public lands. All proposed and existing USFS activities in the subbasin are designed to meet these objectives.

Tribal Government

The CTUIR is responsible for protecting and enhancing treaty fish and wildlife resources and habitats for present and future generations. Members of the CTUIR have federal reserved treaty fishing and hunting rights pursuant to the 1855 Treaty with the United States government. CTUIR co-manages fish and wildlife resources with state fish and wildlife managers and individually and/or jointly implements restoration and mitigation activities throughout areas of interest and influence in northeast Oregon and southeast Washington. These lands include but are not limited to the entire Umatilla subbasin in which CTUIR held aboriginal title. CTUIR fish and wildlife activities relate to all aspects of management (habitat, fish passage, hatchery actions, harvest, research, etc.). CTUIR policies and plans applicable to subbasin management include the CTUIR *Columbia Basin Salmon Policy* (1996), *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon* (Columbia River Inter-tribal Fish Commission 1996a, 1996b), and the CTUIR *Wildlife Mitigation Plan for the John Day and McNary Dams* (Childs 1997).

State Government

Oregon Department of Environmental Quality

The ODEQ is responsible for implementing the Clean Water Act and enforcing state water quality standards for protection of aquatic life and other beneficial uses. The mission of the ODEQ is to lead in the restoration and maintenance of Oregon's quality of air, water and other environmental media. With regard to watershed restoration, the Department is guided by Section 303(d) of the Federal Clean Water Act and Oregon statute to establish total maximum daily loads (TMDLs) of pollutants and implement water quality standards as outlined in Oregon Administrative Rules 340-041. The ODEQ focuses on stream conditions and inputs and advocates for other measures in support of fish populations (Don Butcher, ODEQ, personal communication February 2, 2001).

Oregon Department of Fish and Wildlife

The ODFW mission is to protect and enhance Oregon fish and wildlife and their habitats for use and enjoyment by present and future generations. *Vision 2006* is a six-year strategic operational plan providing guidance for the Department in the next six years. ODFW co-manages fishery resources with the CTUIR and jointly implements the BPA-funded Umatilla River Subbasin Salmon and Steelhead Production Plan. Management of fish and wildlife and their habitats in the Umatilla River subbasin is guided by ODFW policies and federal and state legislation. ODFW policies and plans applicable to the subbasin include the Oregon Administrative Rules on wild fish management and natural production (Oregon Department of Fish and Wildlife 1990a, 1992a) and management plans for elk, mule deer, black bear, and cougar (Oregon Department of Fish and Wildlife 1990b, 1992b, 1993). These plans present systematic approaches to conserve aquatic and terrestrial resources and establish-management priorities within the subbasin.

Oregon Department of Forestry

The ODF enforces the Oregon Forest Practices Act (OFPA) regulating commercial timber production and harvest on state and private lands. The OFPA contains guidelines to protect fish bearing streams during logging and other forest management activities. These guidelines address stream buffers, riparian management, road maintenance, and construction standards.

Oregon Department of Transportation

The Oregon Department of Transportation (ODT) maintains highways that cross streams in the subbasin. Under the initiative of the Oregon Plan for Salmon and Watersheds, efforts to improve protection and remediation of fish habitat impacted by state highways are ongoing.

Oregon Division of State Lands

Oregon Division of State Lands regulates the removal and filling of material in waterways. Permits are required for projects involving 50 cubic yards or more of material. Permit applications are reviewed by the ODFW and may be modified or denied based on project impacts on fish populations.

Oregon Land Conservation and Development Commission

The Land Conservation and Development Commission in Oregon regulates land use on a statewide level. County land use plans must comply with statewide land use goals, but enforcement against negligent counties appears minimal. Effective land use plans and policies are essential tools to protect against permanent fish and wildlife habitat losses and degradation, particularly excessive development along streams, wetlands, floodplains, and sensitive wildlife areas.

Oregon Plan for Salmon and Watersheds

Passed into law in 1997, the Oregon Plan for Salmon and Watersheds outlines a statewide approach to ESA concerns based on watershed restoration and ecosystem management to protect and improve salmon and steelhead habitat in Oregon. The Oregon Watershed Enhancement Board facilities and promotes coordination among state agencies, administers a grant program, and provides technical assistance to local watershed councils and others to implement the Oregon plan. For example, OWEB funded ODFW and WRD, through a grant to OWRD, to determine streamflow restoration priorities in Columbia River basin tributaries.

Oregon State Police

The Oregon State Police patrols the subbasin to enforce laws and regulations designed to protect fish and wildlife. Specific area and resource protection action plans are developed each year in consultation with ODFW.

Oregon Water Resource Department

The Oregon Water Resource Department (OWRD) regulates water use in the subbasin. Guidelines for water appropriation determine the maximum rate and volume of water that can legally be diverted. Oregon Administrate Rules for the Umatilla River subbasin outline objectives for the management, use, and control of its surface and groundwater resources (Oregon Water Resource Department 1993). OWRD also acts as trustee for instream water rights issued to the state of Oregon and held in trust for the people of the state.

In conjunction with ODFW, WRD established priorities for streamflow restoration in the Umatilla River basin. WRD ranked the opportunities for achieving meaningful streamflow restoration in each subbasin, based on the availability and perceived effectiveness of several flow restoration measures. These included transfers and leases to instream uses, cancelled water rights, enforcement and monitoring, improved diversion methods, stream inventories, conservation planning, improved efficiencies, and measurement and reporting of use. By overlaying the identified need and opportunities for restoration, the State of Oregon has identified the subwatersheds where it will apply its resources toward achieving streamflow restoration.

Local Government

Umatilla Basin Watershed Council

The Umatilla Basin Watershed Council's (UBWC) mission is to educate, foster cooperation, and provide people information about watershed health, as well as facilitate and coordinate restoration activities in the Umatilla subbasin. The UBWC works with the CTUIR and ODEQ to develop the TMDL for the Umatilla River and its tributaries.

Conservation Districts

The Umatilla and Morrow County conservation districts work with local landowners, growers, and others to enact voluntary agricultural and other Best Management Practices (BMPs) on private lands in the subbasin. The main purpose of BMPs is to reduce erosion and improve water quality. The BMPs include grassed waterways, terraces, channel stabilization, strip cropping, dividing slopes, grass plantings on critical areas, drop structures, sediment basins, livestock management and watershed planning. The Districts work closely with NRCS to provide technical assistance to the landowners and users for implementation of good management practices. In addition to technical assistance, the District has provided financial assistance for the installation of BMPs when money is available.

Counties

Umatilla and Morrow Counties conduct engineering projects, issue permits for urban development, and conduct law enforcement. Oregon State University offers county extension offices that provide research-based agricultural information.

Cities

The cities of Pendleton, Hermiston, and Mission issue permits for urban development, conduct law enforcement, and maintain wastewater projects.

Goals, Objectives, and Strategies

Fish

The Umatilla River subbasin has diverse populations of fish and wildlife that are of economic and ecological significance to the people of the State of Oregon, the Northwest and of special cultural significance to the Confederated Tribes of the Umatilla Indian Reservation and other treaty tribes. The general goal is to restore the health and function of the Umatilla River ecosystem to ensure continued viability of these important populations. Specific goals for fish and wildlife are outlined below.

Goals

1. Protect, enhance and restore wild and natural populations of summer steelhead, bull trout, shellfish and other indigenous fish in the Umatilla Basin.
2. Reestablish runs of extirpated spring chinook, fall chinook, coho salmon and Pacific lamprey into the Umatilla River Basin.
3. Provide sustainable ceremonial, subsistence, and recreational fisheries and non-consumptive fish benefits such as cultural and ecological values.
4. Maintain genetic and other biological characteristics of indigenous populations and genetic viability of reintroduced populations.
5. With the exception of adding Pacific lamprey, shellfish, and non-consumptive fish benefits, the above Umatilla Basin fish goals basically are taken from previous planning documents (Boyce, 1986. A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin ; NWPPC, 1990. Columbia Basin System Planning – Umatilla River Subbasin Plan ; CTUIR & ODFW, 1990. Umatilla Hatchery Master Plan ; CBFWA, 1999. FY 2000 Draft Annual Implementation Work Plan).

Objectives

1. Reestablish and maintain an average run of 8,000 spring chinook to the Umatilla River mouth by the year 2010 (see Table 55).
2. Reestablish and maintain an average run of 12,000 fall chinook to the Umatilla River mouth by the year 2020 (see Table 55).
3. Reestablish and maintain an average run of 6,000 coho to the Umatilla River mouth by the year 2010 (see Table 55).
4. Achieve and maintain an average run of 5,500 summer steelhead to the Umatilla River mouth by the year 2010 (see Table 55).
5. Achieve and maintain self-sustaining populations and fisheries of Pacific lamprey, bull trout and other indigenous fishes in the subbasin by the year 2010.

Table 55. Umatilla River Production Objectives and Fish Disposition.

Species	Returned to Umatilla Mouth			Disposition of Returns			
	Natural	**Hatchery**	**Total**	**Escapement**	**Broodstock**	**Harvest**	**Total**
Spring Chinook	2,000	6,000	8,000	3,000	1,000	4,000	8,000
Fall Chinook	6,000	6,000	12,000	6,000	1,000[1]	5,000	12,000
Coho	Undeter-mined	6,000	6,000	To be determined			
Steelhead	4,000	1,500	5,500	4,000	116	1384	5,500

[1] Broodstock level for interim program, see discussion below programs and plans have created a reduction in broodstock needs from 1,200 to 1,000.

The above fish natural production, broodstock, and harvest objectives came from the listed planning documents. Initial numbers were developed based on the best available (but limited) fish production information during previous planning efforts. Since that time, information on adult fish return success, habitat utilization and harvest has allowed fish managers to better identify more reasonable or accurate expectations in meeting numeric targets. General rationale for adjustments in Umatilla adult return and disposition targets by species follow.

For spring chinook, the overall return target was reduced from 11,000 to 8,000 to reflect more reasonable and attainable smolt-to-adult return rates. The natural production levels observed in some years prompted an increase from 1,000 to 2,000. Observation of actual harvest levels led to an adjustment in the harvest from 10,000 to 4,000. Modifications in artificial production programs and plans have created a reduction in broodstock needs from 1,200 to 1,000.

Smolt-to-adult returns for the fall chinook have been the least successful for Umatilla Basin hatchery programs. For this reason, smolt release levels and adult return targets have been reduced (from 21,000 to 12,000). More knowledge on utilization of spawning habitats has led to a natural production adjustment from 12,000 to 6,000. Actual harvest levels observed have prompted a harvest target reduction from about 7,000 to 5,000. Major reductions in smolt production have created reduced broodstock needs (1,000 is the current interim need pending success of ongoing production actions).

Coho return and utilization targets have remained unchanged since previous planning efforts. Evaluation and monitoring is ongoing to better define coho habitat utilization and harvest potential.

Steelhead production was reduced from the Umatilla Master Plan level in the early 1990's due to density related poor smolt condition. This reduction and observed SARs and harvest levels has led managers to reduce the overall adult return target from 9,670 to 5,500.

Strategies (not in order of priority)

1. Protect, enhance and restore indigenous fish including federal and state threatened and sensitive fish species in the subbasin.

Action 1.1 Provide protection for federal and state threatened and sensitive fish species in all resource management plans.

Action 1.2 Enforce existing Federal, Tribal, State and local land and water use regulations designed to protect fish habitats.

Action 1.3 Increase enforcement of laws and fishing regulations pertaining to illegal take of fish (all life stages).

2. Protect, enhance or restore water quality to improve the survival, abundance and distribution of indigenous resident and anadromous fish.

Action 2.1 Reduce stream temperatures by restoring or enhancing riparian vegetation, floodplain function and increasing hyporehic and instream flows.

Action 2.2 Increase water quality monitoring and enforcement of existing regulations to maintain or enhance water quality. Use U.S. Clean Water Act, Section 401, Oregon Forest Practices Act to protect and restore water quality and fish habitat.

Action 2.3 Implement and enforce provisions of the Umatilla River Agricultural Water Quality Management Plan.

Action 2.4 Implement provisions of the Umatilla River Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan.

Action 2.5 Support timely updates and resource inventories related to local land use plans to prevent further development and degradation of floodplains, wetlands, riparian and other sensitive areas.

Action 2.6 Properly maintain, relocate or eliminate forest, public and private roads in riparian or other sensitive areas.

Action 2.7 Implement the Conservation Reserve Enhancement Program (CREP), Continuous Conservation Reserve Program (CCRP), Wetlands Reserve Program (WRP) and other pertinent State, Tribal and local programs along riparian zones and in other sensitive areas.

Action 2.8 Use existing cooperative or regulatory programs to reduce sediment delivery to stream channels from roads, agriculture, logging, and other land use activities.

Action 2.9 Monitor and evaluate efforts to improve water quality and utilize data to assist in management decisions.

3. Protect, enhance or restore instream and riparian habitat to improve the survival, abundance and distribution of indigenous resident and anadromous fish.

Action 3.1 Enforce Federal, Tribal, State and local land use regulations designed to protect fish habitats.

Action 3.2 In the short term, plant native vegetation, construct pools and place large woody debris in streams to provide adequate pools and cover for fish. Maintain operation and maintenance of projects already in place.

Action 3.3 Over the long term, implement improvements to stream geomorphic features (sinuosity, width/depth ratio, pool frequency, depth and dimension, entrenchment, etc.) that will result in benefits to fish habitat quantity and quality.

Action 3.4 Over the long term, restore riparian vegetation and adjacent valley bottom and upland vegetation to result in the natural long term recruitment of large woody debris into streams.

Action 3.5 Implement provisions of the Umatilla River Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan.

Action 3.6 Reduce sediment deposition in area streams by reducing erosion and sediment delivery to waterways.

Action 3.7 Improve watershed conditions to reduce human-induced increases of flood peak flows and duration to reduce instream substrate scour, deposition or movement.

Action 3.8 Improve floodplain function to improve stream channel stability, hyporehic flows and instream habitat diversity.

Action 3.9 Improve or eliminate stream fords and other substrate disturbances.

Action 3.10 Protect critical habitat to improve production and survival of indigenous fish. Continue to refine delineation of stronghold areas.

Action 3.11 Monitor and evaluate efforts to protect, enhance and restore instream and riparian habitats.

4. Protect, enhance and restore instream flows to improve passage conditions and increase rearing potential for anadromous and resident fishes in the Umatilla River Basin.

Action 4.1 Continue operations and maintenance of the Umatilla Basin Water Exchange Project for instream flow enhancement.

Action 4.2 Continue and build upon instream flow enhancement measures in the mainstem Umatilla River to improve passage for upstream and downstream migrant resident and anadromous salmonids and lamprey in the subbasin.

Action 4.3 Increase monitoring of water use and instream flows. Use collaborative efforts or enforcement of existing regulations and water rights to maintain or enhance available instream water.

Action 4.4 Increase instream flows by lease and/or purchase of water rights.

Action 4.5 Increase instream flows by improving the efficiency of irrigation systems and use of conserved water for instream use.

Action 4.6 Modify state water law to allow water users to more easily transfer water for instream use and to provide adequate protection (i.e. junior water rights, critical reaches)

Action 4.7 Continue trap and haul and salvage operations when necessary during low flow periods.

Action 4.8 Continue to refine knowledge of flow limited stream reaches and results of enhancement efforts to address remaining needs.

5. Improve fish passage conditions at all human-made passage impediments for resident and anadromous upstream and downstream migrants.

Action 5.1 Implement screening of all diversions (pump and gravity) to meet state and NMFS criteria.
Action 5.2 Modify or remove culverts, bridges, grade controls and water diversion structures as necessary to improve fish passage.
Action 5.3 Operate and maintain all fish passage facilities to ensure proper mechanical function.
Action 5.4 Monitor river conditions and operation of passage facilities to ensure that adequate passage exists and implement adjustments as necessary to ensure efficient passage.
Action 5.5 Where feasible, consolidate diversions to reduce the number of artificial passage situations leading to fish mortality.
Action 5.6 Continue trap and haul and salvage operations when necessary during low flow periods.
Action 5.7 Implement screening of all diversions (pump and gravity) to meet state and NMFS criteria. Achieve compliance with state screening and passage laws.
Action 5.8 Enforce state and federal fish passage regulations and requirements

6. Continue to supplement the recently reintroduced spring chinook population with a hatchery program consisting of Carson stock to provide natural production and harvest.

Action 6.1 Continue releasing 710,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat in the upper Umatilla River Basin to achieve a portion of spring chinook objectives.
Action 6.2 Release an additional 515,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat in the upper Umatilla River Basin to achieve the remainder of the spring chinook objectives.

7. Continue to supplement the recently reintroduced fall chinook population with a hatchery program consisting of upriver bright stock obtained from returns to the Umatilla River and/or returns to Priest Rapids Hatchery.

Action 7.1 Continue the interim program of releasing 480,000 age 1+ and 600,000 age 0+ fall chinook smolts from acclimation facilities into historic fall chinook habitat in the mid Umatilla River Basin.
Action 7.2 Assess monitoring and evaluation results to determine appropriate program changes to achieve objectives.

8. Continue to supplement the recently reintroduced coho salmon population with a hatchery program consisting of early run stock obtained from returns to the Umatilla River and/or returns to the Bonneville Hatchery.

Action 8.1 Continue releasing 1.5 million coho smolts from acclimation facilities into historic coho salmon habitat in the mid Umatilla River Basin.

9. Supplement the indigenous summer steelhead population with a hatchery program consisting of local broodstock to enhance natural production and provide harvest opportunities.

Action 9.1 Continue releasing 150,000 steelhead smolts from acclimation facilities into historic steelhead habitat in the mid-to-upper Umatilla River Basin.

Action 9.2 Design and implement a comprehensive study to assess whether supplementation activities in the subbasin have been effective in rebuilding natural steelhead while maintaining their genetic structure and long-term viability.

10. Develop and implement a Pacific lamprey restoration plan for the Umatilla Basin

Action 10.1 Continue outplanting of adults as detailed in the Umatilla River Basin Pacific Lamprey Restoration Plan (CTUIR 1999).

Action 10.2 Determine reproductive success of adult outplants.

Action 10.3 Monitor for increases in larval abundance, juvenile outmigration and adult returns.

Action 10.4 Assess artificial propagation techniques for potential application in the Umatilla and/or other subbasins.

Action 10.5 Continue genetic assessment of lamprey populations among and within the Umatilla and selected Columbia River subbasins.

11. Monitor genetic characteristics of salmonid populations.

Action 11.1 Continue baseline genetic monitoring and evaluation of indigenous populations in the subbasin.

Action 11.2 Initiate baseline genetic monitoring and evaluation of reintroduced populations in the subbasin.

12. Implement artificial propagation practices to maintain genetic and biological integrity of supplemented stocks.

Action 12.1 Utilize IHOT genetics guidelines for broodstock selection, mating and rearing.

Action 12.2 When fish health and disease issues are identified, take appropriate remedial actions to maximize survival of affected fish and prevent spread to other natural and hatchery fish.

13. Monitor and evaluate Umatilla hatchery programs to ensure they are successful and minimize adverse effects on listed or other indigenous species.

Action 13.1 Complete evaluation of fall and spring chinook salmon performance reared in Michigan (MI) and Oregon (OR) raceways.
Action 13.2 Evaluate performance of yearling spring chinook salmon reared at various stations and released in the Umatilla River.
Action 13.3 Complete evaluation of fall chinook salmon performance reared at three densities in MI raceways.
Action 13.4 Evaluate juvenile migration performance of fall chinook salmon released in varying locations in the Umatilla River.
Action 13.5 Evaluate performance of yearling and subyearling fall chinook releases in the Umatilla River.
Action 13.6 Determine and compare straying of fall chinook salmon into the Snake and upper Columbia rivers for all groups released in the Umatilla River.
Action 13.7 Monitor performance of summer steelhead reared in MI raceways.
Action 13.8 Monitor recreational and tribal fisheries in the Umatilla River.
Action 13.9 Monitor and evaluate the health and disease status of adults and juveniles for all Umatilla hatchery programs.

14. Monitor and evaluate the productivity, abundance, distribution, life history and biological characteristics of anadromous and resident fish and relationship with instream and riparian habitat conditions within the Umatilla River Basin to assess the success of management strategies.

Action 14.1 Continue monitoring adult returns of all fish species at the Three Mile Dam passage/trapping facility.
Action 14.2 Conduct redd and carcass surveys to monitor adult salmonid spawning escapement.
Action 14.3 Evaluate juvenile anadromous smolt production, survival and migration timing by operating smolt collection facilities as necessary.
Action 14.4 Evaluate natural reproductive success of hatchery supplemented steelhead
Action 14.5 Continue to investigate the migratory behavior of bull trout using radio telemetry.
Action 14.6 Conduct biological surveys to monitor and evaluate anadromous and resident fish distribution, abundance, condition, habitat use, life history, etc.
Action 14.7 Monitor the interaction of hatchery fish with wild fish on the spawning grounds.
Action 14.8 Measure the quantity and quality of fish habitat in the basin.
Action 14.9 If above monitoring indicates resident fish populations are being altered or impacted, develop enhancement plans or approaches as necessary.

15. Conduct initial investigations and develop a restoration plan for freshwater shellfish in the Umatilla River Basin (CTUIR).

Action 15.1 Conduct qualitative and quantitative surveys to assess shellfish populations.

Action 15.2 Survey genetic variation within and among Umatilla and selected Columbia River subbasins.
Action 15.3 Determine macrohabitat and physiochemical factors controlling distribution and abundance of shellfish.
Action 15.4 Determine the role of fish communities controlling distribution and abundance of shellfish.
Action 15.5 Develop recovery plan for shellfish in the Umatilla Basin.

16. Improve out-of-basin survival of migratory fish to increase juvenile and adult returns to the Umatilla Basin (specific details in mainstem summaries).

Action 16.1 Implement or support projects to reduce mortality related to Columbia River fish passage, water quality, predation and estuary conditions.
Action 16.2 Enforce state and federal fish passage requirements and water quality standards in the mainstem Columbia River.
Action 16.3 Conduct monitoring of migratory fish to determine survival rates, timing and distribution outside the basin.

Wildlife

Goals

1. Achieve and sustain levels of species productivity to mitigate for wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995).
2. Maintain wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout natural geographic ranges (Puchy and Marshal 1993).
3. Restore and maintain self-sustaining populations of species extirpated from the state or regions within the state, consistent with habitat availability, public acceptance, and other uses of the lands and waters of the state (Puchy and Marshal 1993).
4. Monitor the status of wildlife populations as needed for appraising the need for management actions, the results of actions, and for evaluating habitat and other environmental changes (Puchy and Marshal 1993).
5. Provide recreational, educational, aesthetic, scientific, economic and cultural benefits derived from Oregon's diversity of wildlife (Puchy and Marshal 1993).
6. Ensure long-term maintenance of healthy populations of native landbirds (Altman and Holmes 2000a, 2000b)
7. Identify, establish standards, and implement management measures required for restoring threatened and endangered species, preventing sensitive species from having to be listed as threatened or endangered, and maintaining or enhancing other species requiring special attention (Puchy and Marshal 1993).
8. Reintroduce species or populations where they have been extirpated (Puchy and Marshal 1993)

Forest Habitat

Objectives

- Restore and maintain late seral ponderosa pine habitat
- Maintain and restore habitat connectivity across forest landscapes
- Increase heterogeneity in species composition and structural stage
- Increase snag and down wood density
- Restore fire as an ecological process

Strategies

- Design vegetative management strategies consistent with historical succession and disturbance regimes
- Increase the abundance of shade-intolerant species such as western larch

Shrub Steppe Habitat

Objectives

- Acquire high quality privately owned shrub steppe habitats and move them to protected status (Kagan et al. 2000)
- Protect and enhance remaining shrub steppe habitats
- Initiate actions to enhance size and connectivity of existing quality shrub steppe patches (i.e., reduce fragmentation)
- Institutionalize a policy of "no net loss" of shrub-steppe habitat (i.e., discourage loss and conversion of habitat, but when unavoidable, mitigate with equal or greater restoration efforts)
- Minimize further degradation of shrub steppe habitat (e.g., reduce, eliminate or improve livestock grazing practices)
- Maintain cryptogamic crusts where they occur, and seek ecologically appropriate sites for restoration to ensure proper functioning native plant communities
- Maintain sites dominated by native vegetation and initiate actions to prevent infestations of exotic vegetation
- Improve habitat for grassland-associated wildlife species by managing non-native grasslands (e.g. agricultural lands, inactive grasslands such as CRP and fallow fields) as suitable habitat where biologically appropriate (i.e., where viable landbird populations can be maintained).
- Expand shrub steppe focal species distribution and abundance by establishing Shrub Steppe Bird Conservation Areas (SSBCAs) (Altman and Holmes 2000a, 2000b)
- Implement land use practices consistent with growth of native plants and forbs

Riparian and Wetland Habitat

Objective

- Protect and enhance riparian and wetland habitat

Strategies

- Institutionalize a policy of “no net loss” of riparian and wetland habitat (i.e., discourage loss and conversion of habitat, but when unavoidable, mitigate with equal or greater restoration efforts)
- Initiate actions to increase high quality riparian and wetland habitat through restoration of degraded riparian habitat
- Maintain all tracts of contiguous cottonwood gallery forest >50 acres, regardless of understory composition
- Maintain multiple vegetation layers and all age classes (e.g., seedlings, saplings, mature, and decadent plants) in riparian woodlands
- Initiate actions to increase size (width and length) and connectivity of existing riparian patches (i.e., reduce fragmentation) through restoration and acquisition efforts
- Expand riparian focal species distribution and abundance throughout the Columbia Plateau by establishing Riparian Bird Conservation Areas (RBCAs) (Altman and Holmes 2000a, 2000b)
- Leave upland buffer zones of uncultivated and unharvested areas adjacent to riparian habitats to protect the stream and increase habitat for area-sensitive bird species
- Limit grazing intensity to maintain the integrity of native species composition and health

Unique Habitats

Objectives

- Protect and enhance remaining aspen clones
- Protect and enhance remaining juniper woodlands

Strategies

- Maintain all snags and initiate active snag creation (e.g., fungal inoculation, topping) where snags are limiting and restoration leading to recruitment of saplings is underway
- Eliminate or modify grazing to ensure succession and recruitment of young aspen
- Where starling competition for nest cavities is significant, enact starling control measures
- Fence aspen clones to protect regenerating aspen
- Identify, retain and protect mature and old-growth juniper trees in steppe habitats

Extirpated Species

Sharp-Tailed Grouse

Objective

- Reestablish viable populations of sharp-tailed grouse to suitable habitats in the subbasin

Strategies

- Move sharp-tailed grouse leking, brooding, and wintering habitats into protected status

- Increase suitable sharp-tailed grouse habitats.
- Reintroduce sharp-tailed grouse to suitable protected habitats in the subbasin (Crawford and Coggins 2000)
- Improve habitat quality of CRP lands to make suitable for sharp-tailed grouse including incorporating abundant legumes within CRP
- Use artificial leks to establish breeding sites

Bighorn Sheep

Objectives

- Reintroduce and maintain healthy bighorn sheep populations
- Improve bighorn sheep habitat as needed and as funding becomes available
- Provide recreational ram harvest opportunities when bighorn sheep population levels reach 60 to 90 animals

Strategies

- Reduce domestic sheep/bighorn sheep conflicts in primary Rocky Mountain bighorn sheep habitat
- Work with land management agencies and private individuals to minimize contact between established bighorn sheep herds and domestic or exotic sheep
- Maintain geographical separation of California and Rocky Mountain subspecies
- Prohibit release of bighorn sheep of questionable health status in Oregon
- Maintain sufficient herd observations so as to ensure timely detection of disease and parasite problems
- Monitor range condition and use along with population characteristics
- Consider land purchase in order to put such land into public ownership

Managed Species

Black Bear

Objectives

- Determine black bear population characteristics
- Determine black bear harvest levels
- Maintain black bear populations at socially sustainable levels

Strategies

- Implement or cooperate in research to learn more about black bear ecology in Oregon, develop accurate populations estimates and provide a measurement of population trend.
- Obtain improved harvest information through use of combination report card/tooth envelope.
- Monitor black bear harvest and implement harvest restrictions if necessary.
- Develop an educational program to alert black bear hunters of the need for improved black bear population information.

- If necessary, initiate mandatory check of harvested black bear.
- Continue to work with other agencies and private landowners in solving black bear depredation problems.
- Explore the possibility of using sport hunters for damage control.

Cougar

Objectives

- Continue to study cougar population characteristics as well as the impact of hunting on cougar populations
- Document and attempt to eliminate potential future human-cougar conflicts
- Manage cougar populations through controlled hunting seasons
- Manage deer and elk populations to maintain the primary prey source for cougar

Strategies

- Continue to update and apply population modeling to track the overall cougar population status
- Continue mandatory check of all hunter-harvested cougars and evaluate the information collected on population characteristics for use in setting harvest seasons
- Continue development of a tooth aging (cementum annuli) technique
- Provide information to the public about cougar distribution, management needs, behavior, etc.
- Consider additional hunting seasons or increased hunter numbers in areas where human-cougar conflicts develop
- Manage for lower cougar population densities in areas of high human occupancy
- Continue to allow private and public landowners to take damage-causing cougar without a permit
- Encourage improved livestock husbandry practices as a means of reducing cougar damage on domestic livestock

Mule Deer

Objectives

- Maintain healthy populations of mule deer in the subbasin
- Maintain hunter opportunity and regulate harvest

Strategy

- Set management objectives for buck ratio, population and fawn:doe ratio benchmark for each hunt unit and adjust as necessary
- Antlerless harvest will be used to reduce populations that exceed management objectives over a two or three year period.
- Harvest tag numbers are adjusted to meet or exceed objectives within 2-3 bucks/100 does.

- Population trends will be measured with trend counts, number of deer damage incidents, and harvest data.
- Move heavily used critical winter range to protected status, managed for optimum big game winter habitat

Elk

Objectives

- Maintain healthy Rocky Mountain elk populations
- Maintain, enhance, and restore elk habitat
- Minimize conflicts between wintering wild ungulates and commercial agricultural activities.
- Enhance consumptive and non-consumptive recreational uses of Oregon's elk resource

Strategies

- Protect Oregon's wild elk from diseases, genetic degradation, and increased poaching which could result from transport and uncontrolled introduction of cervid species
- Maintain populations of wild ungulates at management objectives (Oregon Department of Fish and Wildlife 1990, 1992b))
- Ensure both adequate quantity and quality of forage to achieve elk population management objectives in each management unit
- Ensure habitat conditions necessary to meet population management objectives on critical elk ranges
- Maintain public rangeland in a condition that will allow elk populations to meet and sustain management objectives in each unit
- Move heavily used critical winter range to protected status, managed for optimum big game winter habitat.
- Increase forage quality and quantity in big game winter range.(ODFW Green Forage Program Guidelines)
- Increase bull age structure and reduce illegal kill of bulls while maintaining recreational management objectives
- Establish population models for aiding in herd or unit management decisions
- Adequately inventory elk populations in all units with significant number of elk

Game Birds

Objectives

- Maintain healthy game bird populations
- Provide recreational, aesthetic, educational, and cultural benefits from migratory game birds, other associated wildlife species, and their habitats

Strategies

- Establish an Oregon Migratory Game Bird Committee to provide management recommendations on all facets of the migratory game bird program

- Use population and management objectives identified in Pacific Flyway Management Plans and Programs
- Develop a statewide migratory game bird habitat acquisition, development, and enhancement plan based on flyway management plans, ODFW Regional recommendations, and other state, federal, and local agency programs
- Implement a statewide migratory game bird biological monitoring program, including banding, breeding, production, migration, and wintering area surveys based on population information needs of the flyway and state
- Develop a statewide program for the collection of harvest statistics
- Prepare a priority plan for research needs based on flyway management programs
- Annually prepare and review work plans for wildlife areas that are consistent with policies and strategies of this plan
- Regulate harvest and other uses of migratory game birds at levels compatible with maintaining prescribed population levels
- Eliminate impacts to endangered, threatened, or sensitive species
- Provide a variety of recreational opportunities and access, including harvest and viewing opportunities
- Provide assistance in resolving migratory game bird damage complaints

Research, Monitoring, and Evaluation Activities

BPA began funding salmonid monitoring and evaluation projects in the Umatilla subbasin in 1980, with many projects completed by the mid-1990s (Table 56). Additional fish and wildlife monitoring and evaluation projects have also been completed using non-BPA funding sources (Table 57). An oversight committee (Umatilla Management, Monitoring and Evaluation Oversight Committee; UMMEOC) composed of key management personnel and research project leaders carefully coordinates fisheries monitoring and evaluation activities in the subbasin. The committee ensures that projects are coordinated and address the most important monitoring needs. Furthermore, a formal Annual Operation Plan (AOP) is developed each year to further coordinate monitoring and evaluation activities with hatchery, passage and other projects. Initial monitoring and evaluation efforts examined salmonid abundance, age, growth, life history characteristics, and distribution. Evaluations also addressed instream and riparian habitat conditions, salmonid flow needs, water temperature, and the effectiveness of new adult ladders and juvenile by-pass screens. Monitoring activities also examined steelhead genetics, artificial production issues, and smolt to adult survival rates

Monitoring natural and artificial production of salmonids has been streamlined, but remains important for management and restoration in the Umatilla subbasin. Long-term monitoring includes enumeration of adult returns at Three Mile Dam, harvest monitoring, redd surveys, stream and riparian habitat surveys, artificial production evaluations, fish health monitoring, smolt migration survival and timing estimates, and annual index site sampling for long-term trend data on species composition and parr densities (Table 56). Some monitoring is conducted annually, such as redd surveys and water temperature monitoring, but other factors are evaluated less often, such as the assessment of instream and riparian habitat, and population genetic characteristics.

Wildlife surveys and inventories (e.g., big game aerial surveys) are coordinated and conducted regularly within the Umatilla Subbasin by ODFW and CTUIR. Population monitoring addresses species responses to enhancement projects and provides important information for harvest and other wildlife management activities. Wildlife mitigation projects are habitat based and use the USFWS's Habitat Evaluation Procedure (HEP) for evaluating their success. Treatment specific monitoring techniques are also employed to evaluate treatment methods

Table 56. BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities (Columbia Basin Fish and Wildlife Authority 1999; Bonneville Power Administration and Northwest Power Planning Council 1999; Pacific States Marine Fisheries Commission 2001)

Completed Monitoring and Evaluation Projects	BPA #	Sponsor	Duration
Identify the genetic composition of endemic steelhead	7900100	NMFS	1980, 1982
Assess passage improvements in the lower three miles of the Umatilla River and determine if sites still impede fish passage	8201000	CTUIR	1982
Compile a data base for a coordinated approach to restoring and enhancing anadromous fish	8110600	CTUIR	1981
Evaluate survival of acclimated and unacclimated coho salmon, chinook salmon and summer steelhead tagged and released into the Umatilla River	8383400	ODFW	1984-1985
Monitor and evaluate adult salmon and steelhead passage at five irrigation dams in the middle and lower Umatilla River. Conduct instream and riparian habitat surveys on the mainstem and major tributaries in the Umatilla Basin	9000501	CTUIR	1992-1996
Study hardwood riparian recovery in N.E. OR	9141	OSU	1999
Assess adult salmon and steelhead passage at the Umatilla River mouth	9204101	USACE	1996
Assess status and survival limitations of Pacific lamprey and develop restoration and monitoring plans	9402600	CTUIR	1995-1999
Hatchery oversight and auditing of the Umatilla Hatchery	9500200	Montgomery Watson	1995
Determine status, life history, genetic, habitat needs, and limiting factors for bull	9405400	ODFW, OS Systems	1994-1997

Completed Monitoring and Evaluation Projects	BPA #	Sponsor	Duration
trout populations in the North and South Fork Umatilla River			
Develop preliminary design criteria for the Bonifer and Minthorn acclimation sites on the Umatilla Indian Reservation.	7900100	NMFS	1980, 1982
Evaluate artificial production facilities to raise chinook salmon and steelhead	8805300	Montgomery Watson	1991-1993, 1995-1997
Develop restoration and monitoring plan for Pacific lamprey	9402600	CTUIR	1995-1999
Analyze the potential effects of a the new Westland diversion ladder on Umatilla River subbasin streamflow	8741602	USBR	1989
Ongoing Monitoring and Evaluation Projects	**BPA #**	**Sponsor**	**Duration**
Standardize fish health monitoring programs with Columbia River anadromous hatcheries	8343500	CTUIR	1984-2004
Monitor and evaluate the natural production of adult salmon and steelhead including spawning, rearing, juvenile migration and adult returns. Monitor water temperatures in coordination with other projects.	9000501	CTUIR	1992-2004
Study natural and hatchery juvenile salmonid migration survival and timing in the lower Umatilla River	8902401	ODFW	1989-2004
Monitor in hatchery growth and production and smolt to adult survival of general hatchery production groups. Evaluate experimental rearing and release strategies used during the artificial propagation of salmon and steelhead.	9000500	ODFW	1991-2004
Initiate the restoration and monitoring plans for Pacific lamprey in the Umatilla Subbasin.	9402600	CTUIR	1999-2004
Pre and post habitat enhancement project monitoring			
Identify problems and develop solutions to land use issues impacting fisheries habitat	8710000, 8710001, 8710002	UNF, CTUIR, ODFW	1987-2000

Table 57. Non BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities (Shaw 1997; Oregon Department of Environmental Quality et al. 2000; U. S. Forest Service 1990; Mark Kirsch, ODFW, personal communication January 11, 2001)

Project	Funding/Lead Agency	Status
Limiting factors report draft required by WA state legislature to compile information about the WRIA	WCC	2000
Monitoring for nonpoint source water pollution control projects	UCSWCD, UBWC, CTUIR	2000
Special report on blue grouse in NE OR	ODFW	1995
Sampling and analysis	ODFW, CTUIR	1993, 1996-1999
Watershed assessment report	Various/CTUIR, CEED	ongoing
Annual blue and ruffed grouse sex, age, and hatch date analysis	ODFW	ongoing
Annual harvest reports for pronghorn, bear, cougar, deer, elk, waterfowl, and upland game birds	ODFW	ongoing
Annual inventory of trend and production data for upland game birds, deer, and elk	ODFW	ongoing
Mount Emily elk herd delineation wildlife research report	ODFW	ongoing
Annual mule deer fall herd composition counts	ODFW	ongoing
Annual mule deer and elk spring composition counts	ODFW	ongoing
Annual upland bird brood counts	ODFW	ongoing
Winter raptor surveys	ODFW	ongoing
Develop winter-range, grassland, and shrub steppe areas to establish native habitats for either deer and elk winter range and sharp-tailed grouse habitat	ODFW, NRCS	ongoing
Wildlife population monitoring programs	CTUIR, ODEQ, USFS, ODFW, OWRD	ongoing
Population modeling for both mule deer and elk populations	ODFW	ongoing

Statement of Fish and Wildlife Needs

Fish and wildlife managers in the Umatilla subbasin continue to seek solutions to resolve problems affecting the productivity, stability, and perpetuity of natural resources. The first step in accomplishing this task is to identify factors known to limit the productivity of the resources. Upon their definition, resource specialists are able to prescribe specific strategies or actions needed to rectify or adjust the limitation.

Lead management agencies in the subbasin have a common goal of restoring and/or stabilizing native fish, wildlife and plant species. Given the conditions and large number of critical resource needs, it will likely take an appreciable amount of time before noticeable gains are made. For instance, fisheries managers have pointed to the need for rectifying flow and temperature problems in the subbasin for years, and considerable gains have been made; however, problems with flow and temperature continue to persist. Similarly, today's wildlife managers recognize the need to improve habitat connectivity, reduce invasion of exotic species, and restore the structural complexity of vegetation types; yet, these problems continue to be among the greatest threats to species persistence.

Fortunately, core refugia for plant and animal species in the Umatilla exists, albeit at reduced levels from historic conditions. Conservation and expansion of these areas is a common need recognized by both fish and wildlife managers. Specific needs for fish and wildlife managers are listed below.

Fish Needs

Needs for the improvement of population status of key fish species in the Umatilla subbasin are identified in Table 58. Fisheries resource management needs have been repeatedly identified in multiple planning, restoration and research documents and many are referenced in Table 58. The identified needs are a response to limiting factors, and constitute what the strategies and actions are designed to address. The table illustrates the linkage between needs, life history, and management strategies, and provides external reference information directly associated with the identified limiting factor.

Table 58. Fisheries resources management needs in the Umatilla subbasin

Needs	Reference from this document		Other References
	Limiting Factor	Strategy/Action	
Improve Stream Flows	Tables 34, 38, 39 and 43	4.1-4.7	(CTUIR & ODFW 1990; CTUIR 1990; CTUIR 1999; ODEQ 1998; ODEQ 2000; Shaw 2000; CBFWA 1999; Evans 1984; Contor et al. 1998; CRITFC 1996b; Towle 1935; Reeve 1988; Boyce 1986; CTUIR 1984; OWRD 1988; USFWS & CRITFC 1981; BOR 1988
Improve Stream Temperatures	Table 43	1.1-1.3 2.1-2.8	(ODEQ 2000; Boyd et al. 1999; Shaw 2000; CTUIR & ODFW 1990; Bond 1963; Buchannan et al. 1997; Contor et al. 1995-1998; Bull Trout Working Group 1999; Umatilla National Forest 2000; CBFWA 1999; Reeve 1988; Boyce 1986; CTUIR 1984; Smith and Pitney 1973; OWRD 1988; CRITFC 1996b
Address Passage Impediments	Table 36, 39, 40 and 43	5.1-5.6	(Knapp and Ward 1990; BOR 1988; ODEQ 2000; Buchanan et al. 1997; CRITFC 1996b; CTUIR & ODFW 1990; Reeve 1988; Boyce 1986; Contor et al. 1998; CTUIR 1984; BOR 1988
Improve Riparian Habitats	Table 31 and 43	1.1-1.3 2.1-2.8 3.1-3.9	(Shaw 1996, 1997, 2000; Contor et al. 1995-1998; Buchanan et al. 1997; CTUIR & ODFW 1990; ODEQ 2000; Kagan et al. 2000; USACE 1997; CRITFC 1996b; Reeve 1988; Boyce 1986; CTUIR 1984; CRITFC 1996b
Improve Instream Habitat Quality and/or Diversity	Table 31 and 43	3.1-3.9	(Shaw 2000; Contor et al. 1997; Buchanan et al. 1997; Northrop 1997; Bull Trout Working Group 1998; ODEQ 2000; CTUIR 1994, 1996; Crabtree 1996 CRITFC 1996b; Umatilla National Forest 2000; CTUIR & ODFW 1990; Reeve 1988; Boyce 1986; CTUIR 1984; CRITFC 1996b
Reduce Sediment Inputs	Table 32 and 43	1.1-1.3 2.1-2.8 3.1-3.9	(Shaw 2000; CRITFC 1996b Harris and Clifton 1999; CTUIR & ODFW 1990; Reeve 1988; Boyce 1986; CTUIR 1984;
Protect Stronghold Habitats	Table 30 and 43	3.10	(Umatilla National Forest 2000; CTUIR & ODFW 1990; Boyce 1986; CTUIR 1984; CRITFC 1996b;
Law Enforcement for Protection of Fish and Wildlife and their Habitats	Table 42	1.2-1.3 2.2 3.1 4.3 5.8 16.2	CRITFC 1996b

Needs	Reference from this document		Other References
	Limiting Factor	Strategy/Action	
Increase Adult Spawners (parental base)	Table 42	all strategies/ actions listed above plus 6.1-6.2 7.1-7.2 8.1 9.1-9.2 10.1 12.1-12.2	(Bradbury et al. 1995; Contor et al. 1997, 1998; CTUIR & ODFW 1990; CRITFC 1996b; Boyce 1986; CTUIR 1984; CTUIR & ODFW 1990b
Increase SARs (smolt-to-adult returns)	Table 42	12.1-12.2 16.1	CTUIR 1999; Contor et al. 1995-1998; CRITFC 1996b; CTUIR & ODFW 1990; Boyce 1986; CTUIR & ODFW 1990b
Address Research Monitoring &Evaluation and Data Gaps		2.9 3.11 4.8 10.2-10.5 11.1-11.2 13.1-13.9 14.1-14.9 15.1-15.5 16.2	(CTUIR 1990; CTUIR & ODFW 1990; Busby 1996; CRITFC 1996b; CTUIR & ODFW 1990b

Improve Stream Flows

Historically, Umatilla Basin fish populations have been severely impacted by low stream flows due to out-of-stream uses. Dewatering was the primary contributing factor in the extinction of several species of indigenous salmonids. To ameliorate some of these impacts, the Umatilla Basin Water Exchange Project was implemented by the Bureau of Reclamation and Bonneville Power Administration (O & M power costs). This project delivers Columbia River water to three of the five major irrigation districts in the Umatilla Basin in exchange for leaving instream flows in the Umatilla River for anadromous fish passage and rearing (Heirs 1996). The purpose of this exchange was not to increase year-round flows, but rather to increase flows in the lower Umatilla River during critical migration and rearing periods. However, little has been done to address flow problems in the upper Umatilla and tributaries basin-wide. Many tributaries suffer low flow situations as a result of both out-of-stream uses and watershed-scale degradation. Lack of summer rearing habitat due to low flows is a primary limiting factor in the Umatilla Basin (Contor et al. 1998). Ongoing efforts to restore floodplain/riparian function should continue.

Where out-of-stream uses are causing low flow problems, attempts should be made to mitigate them. One possible solution is acquisition of water rights. Oregon's Instream Water Rights Law allows water right holders to donate, lease, or sell some, or all, of their water right for transfer to instream use. Oregon Water Trust (OWT), a private, non-profit group, negotiates voluntary donations, leases, or permanent purchases of out-of-stream water rights. These rights are converted to instream water rights in those streams where they will provide the greatest benefits to fish and water quality. Where watershed land use practices have led to lowered summer flows, management should focus on developing "flow friendly" land use practices.

An immediate need is the continuation of funding for the power costs associated with the Umatilla Basin Water Exchange Project. While this project has successfully improved flows in the lower Umatilla, target flows developed for the project are not always met during the identified time period. Also, managers have found additional flow needs for addressing species and life histories phases that were not included in project Phase I and II flow target and times. A Phase III of the Umatilla Basin Flow Augmentation Project is being pursued by CTIUR. Phase III, as proposed, would fund feasibility studies to identify the most efficient flow enhancement options for addressing outstanding flow problems. Phase III could also involve local partnerships (for example,. City of Pendleton municipal needs).

ODFW and OWRD have established priorities for restoration of streamflow as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). ODFW has prioritized streamflow restoration needs by ranking biophysical factors, water use patterns, and the extent that water limits fish production in a particular area (Figure 40). OWRD watermasters will incorporate the priorities into their field work activities as a means to implement flow restoration measures. The "needs" priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects. Watershed councils and other entities may also use the needs priorities as one piece of information to determine high priority restoration projects

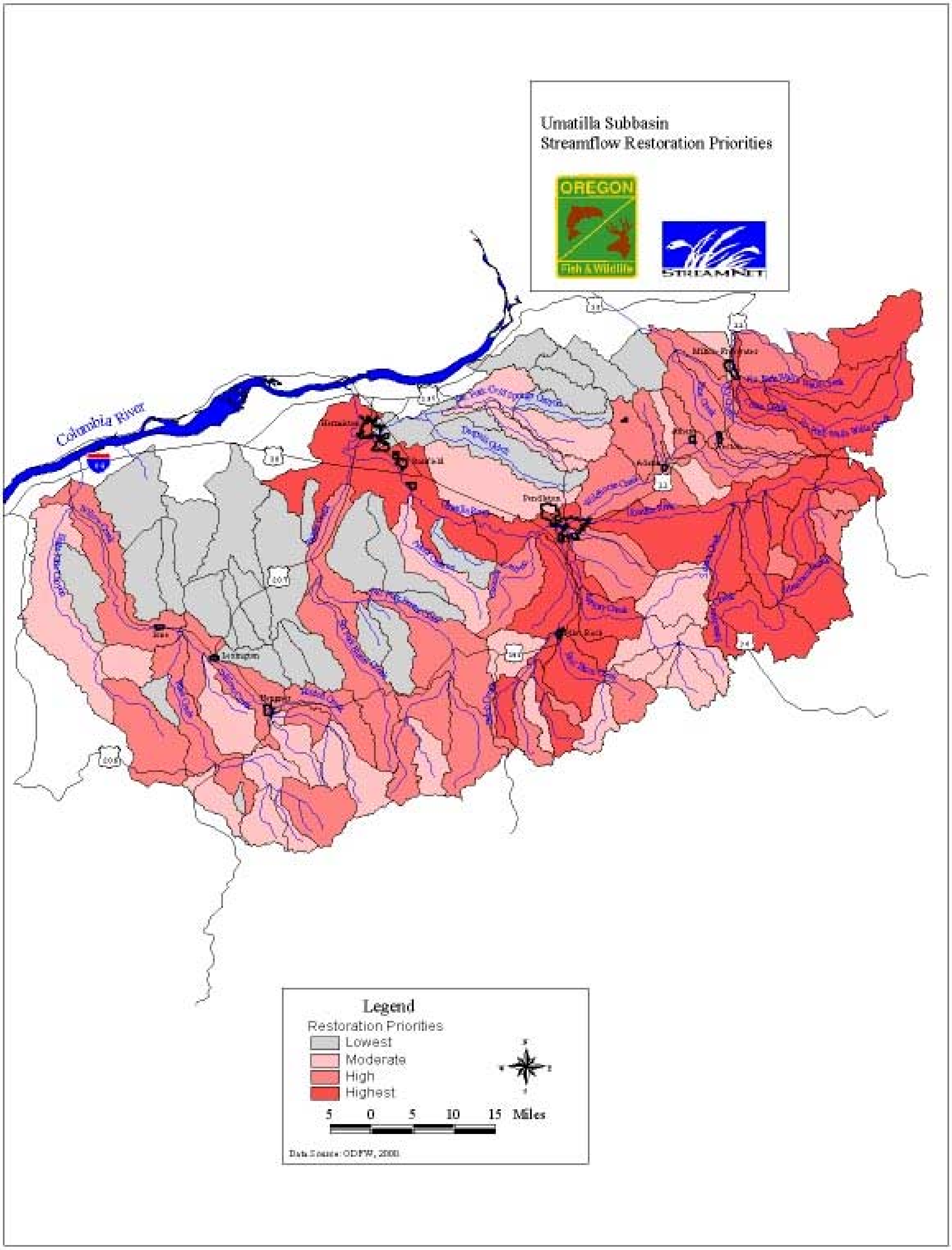

Figure 40. Umatilla/Willow subbasin streamflow restoration priorities (also includes Oregon portion of the Walla Walla subbasin).

Improve Stream Temperatures

Excessively high water temperatures are a basin-wide problem as indicated by the number of streams listed for temperature on the DEQ 303 (d) list (Table 3). Elevated water temperatures are a result of anthropogenic changes in the basin. Primary causes for elevation of stream temperatures include loss of shade producing vegetation, reduced stream flows, reduced hyporheic flows, loss of effective floodplain function, and changes in stream channel geomorphology.

Areas with high water temperatures that need to be addressed in the short term include the mainstem Umatilla from the confluence of Meacham Creek to the mouth (excluding the reach immediately below the cool water inflow from McKay Reservoir), Meacham Creek from mouth to headwaters, and Birch Creek from mouth to headwaters. Ongoing activities to restore riparian vegetation and improve stream channel morphology and floodplain function should be continued. Efforts to improve streamflows through water exchanges and through lease or purchase of out-of-stream water rights for transfer to instream should be accelerated.

Address Passage Impediments

As with instream flows and temperature, passage impediments have severely impacted fish populations in the Umatilla subbasin and were a major cause of the extinction of native salmon stocks. Passage problems on the mainstem Umatilla River from the construction of diversion dams have been largely mitigated, as have many passage problems on tributaries; however, a number of significant passage barriers remain, particularly in Birch, Butter, and Willow Creeks. Birch Creek continues to produce very significant numbers of summer steelhead. Butter and Willow Creeks historically supported summer steelhead, but no longer do so because of passage barriers and low streamflows. Both continue to support populations of interior redband trout. The remaining passage barriers in the Birch Creek watershed should be addressed to improve production of summer steelhead. Passage barriers in both Butter and Willow Creeks should be inventoried and a plan developed for addressing them.

While ladders and screens are in place at all lower Umatilla River Irrigation diversions, these facilities must be properly operated and maintained to provide optimum protection for salmonid fish. Ongoing efforts to operate and maintain these facilities should continue. All fish screens and passage structures in the basin need to be maintained to provide optimum benefits.

As with upstream passage barriers, unscreened water diversions have also had a substantial impact on anadromous fish in the Umatilla Basin. All known gravity feed diversions in the anadromous portion of the basin are screened. It is not known to what extent pump diversions have been screened in the anadromous portion of the subbasin. An inventory of pump installations should be conducted to determine screening needs; all unscreened pumps should be appropriately screened. The number of unscreened diversions in Butter and Willow Creeks is unknown. An inventory of all surface water diversions should be conducted and a plan developed for screening all unscreened diversions.

Improve Riparian Habitats

Riparian vegetation is a critical component of a stable, functioning stream ecosystem. Degradation of riparian vegetation leads to changes in both the physical and biological parameters important for salmonids and other aquatic organisms. Riparian vegetation provides multiple benefits, including streambank stability, stream channel shading, insect drop, organic matter for terrestrial and aquatic insects to feed upon, thermal cover for wildlife, nesting and roosting areas for song birds, and recruitable instream wood. Reeves et al (1988) found that approximately 70% of 422 miles of streams in the Umatilla Basin inventoried by ODFW would benefit from riparian improvements. Since 1988, the ODFW, CTUIR and UNF have implemented habitat enhancement projects on nearly 38.15 miles of streams on UNF and private owned lands. These areas are currently in early recovery. Numerous small properties, fragmented ownerships, and lack of cooperative landowners frequently make it difficult to recover a contiguous riparian buffer in high priority areas.

Activities to improve riparian habitat should continue, particularly in subwatersheds with temperature, sediment and/or flow problems such as Birch, Meacham, Wildhorse, and Butter Creeks. Activities should include operation and maintenance of existing projects; implementation of new restoration projects (e.g., fencing, revegetation, bioengineering, noxious weed control); purchase of critical habitat for fish and wildlife; and acquisition of grazing, timber, mineral and water rights.

Improve Instream Habitat Quality and/or Diversity

Intensive land uses throughout the basin have negatively affected watershed function, altered natural channel and floodplain characteristics, and have destroyed or deteriorated riparian zones. Many streams in the subbasin have been channelized, resulting in channel incision below the water table. Such incision lowers the surrounding water table, which reduces the amount of water available to riparian plant communities, thus lowering the viability of native riparian plant species. Other outcomes of channelization include streams losing their bank strength, channel widening, and lateral channel extension. This has resulted in large, unstable gravel bars and wide, shallow stream flow. The cumulative effects of such stream channel alterations result in unstable channels and poor fish habitat. Ongoing efforts in the basin to restore historic stream channel dynamics and native riparian vegetation should continue. Many miles of stream in the subbasin are still in need of treatment.

Reduce Sediment Inputs

Many streams in the Umatilla basin have excessively turbid waters and a high percentage of fine sediment in spawning substrates (DEQ 2000). Some of the highest suspended sediment loads were found in the Wildhorse Creek, Tutuilla Creek and Butter Creek drainages. Most areas of the basin exceed the water column turbidity target of 30 NTU developed for the TMDL requirement. DEQ found that water column sediment in the Umatilla Basin is derived from both streambank (bed and banks of the stream) and upland sources; however, the primary source (71% to 96% of the sediment load) was from streambanks. As with instream habitat quality, reduction of streambank erosion can be accomplished by restoring stream channel morphology and natural flow regimes, and by restoring riparian vegetation. Upland sources should be addressed by implementing Best Management Practices (BMPs) as documented in the TMDL Water Quality Management Plans (DEQ 2000).

Protect Stronghold Habitats

Particular areas of the basin provide habitat strongholds. For example, the North Fork Umatilla provides stronghold habitat for bull trout and spring chinook, and Squaw Creek provides stronghold habitat for summer steelhead. Stronghold habitats are paramount to conservation of salmonid species in the Umatilla Basin. These areas are the life-blood of the basin and account for the majority of fish production. Should catastrophic events occur, these areas would likely be instrumental in maintaining a basin-wide population base. Current management and/or protective strategies that have allowed stronghold habitats to persist should be continued. Above all else, stronghold habitats should be protected to maintain their current status. Additionally, all salmonid habitats should be protected to at least maintain their current quantity and quality. Habitat acquisition should be emphasized where opportunities exist to protect stronghold fish and wildlife habitats or to enhance areas to stronghold status.

Increase Adult Spawners

Salmonid species in the subbasin currently limited by the number of adult spawners include bull trout (Hansen et al. 2001), and summer steelhead (Chilcote 2001 unpublished draft). Reintroduced salmon species (chinook and coho) are likely also limited by lack of adult spawners. While natural production has been documented for these reintroduced species, it is far below the level needed to provide replacement of adult returns. This is not unusual considering Umatilla reintroduction efforts (utilizing non-endemic stocks) is still in the "start-up" stage. Most endemic salmon and steelhead populations in the mid to upper Columbia River system are currently not replacing themselves; therefore there may be factors other than in-subbasin instream habitat influencing fish recovery. Even if replacement was occurring, populations would still not be at a level that could meet natural production and harvest objectives. As a result, key needs for Umatilla fish recovery include habitat enhancement, both in and out of the subbasin, as well as the continuation of artificial production efforts in order to increase the number of natural spawners.

There are numerous strategies for increasing natural spawning escapement. These include improvements in total survival, reduction of sport and commercial harvest, artificial propagation, habitat enhancement, and passage improvement. Current efforts to increase bull trout spawner abundance include prohibiting sport harvest, improving habitat and passage, and improving the survival of fish with a "fluvial" life history. These efforts should be continued, and improvements made through monitoring and evaluation of the "fluvial" life history pattern.

Steelhead abundance below objectives should be addressed through habitat improvement and continued hatchery supplementation with endemic Umatilla stock (CTUIR). Spring chinook abundance below objectives should be addressed through habitat improvement and continued hatchery supplementation with the additional production proposed by CTUIR. Fall chinook abundance below objectives should be addressed through habitat improvement and hatchery supplementation utilizing 0+ and 1+ juvenile releases, and adult outplants. Adult return success should also continue to be evaluated. Coho salmon abundance below objectives should be addressed through habitat improvement and continuation of the existing hatchery reintroduction program. Pacific lamprey research and restoration efforts utilizing supplementation should continue in order to meet restoration objectives (CTUIR). Monitoring of survival and adult return success (for anadromous species) should be continued.

Increase SARs (smolt to adult returns)

Low SARs continue to impede efforts to achieve natural production, broodstock, and harvest objectives in the Umatilla Basin. This has been a problem for both natural and hatchery produced smolts. According to Chilcote (1998), Umatilla wild summer steelhead have been below estimated population equilibrium since the 1994 spawning year. Actual SARs for hatchery produced smolts have been far below the target planning levels identified in the Umatilla Hatchery Master Plan (NWPPC 1990). This is believed to be caused by conditions both inside and outside the subbasin.

The survival rate of smolts initiating downstream migration in the Umatilla River is estimated at 60-70% (Knapp and Ward 1990). While the specific survival bottlenecks have not yet been identified, it is presumed that improved passage conditions (in-river flows, water quality, management of smolt by-pass facilities, and decreased avian predation) will result in higher smolt survival. The Umatilla River Fish Passage Operations Project should continue to oversee operation of fish by-pass facilities, monitor river conditions, and direct implementation of the Umatilla Basin Water Exchange Project to optimize in-river smolt migration conditions. Fish managers should support implementation of actions to achieve the waste load allocation adopted by the Umatilla TMDL (DEQ 2000) to improve water quality conditions for smolt outmigration.

In 2000, fish managers modified the Umatilla hatchery fall chinook production program because of low smolt to adult returns from subyearling's released in the Umatilla. Smolt to adult returns have been low since fall chinook production at the Umatilla Hatchery began. While the bottleneck(s) for fall chinook SARs are not currently known, managers hypothesize that size of release, low streamflows, and high water temperatures in the Umatilla River at the time of release, are the primary problems (ODFW and CTUIR 2000, unpublished). Over the next several years, managers will implement different release strategies to improve survival. These strategies will be evaluated to determine which actions are most successful.

Problems with low SARs for spring chinook smolts reared at Umatilla Hatchery and released into the Umatilla have been observed in recent years. Managers believe that this survival problem is tied to the water supply in which the fish are reared. The fish are reared in warm well water with a temperature regime unlike natural conditions. This has resulted in early maturation of fish. In past years, juveniles were smolting in the hatchery prior to transfer to acclimation facilities for release. Managers hypothesize that early transfer to acclimation ponds with natural temperature regimes will increase survival. To test this hypothesis, one group of spring chinook smolts will be transported to acclimation facilities in mid November for release in March.

The major problem affecting SAR that occurs outside the subbasin is outmigration through the Columbia River hydropower system. Reducing the mortality of downstream migrants through the impounded Columbia River mainstem will be necessary before any upriver subbasins can be expected to meet production and harvest objectives. There is a need for special emphasis on addressing problems with fish passage, water quality, predation, and estuary conditions in the Columbia. These problems will be elaborated in the mainstem "subbasin" assessments as a part of the NWPPC fish and wildlife restoration planning and implementation process. Without appropriate sharing of the conservation burden throughout the fish's life history, concentrated efforts in the subbasins will have limited results.

Address Research/Data Gaps

Natural Production

- Continue collecting trend data for salmonid distribution, abundance, densities, age, and growth throughout the subbasin at established index sites
- Continue collecting trend data for natural adult returns and the natural spawning of hatchery and natural produced steelhead, spring chinook, fall chinook, coho, bull trout and lamprey
- Maintain regular collections and archives of genetic material for *O. mykiss* and bull trout
- Maintain artificial production monitoring and evaluation programs
- Monitor juvenile salmonid outmigrant timing and survival
- Evaluate existing flow enhancement efforts and define the most feasible options to meet additional needs
- Evaluate salmonid supplementation programs
- Continue research and restoration of Pacific lamprey and develop a research and restoration plan for shellfish
- Monitor and evaluate patterns of fluvial bull trout
- Monitor distribution and abundance of spawning hatchery-reared steelhead
- Inventory pump diversions and determine screening needs
- Inventory irrigation diversions in the Butter and Willow Creek drainages and determine passage and screening needs

Artificial Production

- Maintain artificial production monitoring and evaluation programs

Flows/Passage

- Evaluate existing flow enhancement efforts and define most feasible options to meet additional needs
- Inventory pump diversions and determine screening needs
- Inventory irrigation diversions in the Butter and Willow Creek drainages and determine passage and screening needs

Planning

- Continue research and restoration of Pacific lamprey
- Develop a research and restoration plan for shellfish

Wildlife Needs

Habitat

Grassland and Shrub Steppe

1. Protect, maintain and enhance shrub steppe habitats
2. Improve connectivity between existing shrub steppe fragments
3. Move savannah grassland with potential brooding , leking and wintering sharp-tailed grouse habitat into protect status
4. Enhance and restore native perennial grassland habitats
5. Reduce non-native annual grasses in shrub-steppe and grassland habitat
6. Pursue and implement effective biological controls on noxious weeds including yellow-star thistle and knapweeds

Forest

1. Protect, maintain, and enhance late-seral dry forest habitats
2. Maintain large patch size late-seral dry forest stands
3. Restore and maintain snag and downed wood densities of a variety of species to meet nesting and foraging requirements of forest dwelling landbirds
4. Move mid-elevation and foothill big game winter range habitat into protected status
5. Protect, enhance, and restore aspen groves
6. Reduce road densities and associated impacts to watershed functions

Riparian

1. Control noxious weeds in specific high value habitat areas (e.g. reed canary grass in wetland and riparian communities)
2. Restore riparian understory shrub communities
3. Maintain and improve large structure riparian cottonwood galleries for Lewis's woodpeckers
4. Identify and protect remaining ferruginous hawk nest sites and associated habitats in the subbasin

Wildlife Populations

1. Restore anadromous fish populations to support salmon dependent wildlife and promote natural nutrient cycling
2. Evaluate status of avian species that are inadequately surveyed by standardized survey protocols
3. Evaluate the importance of individual habitat fragments to native wildlife species on private lands in the subbasin
4. Assess methods to reduce cowbird parasitism on native bird species
5. Inventory herptile and small mammals and their habitats in the subbasin

6. Maintain, protect and enhance big game winter range
7. Reduce bullfrog predation on juvenile western painted turtle and other native herptiles
8. Reduce domestic sheep/bighorn sheep conflicts in primary Rocky Mountain bighorn sheep habitat
9. Reintroduce Rocky Mountain bighorn sheep into suitable habitats
10. Reestablish harvestable populations of mountain quail
11. Assess impacts of ravens, cowbirds, crows, starlings, and magpies on species at risk
12. Assess the impacts of shed antler collecting on deer and elk herds and associated habitats

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Umatilla Subbasin Recommendations

FY 2001 Projects Proposals Review

The following subbasin proposals were reviewed by the Umatilla River Subbasin Team and the Province Budget Work Group and are recommended for Bonneville Power Administration project funding for the next three years.

Table 1 provides a summary of how each project relates to resource needs, management goals, objectives, and strategies, and other activities in the subbasin.

Projects and Budgets

Continuation of Ongoing Projects

Project: 195505500 – Umatilla Tribal Fish & Wildlife Enforcement

Sponsor: CTUIR

Short Description:
Increase law enforcement (LE) protection to fish, wildlife, their critical habitats and other essential natural resources within watersheds managed by CTUIR. The program will be coordinated with all other resource enhancement projects of the tribe.

Abbreviated Abstract:
Law enforcement is an integral and essential component of natural resource management. Enforcement of existing fish, wildlife and habitat regulations is needed to ensure compliance rates and protect fish stocks, wildlife populations and their critical habitats. Coordination of State and Tribal government operations, public awareness and public participation are all benefits of natural resource enforcement.

A CTUIR Fish and Wildlife Enforcement division will provide three enforcement officers for enforcement activities on 1855 Treaty reserved mainstems and tributaries. Coordination between all jurisdictions involved in the enforcement effort will increase effectiveness and alleviate duplication of efforts. Officers will enforce fisheries and habitat regulations on reservation and ceded lands. Enforcement officers will protect anadromous fish, resident fish and critical habitats on reservation and ceded lands. An organized evaluation of desired and actual achievement (budget, personnel, equipment, coordination, contacts, warnings, arrests, seizures and critical habitat protected) will analyze the impact of the program.

Increased enforcement presence will act as a deterrent to illegal activity and public awareness programs will increase support and understanding of the goals of the program. Increased survival rates of both juvenile and adult salmonids and protection of critical habitats are the goal of this program.

Enforcement plays a vital role for the protection of the investments made by BPA, past, present, and future projects.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
20127	Walla Walla Basin Natural Production Monitoring and Evaluation	Enforcement Component protects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
9000501	Umatilla Basin Natural Production Monitoring and Evaluation	Enforcement Component protects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
97100010	Umatilla Basin Habitat Enhancement	Enforcement Component protects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
20131	John Day Basin Habitat Enhancement	Enforcement Component protects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
9604601	Walla Walla Basin Habitat Enhancement	Enforcement Componentprotects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
9608300	Grande Ronde Habitat Enhancement	Enforcement Componentprotects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
9800703	Grande Ronde Satellite Facility	Enforcement Componentprotects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project
8343500	Umatilla Hatchery Satellite Facility O+M	Enforcement Component protects investment of field activities/equipment, habitat restoration efforts and ultimate survival of fish & wildlife resources tied to this project

Relationship to Existing Goals, Objectives and Strategies:
CTUIR Enforcement supports the efforts of State and Federal Regulatory Agencies, county and local organizations to enforce fish, wildlife and habitat laws. Each agency has areas of primary responsibility and areas that overlap with other agencies. Since numbers of personnel are limited, these overlapping areas allow for the coordination of efforts of individuals, maximizing the efficacy of those efforts.

Fish and Wildlife law enforcement proposed under this project will specifically address fish, wildlife and habitat protection that is identified as a critical resource management need in the Umatilla Subbasin Summary (CTUIR et al., 2001). Numerous strategies in the Umatilla Subbasin Summary contain action items that call for enforcement. This project is expected to be directly or indirectly involved in the following actions recommended in the Umatilla Subbasin Summary:

1.3 Enforcement of laws and fishing regulations
2.2 Increase water quality monitoring and enforcement of existing regulations
2.3 Enforce Umatilla River Agricultural Water Quality Management Plan
3.1 Enforce land use regulations designed to protect fish habitats
4.3 Increase monitoring and enforcement of existing regulations on water use and instream flows

Review Comments:
This is a new project and not an ongoing project. The tribe currently has only 0.5 FTE for enforcement throughout NE Oregon which is inadequate. Through this proposal, enforcement is proposed for all seeded land. Reviewers indicate that there appears to be a lack of coordination among enforcement proposals. The CTWSRO, ODFW, and CTUIR need to meet and coordinate prior to funding. If funded, this project should be held to the same standards as the two existing conservation enforcement projects currently being funded under the fish and wildlife program.

Budget:

FY02	FY03	FY04
163,369 Category: High Priority	171,506 Category: High Priority	180,081 Category: High Priority

Project: 198343500 - Operate and Maintain Umatilla Hatchery Satellite Facilities

Sponsor: CTUIR

Short Description:
Acclimate juvenile salmon and steelhead prior to release in the Umatilla Basin. Collect, hold, and spawn steelhead, coho, and chinook salmon and provide eggs to ODFW and other hatcheries for incubation, rearing, and later release in the Umatilla Basin.

Abbreviated Abstract:
In the early 1980's, CTUIR and ODFW began implementing a comprehensive plan (Umatilla Fisheries Restoration Plan) to supplement steelhead and re-establish salmon runs in the Umatilla River Basin. Artificial production, including the need for Umatilla Hatchery and associated satellite facilities, was identified as a key component in this effort.

This project provides for the operation and maintenance of both juvenile and adult satellite facilities. The goals and objectives are to: 1) assist in achievement of Umatilla Basin adult salmon and steelhead return goals by increasing smolt-to-adult survival/returns through acclimation of juvenile salmon and steelhead in natural production areas prior to release into the Umatilla Basin, 2) operate adult holding and spawning facilities to provide salmon and steelhead eggs for Umatilla production, and 3) increase the number of spring chinook adult spawners in the Umatilla Basin by temporarily holding adults for later outplanting into natural production areas.

The reduced stress and increased imprintation of juvenile salmon and steelhead released from acclimation ponds in the Umatilla Basin will increase smolt to adult survival back to both the Columbia and Umatilla rivers which specifically addresses the Columbia Basin Fish and Wildlife Program by contributing to increased adult returns to the Columbia Basin. Acclimation also increases homing and imprints fish back to natural production areas.

Results of the project are monitored and evaluated as part of the Umatilla Hatchery and Natural Production Monitoring and Evaluation programs (project no. 9000501 and 9000500). Data collected by this project is shared with the monitoring and evaluation programs and is also summarized in an annual report to BPA. The information is analyzed by CTUIR and ODFW managers and researchers, and each year, adaptive management decisions are made and incorporated into the Umatilla Hatchery and Basin Annual Operation Plan.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
8903500	Umatilla Hatchery O & M	Umatilla Hatchery is the primary production facility for providing juvenile salmon and steelhead smolts for acclimation and release into the Umatilla Basin
8802200	Umatilla River Fish Passage Operations	The passage operations project provides adult recovery information and broodstock for spawning, and provides passage for outmigrating hatchery produced juveniles
9000501	Umatilla Basin Natural Production M & E	The UBNPM&E project provides biological information related to the outcome of the production goals
8710001	Umatilla River Basin Anadromous Fish Habitat Enhancement	The URBAFHE project provides increased habitat for fish utilization
9000500	Umatilla Hatchery M & E	The UHM&E project provides biological information related to the operation of the satellite facilities and evaluates the success of the artificial production program
8902401	Evaluate Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River Basin	This project provides biological information related to the operation of the production program
8343600	Umatilla Basin Fish Facilities O & M	The UBFFO&M project assists in preventative and heavy maintenance at all Umatilla Hatchery satellite facilities
8805302	Design and Construct Umatilla Hatchery Supplement	This project provides for design and construction of new artificial production facilities which will be operated under project 8343500 when completed

Project #	Title/description	Nature of relationship
	NEOH Hatchery - Walla Walla Component - Design and Construction	Same as box above
	Little White Salmon Hatchery O & M	LWSH provides spring chinook salmon smolts for acclimation and release into the Umatilla River basin

Relationship to Existing Goals, Objectives and Strategies:
This project is an essential part of a comprehensive Umatilla River fish restoration plan developed by CTUIR and ODFW in cooperation with the Council, BPA, NMFS, various irrigation districts and private landowners. The project helps to increase smolt to adult survival and provide eggs for the program and directly increases survival of salmon and steelhead to the upper Columbia River Basin which is consistent with the Council's Fish and Wildlife Program, U.S.v.OR Columbia River Fisheries Management Plan and the Pacific Salmon Treaty.

The project goals of increasing smolt-to adult survival and homing to the Umatilla River basin and providing eggs for the Umatilla production program are directly related the Council's mandate to protect, mitigate, and enhance fish and wildlife of the Columbia River Basin that have been affected by the development and operation of hydroelectric dams. The project falls under the Columbia Plateau Ecological Province and is recommended in the Draft Umatilla Subbasin Summary. Specific objectives of this project are linked to the Draft Umatilla Subbasin Summary as follows:

Objective 1 (operations and maintenance phase) is directly related to the goals, objectives, and strategies stated in the Subbasin Summary by assisting in the restoration and enhancement of salmon and steelhead populations in the Umatilla basin by increasing smolt-to-adult survival rates and homing to the Umatilla River basin. There are five specific strategies in the Subbasin Summary, which identify needed actions directly related to this project. Strategies 6, 7, and 8 (Continue to supplement the recently reintroduced spring chinook, fall chinook, and coho salmon populations with a hatchery program) identifies several actions specific to the project. These actions include the continued acclimation and release of juvenile salmon and steelhead into historic habitat (Project Task 1.a). Strategy 9 (Supplement the indigenous summer steelhead population with a hatchery program consisting of local broodstock) is also specific to this project. Action 9.1 is to continue the acclimation and release of summer steelhead into historic habitat (Project Task 1.a). Strategy 12 (Implement artificial propagation practices to maintain genetic and biological integrity of supplemental stocks) identifies one action, which involves this project. Action 12.2 is to take appropriate actions to maximize survival of unhealthy fish (Project Task 1.a). Juvenile outmigration data collected at the Westland Canal juvenile trapping facility (Project Task 1.b) is shared with other projects to help assess juvenile anadromous smolt production, survival and migration timing (Strategy 14; Action 14.3).

Objective 2 (operations and maintenance phase) is also directly related to the goals, objectives, and strategies stated in the Subbasin Summary. Strategy 12 (Implement artificial propagation practices to maintain genetic and biological integrity of supplemental stocks) identifies two actions, which involve this project. Action 12.1 is to utilize IHOT genetic guidelines for broodstock mating, and action 12.2 is to take appropriate actions to maximize survival of unhealthy fish (Project Tasks 2.a and 2.b). In addition, this project is involved indirectly with Strategy 13. (Monitor and evaluate Umatilla hatchery programs to ensure they are successful and minimize adverse effects on listed or other indigenous species). This project provides snouts and data to ODFW, the Pacific States Marine Fisheries Commission (PSMFC), and the Umatilla Hatchery Monitoring and Evaluation project so that project can evaluate the success of the various rearing and release strategies being used in the Umatilla Basin (Project Task 2.a).

While not specific to either action in Strategy 6 (Continue to supplement the recently reintroduced spring chinook population with a hatchery program), Objective 3 (operations and maintenance phase) is involved indirectly by helping to increase the number of spring chinook adults spawning naturally in the Umatilla River basin (Project Task 3.a).

Objective 4 (operations and maintenance phase) is also directly related to the goals, objectives, and strategies stated in the Subbasin Summary. Strategy 6 (Continue to supplement the recently reintroduced spring chinook salmon population with a hatchery program) identifies one action specific to this project. Action 6.1 is to continue releasing 710,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat. The 350,000 spring chinook produced at Little White Salmon Hatchery is a major component of that production (Project Task 4.a). Strategy 12 (Implement artificial propagation practices to maintain genetic and biological integrity of supplemental stocks) identifies another action involving this project. Action 12.2 is to take appropriate actions to maximize survival of unhealthy fish (Project Task 4.a).

Objective 1 (planning and design phase) is also directly related to the goals, objectives, and strategies stated in the Subbasin Summary. Strategy 6 (Continue to supplement the recently reintroduced spring chinook population with a hatchery program) identifies one action, which involves this project. Action 6.2 is to release an additional 515,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat in the upper Umatilla River Basin. One additional hatchery is needed to produce additional spring chinook smolts for the Umatilla River in order to achieve Umatilla juvenile production goals (Task 4.a). It will be located at the existing South Fork Walla Walla facility.

The project does address the Council's Basin-level biological objectives listed in the 2000 Fish and Wildlife Program. More specifically, the project objective of increasing smolt to adult survival directly addresses those items listed in Section III.C.2.a.1 (Anadromous fish losses); halt declining trends in salmon and steelhead populations, restore naturally reproducing populations of salmon and steelhead, and increase adult salmon and steelhead runs.

The Umatilla Hatchery Satellite Facilities O & M project is also involved directly or indirectly with two RPA actions listed in the NMFS 2000 FCRPS Biological Opinion. The project contributes data to studies identified under Section 9.6.1.6.2, Action 107 (Homing/straying) and Section 9.6.5.3.4, Action 184 (Monitor the size, age, health, and smolt quality (growth), as well as release locations, timing, and life history stages of hatchery fish).

The successes being achieved in the Umatilla River to return once-extirpated salmon to a tributary to contribute towards natural spawning, broodstock collection, and Indian and non-Indian harvest objectives is being called a rare success in today's challenging times for Columbia River fisheries resources. It is hoped that some of the success principles such as hatchery supplementation of natural production can be employed elsewhere.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
956,849 Category: High Priority	1,471,623 Category: High Priority	1,520,077 Category: High Priority

Project: 198343600 – Umatilla Basin Fish Facilities Operation and Maintenance

Sponsor: WID

Short description
Provide Operations and Maintenance services of fish passage and satellite facilities in the Umatilla Basin.

Abbreviated Abstract
In the 1980's, CTUIR and ODFW began implementing the Umatilla Fisheries Restoration Plan. An integral part of that effort was to address the inadequate flow and migration conditions by constructing fish passage facilities, initiating a trap and haul program, and implementing the Umatilla Basin flow enhancement project.

The Umatilla Passage Facilities O&M Project main objective is to increase adult and juvenile migrant survival in the Umatilla Basin. The project provides survival benefits for both hatchery and natural production by operating and maintaining ladders, bypasses, screen sites and trap facilities according to design criteria. A secondary objective of the project is to support the basin artificial production program by assisting CTUIR in the maintenance of the adult holding and spawning facilities and juvenile acclimation sites.

The project began in 1989 under the U.S. Bureau of Reclamation and an irrigation district component began in 1990 as part of the Umatilla Trap and Haul Project. The two portions of the project were combined under the Bureau of Reclamation in 1992 and were transferred to Westland Irrigation District in 1997. The project is viewed as a long term O& M project required for maintaining the survival advantages achieved by implementation of the fish passage and satellite facility projects in the Umatilla Basin.

Relationship to Other Projects

Project #	Title/description	Nature of relationship
8902700	Power Re-pay Umatilla Basin Project	Umatilla Basin Project flow enhancement efforts are coordinated with operation of physical passage facilities which the proposed project provides O&M for.
8802200	Umatilla River Fish Passage Operations	Project 8802200 oversees proposed project O&M activities and operates passage and trapping facilities for which the proposed project provides O&M.
8403300	Umatilla Hatchery O & M	Proposed project provides adequate passage for juveniles produced under project 8403300 by operating and maintaing passage facilities.
8343500	Umatilla Hatchery Satellite Facilities O & M	Proposed project provides adequate passage for juveniles released by project 8343500 by operating and maintaining passage facilities. Also assists project 8343500 in maintaining satellite facilities.
8902401	Umatilla River/WEID Screens M&E	Proposed project provides O&M for facilities operated and evaluated by project 8902401.
9000501	Umatilla Basin Natural Production M & E	Proposed project provides passage for adults and juveniles to and from natural production areas by maintaining and operating passage facilities.
9000500	Umatilla Hatchery M & E	Proposed project maintains adult and juvenile trapping facilities.

Relationship to Existing Goals, Objectives and Strategies

As stated in Section 9.b., inadequate passage conditions for both upstream and downstream migrants were the primary contributor to the disappearance of salmon and decline of steelhead in the Umatilla Basin. Although many passage improvements have been implemented there are still critical times of the year when inadequate migration conditions exist. The objective of the project is directly related to the goals and objectives stated in the Subbasin Summary by assisting in the restoration of salmon and steelhead populations in the Umatilla River by increasing the tributary survival of migrating adults and juveniles.

The secondary objective of the project is related to operating and maintaining the satellite facilities identified as required to enhance the success of the artificial production program. Proper maintenance of these satellite facilities should also assist in meeting the Subbasin Summary goals and the Council rebuilding goal of increasing the number of returning adults.

The project is directly involved in Strategy 5 (*Improve fish passage conditions at all man-made passage impediments for resident and anadromous upstream and downstream migrants.*), Action 5.3 (operating and maintaining all fish passage facilities). In addition, the project is also involved in artificial production Strategies 6, 7, 8, and 9 by assisting in the maintenance of acclimation and adult holding/spawning facilities.

The project goal of assisting in the restoration and rebuilding of salmon and steelhead populations in the Umatilla Basin is directly related to the Council’s mandate to protect, mitigate, and enhance fish and wildlife affected by development and operation of the hydropower system. Though the project falls under the Columbia Plateau Ecological Province for which specific objectives and strategies will be adopted later, the project does address the Council's Basin-level biological objectives listed in the 2000 Fish and Wildlife Program. More specifically, the project objective of increasing tributary survival directly addresses the three items listed in Section III.C.2.a.1. (*Anadromous fish losses*); halt declining population trends, restore natural populations, and increase adult runs.

The Fish Facilities Operation and Maintenance project is also indirectly involved in two of the RPA actions listed in the NMFS 2000 FCRPS Biological Opinion. Although not specifically identified in any specific Action, the project is directly involved in the activities listed under Section 9.6.2.1 (*Actions Related to Tributary Habitat*).

Review Comments:
The NMFS suggests that this project is essential for maintaining anadromous fish access to the Umatilla River.

Budget:

FY02	FY03	FY04
498,512 Category: High Priority	523,450 Category: High Priority	549,625 Category: High Priority

Project: 198710001 – Enhance Umatilla River Basin Anadromous Fish Habitat

Sponsor: CTUIR

Short Description:
Enhance floodplain, riparian and in-stream habitat on private lands in the Umatilla River Basin to increase natural production of summer steelhead, coho salmon and chinook salmon.

Abbreviated Abstract:
The goal of this project is to protect and enhance anadromous fish habitat on private lands in the Umatilla River Basin. Project objectives include: 1) identification of detrimental land uses and development of watershed-level solutions to address habitat impacts; 2) maintenance and continued implementation of habitat enhancements; 3) collection of baseline data and post-project monitoring to identify habitat limiting factors and assess effects of habitat enhancements.

Since its inception in 1987, the project has secured 48 agreements with landowners and enhanced 18.5 stream miles on private properties throughout the Umatilla River Basin. The recently completed Umatilla Subbasin Summary and the nearly finalized Umatilla Subbasin Watershed Assessment will provide direction and assist with prioritization of future habitat needs. Targeted areas shall include portions of the mid and upper mainstem Umatilla River and stream reaches within the Birch, Wildhorse, Mission, Cottonwood, Moonshine, Coonskin, Buckaroo, Squaw, Meacham Creek Subwatersheds.

Although the Tribes will continue to implement individual projects with cooperative landowners, efforts are currently underway in all targeted watersheds to tie existing and proposed enhancements together. Such an expanded approach will result in stream reach-level habitat recovery and complement other Bonneville Power Administration funded projects in achieving more comprehensive watershed restoration goals. The Tribes will continue to prioritize passive, natural recovery to preserve and restore stream habitat. Active, bioengineering approaches will be reserved for areas that will not sufficiently recover in a natural state.

Short-term project effects shall include native plant community recovery, increased stream bank stability and increased stream channel shading. Long-term project effects shall include improved stream geomorphic features, vegetative succession, cooler stream temperatures, reduced sediment deposition, increased large woody debris recruitment, greater habitat diversity, increased juvenile and adult salmonid freshwater survival, greater salmonid offspring out-migration and increased bird, mammal and invertebrate populations.

Project monitoring shall include stream channel transect measurements, photo point documentation, habitat inventories, macroinvertebrate surveys, biological sampling, stream temperature monitoring and suspended sediment monitoring. Results will be evaluated in annual reports submitted to the Bonneville Power Administration.

This project is consistent with Northwest Power Planning Council Measure Numbers 7.6, 7.7 and 7.8. The project entails coordinated, cooperative efforts to protect and improve anadromous fisheries habitat on a comprehensive watershed management basis.

Relationship to Other Projects

Project #	Title/description	Nature of relationship
8710002	Umatilla Basin Habitat Improvement	Integrate basin-wide approach to identify and remedy habitat limiting factors. While this project and Project 871002 operate independently, they function as part of an interdependent program (under the 1987 Umatilla Drainage Habitat Implementation Plan).
9000501	Umatilla Basin Natural Production Monitoring and Evaluation	This project enhances habitat based upon habitat limiting factors identified from physical surveys, biological surveys, spawning surveys and water quality data under Project 9000501.
8343500	Umatilla Hatchery Satellite Facilities Operation and Maintenance	This project expands available rearing habitat to increase survival and out-migration potential of juvenile fish released under Project 8343500.
8802200	Umatilla River Fish Passage Operations	This project improves passage conditions and spawning and holding habitat for adult fish trapped and hauled under Project 8802200.

Project #	Title/description	Nature of relationship
9604601	Walla Walla Basin Habitat Enhancement	This project is housed with and shares personnel, vehicles and equipment with Project 9604601 on a daily basis.
9608300	Grande Ronde Basin Habitat Enhancement	This project occasionally shares personnel, vehicles or equipment with Project 9608300.
200003100	North Fork John Day River Basin Anadromous Fish Habitat Enhancement	This project occasionally shares personnel, vehicles or equipment with Project 9608300.

Relationship to Existing Goals, Objectives and Strategies
The project is consistent with the intent of Section III. 2. of the 2000 Fish and Wildlife Program (FWP); this project is needed to meet one component of recovery efforts in a broad range of strategies. This habitat project is one element in the comprehensive Umatilla Program, which also includes artificial production, adult and juvenile passage improvements (ladders, screens, and trap and haul), in-stream flow enhancement, and monitoring and evaluation. The activities proposed under this project are also consistent with the Habitat Actions found in the National Marine Fisheries Service (NMFS) 2000 FCRPS Biological Opinion. The primary goal of this project is to protect and enhance habitat for existing wild summer steelhead and re-introduced chinook and coho salmon on private lands throughout the Umatilla River Basin. Populations of the Mid Columbia Evolutionary Significant Unit of summer steelhead are currently listed as threatened in the Umatilla Subbasin. Restoration of habitat is critical to the recovery of diminished populations of steelhead in the subbasin.

This project is further consistent with NPPC's 1994 FWP, Sections 7.6-7.8. This project will assist in accomplishing the goals set forth in the 1994 FWP by: (1) protecting existing high quality habitat through local coordination and cooperation, (2) proritizing restoration projects through the use of watershed assessment, (3) promoting watershed and resource management and protection through public outreach and educational efforts, (4) prioritizing actions that maximize the desired result per dollar spent, (5) coordinating data collection, analysis and reporting, and adaptive management to monitor progress in achieving compliance with the Council’s habitat objectives, (6) managing riparian and floodplain areas to promote the protection and re-establishment of natural ecological functions and, thereby, protect and improve salmon and steelhead habitat, (7) developing and maintaining local and regional watershed approaches on the Reservation and Tribal ceded lands, (8) encouraging land management activities that maintain the quantity and quality of existing salmon and steelhead habitat, (9) initiating recovery actions where water quality or land management objectives for fish habitat are not being met, (10) improving livestock management by developing, updating and implementing livestock management plans, (11) implementing riparian easements of sufficient width to improve and maintain salmon and steelhead production in privately owned riparian areas and adjacent lands, and (12) seeking cost-share and encouraging the investment of volunteers.

Considerable time has been spent insuring that the goals of this project closely reflect biological needs of salmonid fish outlined in the Umatilla Subbasin Summary. The following table outlines some of these relationships.

Table 1. Strategies and associated actions in the Umatilla Subbasin Summary that this project will assist with meeting.

Subbasin Strategies	Project Actions for meeting Strategies
2. Protect, enhance or restore water quality to improve the survival, abundance and distribution of indigenous resident and anadromous fish.	Action 2.1 Reduce stream temperatures by restoring or enhancing riparian vegetation, floodplain function and increasing hyporehic and instream flows. Action 2.7 Implement the Conservation Reserve Enhancement Program (CREP), Continuous Conservation Reserve Program (CCRP), Wetlands Reserve Program (WRP) and other pertinent State, Tribal and local programs along riparian zones and in other sensitive areas. Action 2.9 Monitor and evaluate efforts to improve water quality and utilize data to assist in management decisions.
3. Protect, enhance or restore instream and riparian habitat to improve the survival, abundance and distribution of indigenous resident and anadromous fish.	Action 3.2 In the short term, plant native vegetation, construct pools and place large woody debris in streams to provide adequate pools and cover for fish. Maintain operation and maintenance of projects already in place. Action 3.3 Over the long term, implement improvements to stream geomorphic features (sinuosity, width/depth ratio, pool frequency, depth and dimension, entrenchment, etc.) that will result in benefits to fish habitat quantity and quality. Action 3.4 Over the long term, restore riparian vegetation and adjacent valley bottom and upland vegetation to result in the natural long term recruitment of large woody debris into streams. Action 3.6 Reduce sediment deposition in area streams by reducing erosion and sediment delivery to waterways.

	Action 3.7 Improve watershed conditions to reduce human-induced increases of flood peak flows and duration to reduce instream substrate scour, deposition or movement. Action 3.8 Improve floodplain function to improve stream channel stability, hyporehic flows and instream habitat diversity. Action 3.9 Improve or eliminate stream fords and other substrate disturbances. Action 3.10 Protect critical habitat to improve production and survival of indigenous fish. Continue to refine delineation of stronghold areas. Action 3.11 Monitor and evaluate efforts to protect, enhance and restore instream and riparian habitats.
4. Protect, enhance and restore instream flows to improve passage conditions and increase rearing potential for anadromous and resident fishes in the Umatilla River Basin.	Action 4.8 Continue to refine knowledge of flow limited stream reaches and results of enhancement efforts to address remaining needs.
5. Improve fish passage conditions at all human-made passage impediments for resident and anadromous upstream and downstream migrants.	Action 5.2 Modify or remove culverts, bridges, grade controls and water diversion structures as necessary to improve fish passage.
14. Monitor and evaluate the productivity, abundance, distribution, life history and biological characteristics of anadromous and resident fish and relationship with instream and riparian habitat conditions within the Umatilla River Basin to assess the success of management strategies.	Action 14.5 Conduct biological surveys to monitor and evaluate anadromous fish habitat use (coordinated with the CTUIR Umatilla Basin Natural Production Monitoring and Evaluation Project - BPA Project # 9000501). Action 14.7 Measure the quantity and quality of fish habitat in the basin (coordinated with the CTUIR Umatilla Basin Natural Production Monitoring and Evaluation Project - BPA Project # 9000501).

Review Comments:

No comments.

Budget:

FY02	FY03	FY04
506,403 Category: High Priority	531,724 Category: High Priority	558,310 Category: High Priority

Project: 198710002 Umatilla Subbasin Fish Habitat Improvement

Sponsor: ODFW

Short description

Protect and enhance coldwater fish habitat on private lands in the Umatilla River basin in a manner that achieves self-sustaining salmonid populations and their associated habitat by utilizing natural stream functions to the fullest extent.

Abbreviated Abstract

Initiated in 1987, the “Umatilla Subbasin Fish Habitat Improvement Project” protects and enhances coldwater fish habitat on private lands using both passive and active restoration techniques. Riparian exclosure fencing is the preferred tool for this work where applicable. Active remediation techniques are as used such as soil bioengineering techniques, stable channel designs (Rosgen 1996) native vegetative plantings, off-site water developments, and site specific instream structures. Long term riparian leases, cooperative agreements, and easements are developed with private landowners to protect project investments. Individual projects contribute to ecosystem/basin wide watershed restoration/management efforts that are underway by state, federal and tribal agencies. Project planning includes the participation/involvement of private landowners, state/federal agencies, tribes, stakeholders, and watershed council(s).

The Umatilla program goal is to rehabilitate and improve anadromous fish spawning, rearing habitat, and tributary passage to contribute to the NWPPC’s interim goal of five million anadromous fish returning to the Columbia River Basin. While summer steelhead are the focus of this project, spring chinook, coho, resident fishes, and many species of wildlife also benefit. In FY2002 the Umatilla program will implement restoration work along two miles of stream in the Birch Creek watershed and continue maintenance of existing projects.

Long term monitoring and evaluation is an ongoing and vital element of this program. Monitoring includes stream temperature data, physical & biological stream surveys, photopoints, and habitat transects.

Relationships to other projects

Project #	Title/description	Nature of relationship
198710001	CTUIR - Umatilla Subbasin Fish Habitat Improvement	Implements fish habitat improvements on reservation lands and on Wildhorse Creek and mainstem Umatilla River.

Relationship to Existing Goals, Objectives and Strategies
The 2000 Columbia River Basin Fish and Wildlife Program places a strong emphasis on habitat protection and restoration to accomplish program goals and objectives. A part of the vision for the fish and wildlife program states, "wherever possible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats and biological diversity of the Columbia River Basin." One of the policy judgements and planning assumptions states, "this is a habitat based program, rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating and restoring habitats and the biological systems within them, including anadromous fish migration corridors."

This project fits well within the framework of the 2000 Columbia River Basin Fish & Wildlife Program as described above. This project focuses on restoring native vegetation and natural form and function of target streams in the Umatilla Subbasin. While the project targets one species for restoration, summer steelhead/redband trout, actual habitat improvements are implemented to restore overall physical and ecological functions. Birch Creek, the primary target watershed supports a relatively abundant population of summer steelhead even though it is depressed from historical numbers. Approximately 30% of the wild adult summer steelhead escaping to the Umatilla subbasin return to the Birch Creek watershed. And as mentioned above, the Birch Creek watershed is managed as a sanctuary free from direct influences from hatchery programs; no hatchery-reared salmonid fish are released in the watershed. Monitoring activities indicate that few hatchery-reared summer steelhead released into other parts of the Umatilla subbasin stray into the Birch Creek watershed.

While on a unit basis this project contributes toward improving watershed conditions by treating streams and riparian zones, other entities are better suited to address uplands within the target watersheds. Therefore, the extent of this project's efforts toward upland improvement are to advocate and facilitate groups such as Soil and Water Conservation Districts, watershed councils and the Natural Resources Conservation Service to implement upland watershed-wide improvements. The implementation of the Umatilla TMDL and Water Quality Management Plan should also help.

This project is linked to the Oregon Plan for Salmon and Watersheds by addressing factors for the decline of wild summer steelhead in the Umatilla subbasin. Executive Order No. EO 99-01 states in paragraph 1 "The Oregon Plan first addressed coho salmon on the Oregon Coast, was then broadened to include steelhead trout on the coast and in the lower Columbia River, and is now expanding to all **at-risk wild salmonids throughout the state** [emphasis added]. The Oregon Plan addresses all factors for the decline of these species, including watershed conditions and fisheries, to the extent those factors can be affected by the state."

The Birch Creek watershed is the primary target for this project and where FY 2002 implementation work is planned. The Umatilla Subbasin Summary lists the following habitat limiting factors for the Birch Creek watershed: flow, water temperature, passage, channel conditions, instream habitat diversity, sedimentation, riparian vegetation. Habitat improvements implemented under this project are focused on improving riparian vegetation communities, improving stream channel form and function, and improving instream habitat diversity. The following benefits will be derived: 1) increased water table saturation zones and in-stream flow levels during summer months, 2) slower water velocities and narrower stream channels, 3) more abundant and diverse riparian vegetation communities, 4) more recruitable wood for instream cover, 5) increase shading, 6) increase insect drop, and 7) reduced sediment inputs. These benefits address all of the listed limiting factors except passage, which is covered in a separate project proposal submitted by ODFW.

The treatment methodologies described above are directly linked to Goals, Objectives, Strategies and Actions listed in the Umatilla Subbasin Summary. This project is tied directly to Goals 1, 3 and 4. Goal 1 states, "protect, enhance and restore wild and natural populations of summer steelhead, bull trout and other indigenous fish in the Umatilla basin." The target species of this project is *summer* steelhead/redband trout in the Birch Creek and Meacham Creek watersheds. This project seeks to increase numbers of wild steelhead in both watersheds. In particular this project focuses on restoring steelhead runs in the Birch Creek watershed, which is currently managed as a wild steelhead sanctuary. Goal 3 states, "provide sustainable ceremonial, subsistence, and recreational fisheries; non-consumptive fish benefits such as cultural and ecological values." This project contributes to this goal by increasing returns of summer steelhead. Goal 4 states, "Maintain genetic and other biological characteristics of indigenous populations and genetic viability of reintroduced populations." This project contributes toward this goal by protecting and restoring habitats for wild fish in sanctuary areas as mentioned above. This project is directly linked to objective 4, "achieve and maintain an average run of 5,500 summer steelhead to the Umatilla River mouth by the year 2010."

This project will play a major role in accomplishing strategies 2 and 3 of the Umatilla Subbasin Summary. Strategy 2 of the subbasin summary states, "protect, enhance and restore water quality to improve survival, abundance and distribution of indigenous resident and anadromous fish." Strategy 3 of the subbasin summary states, "protect enhance and restore instream and riparian habitat to improve the survival, abundance and distribution of indigenous resident and anadromous fish. This project will address actions 2.1, 2.4, 2.7, 2.8, 2.9, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.10 and 3.11.

In the "Statement of Fish & Wildlife Needs" section of the Umatilla Subbasin Summary the following fish needs are identified of which this project contributes toward accomplishment of the need: improve instream flows, improve stream temperatures, improve riparian habitats, improve instream habitat quality and/or diversity, reduce sediment inputs and protect stronghold habitats.

The National Marine Fisheries Service's Biological Opinion regarding operation of the Columbia River Hydropower System, under "Habitat Actions" states that a Basinwide Recovery Strategy should focus immediate attention on priority subbasins with the potential for significant improvement in anadromous fish productive capacity as a result of habitat restoration. The fact that the Birch Creek watershed currently produces approximately 30% of the returning adults indicates that it currently has significant productive potential. Previous habitat assessments (Reeve et al. 1988; ODEQ et al. 2000) indicate that significant improvements could and should be made that will lead to increased fish production and improved water quality.

Action 150 of the NMFS Biological Opinion states, "In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-Federal habitat, especially if at risk of being degraded…" The Riparian leases developed by this project are used as a tool for protecting habitat as well as improving habitat. When high quality areas are adjacent to areas in need of improvement, those productive areas are sometimes included in the "leased" area.

Action 153 of the NMFS Biological Opinion states, "BPA shall, working with the agricultural incentive programs, negotiate and fund long-term protection for 100 miles of riparian buffers per year…" The proposed project will contribute toward meeting this annual goal.

This habitat restoration project is a necessary measure to accomplish natural productions goals as outlined in the Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla Basin (Boyce 1986) Umatilla River Subbasin Salmon and Steelhead Production Plan (CTUIR and ODFW1990a), and Umatilla Hatchery Master Plan (ODFW and CTUIR 1990b). Failure to meet biological objectives in the Umatilla subbasin will impact the Northwest Power Planning Council in realizing its goal of five million anadromous fish returning to the Columbia River Basin.

Additionally, failure to fund maintenance of existing projects will lead to significant losses in recovery gained. This would occur mainly through livestock entering exclosure fences that are not maintained. Without maintenance, cattle will enter these exclosures and rapidly destroy riparian vegetation that has been restored over the past 13 years. Accomplishment of maintenance activities by landowners would be variable.

Review Comments:
The cost of this project continues to increase due to change in approach (I.e., active v.s passive channel restoration).

Budget:

FY02	FY03	FY04
759,300 Category: High Priority	796,719 Category: High Priority	836,575 Category: High Priority

Project: 198802200 – Umatilla River Fish Passage Operations

Sponsor: CTUIR

Short Description:
Increase survival of migrating juvenile and adult salmon and steelhead in the Umatilla Basin by operating passage facilities, flow enhancement measures, trapping facilities, and transport equipment to provide adequate passage conditions.

Abbreviated Abstract
In the 1980's, CTUIR and ODFW began implementing the Umatilla Fisheries Restoration Plan. An integral part of that effort was to address inadequate flow and migration conditions by constructing fish passage facilities, initiating a trap and haul program, and implementing the Umatilla Basin Project flow enhancement effort. The Fish Passage Operations Project objective is to increase adult and juvenile migrant survival in the

Umatilla Basin. The project provides survival benefits for both hatchery and natural production by operating and maintaining ladders, bypasses, screen sites, trap facilities, and hauling equipment and coordinating these operations with flow enhancement measures and diversion activities. The project also provides valuable support to other projects by refining fish passage criteria, collecting return and migration data, and collecting and transporting broodstock.

The project began in 1989. Since then, up to 3,800 adults and 100,000 pounds of juveniles have been trapped and hauled annually. These increases in juvenile and adult survival contribute directly to the NPPC rebuilding goals. In addition, recommendations based on project observations and operations are incorporated into subbasin management documents. The project is viewed as a long term O&M project required for maintaining the survival advantages achieved by implementation of the fish passage and flow enhancement projects in the basin.

Relationship to Other Projects

Project #	Title/description	Nature of relationship
8902700	Power Repay - Umatilla Basin Project	Proposed project provides oversite and coordination of Umatilla Basin Project flow enhancement operations.
8343600	Umatilla Passage Facilities O&M	Proposed project works in coordination with project 8343600 to operate passage facilities and provides oversite to project 8343600 on maintenance of those facilities.
8902401	Umatilla River/WEID Screens M&E	Proposed project operates passage facilities that project 8902401conducts M&E at and provides migration information to project 8902401.
8403300	Umatilla Hatchery O&M	Proposed project provides adequate passage for juveniles produced at Umatilla Hatchery and provides broodstock for Umatilla Hatchery production.
8343500	Umatilla Hatchery Satellite Facilities O&M	Proposed project provides adequate passage for juveniles released by project 8343500 and collects and transports broodstock to satellite facilities operated by project 8343500.
9000500	Umatilla Hatchery M&E	Proposed project provides return data for hatchery adults and migration data on juveniles to project 9000500.
9000501	Umatilla Basin Natural Production M&E	Project provides adequate passage for natural adults and juveniles to and from natural production areas. Also provides return data for natural adults and migration data on juveniles to project 9000501.

Relationship to Existing Goals, Objectives and Strategies

As stated in Section 9.b., inadequate passage conditions for both upstream and downstream migrants were the primary contributor to the extirpation of salmon and decline of steelhead in the Umatilla Basin. Although many passage improvements have been implemented there are still critical times of the year when inadequate migration conditions exist. The objective of the project is directly related to the goals and objectives stated in the Subbasin Summary by assisting in the restoration of salmon and steelhead populations in the Umatilla River by increasing the tributary survival of migrating adults and juveniles.

There are two specific strategies in the Subbasin Summary which identify needed actions directly related to the Fish Passage Operations Project. Strategy 4 (*Protect, enhance, and restore instream flows to improve passage conditions and increase rearing potential for anadromous and resident fishes in the Umatilla River Basin.*) identifies three actions specific to the project. Action 4.1 is to continue operations of the Umatilla Basin Project, Action 4.2 is for continuing flow enhancement measures to improve passage conditions, and Action 4.7 is to continue trap and haul salvage operations as needed during low flow periods. The project is also involved in a number of other actions listed under Strategy 4.

Strategy 5 (*Improve fish passage conditions at all man-made passage impediments for resident and anadromous upstream and downstream migrants.*) lists four actions in which the project is directly involved. Action 5.1 is to implement screening of all diversions, Action 5.3 is for operating and maintaining all fish passage facilities, Action 5.4 is to ensure adequate passage conditions exist, and Action 5.6 is for continuing trap and haul operations. The project is also involved in other actions listed under Strategy 5.

The Fish Passage Operations Project is also directly involved in Strategies 6, 7, 9, 12, 14, and 16. For Strategies 6, 7, and 9, the project is the primary broodstock collection source for the various artificial production programs listed. The project broodstock collection activities also fall under Strategy 12, Action 12.1. The project is solely responsible for Strategy 14, Action 14.1, the monitoring of adult returns at Threemile Dam. Under Strategy 16, Action 16.1, the project provides data to mainstem Columbia River monitoring projects, most specifically the Fish Passage Center gas bubble disease monitoring and headburn study and the University of Idaho mainstem adult migration monitoring study.

The project goal of assisting in the restoration and rebuilding of salmon and steelhead populations in the Umatilla Basin is directly related to the Council's mandate to protect, mitigate, and enhance fish and wildlife affected by development and operation of the hydropower system. Though the project falls under the Columbia Plateau Ecological Province for which specific objectives and strategies will be adopted later, the project does address the Council's Basin-level biological objectives listed in the 2000 Fish and Wildlife Program. More specifically, the project objective of increasing tributary survival directly addresses the three items listed in Section III.C.2.a.1. (*Anadromous fish losses*); halt declining population trends, restore natural populations, and increase adult runs.

The Fish Passage Operation project is also indirectly involved in a number of the RPA actions listed in the NMFS 2000 FCRPS Biological Opinion. As stated previously, the project contributes data to studies identified under Actions 107 and 108 (Fish Passage Center gas bubble disease monitoring and headburn study and University of Idaho mainstem adult migration monitoring study). Although not specifically identified in Action 149 or 151, the project is directly involved in activities associated with those Actions and listed under Section 9.6.2.1 (*Actions Related to Tributary Habitat*).

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
343,979 Category: High Priority	361,178 Category: High Priority	379,237 Category: High Priority

Project: 198805302 – Design and Construct Umatilla Hatchery Supplement

Sponsor: CTUIR

Short Description:
Build incubation/juvenile rearing capabilities at the existing South Fork Walla Walla spring chinook adult holding and spawning facility to rear spring chinook for acclimation/release in the Umatilla Basin.

Abbreviated Abstract:
In the 1980's, CTUIR and ODFW began implementing the comprehensive Umatilla Fisheries Restoration Program. An integral part of that effort was artificial propagation of salmon and steelhead for release into natural production areas. Umatilla and Little White Salmon hatcheries currently produce spring chinook smolts for release in the Umatilla River. Although the existing program is achieving success in returning adults for natural production, broodstock acquisition and harvest, these hatcheries do not provide for the full production required to achieve the Umatilla Basin spring chinook restoration goals and objectives as defined in the Draft Umatilla Subbasin Summary (CTUIR et al., 2001). An additional 515,000 smolts are needed to achieve these objectives. Numerous completed and ongoing passage, flow enhancement, and habitat improvement efforts in the Umatilla Basin are expected to greatly enhance the benefits of the proposed hatchery project.

The Umatilla Hatchery Satellite Facility for spring chinook adult holding and spawning already exists at the proposed South Fork Walla Walla River project site. The existing facility includes land, water intake and effluent settling pond that is sized to accommodate the proposed new production. Project master planning, NEPA, final designs, and projct review by the NPPC are scheduled for 2001 and 2002. Construction is scheduled for 2002. Upon completion, the entire facility will be operated under the existing Umatilla Hatchery Satellite Facilities O & M project #8343500.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
8343500	Umatilla Hatchery Satellite Facilities O&M	The O&M project will provide for operation and maintenance of the facilities and M&E (production monitoring and CWTagging) under this project
8903500	Umatilla Hatchery O&M	Like this project, Umatilla Hatchery will provide fish for release in the Umatilla River Basin.
8802200	Umatilla River Fish Passage Operations (URFPO)	The UBFPO project will provide adult recovery information, broodstock for spawning, and provide passgae for outmigrating hatchery produced juveniles
9000500	Umatilla Hatchery M&E	The UHM&E project will provide biological information related to the operation of the facilities and will evaluate the overall success of the Umatilla artificial production program
8343600	Umatilla Passage Facilities O&M	The UPFO&M will assist in the heavy maintenance of facilities completed under this project
20138	Design and Construct NEOH - Walla Walla Hatchery	The Walla Walla Hatchery will also provide additional spring chinook production at the South Fork facility but releases will occur in the Walla Walla Basin. Design and construction for that project will be closely linked to this project.
900501	Umatilla Basin Natural Production Monitoring and Evaluation	M&E Project will monitor the natural production success of fish produced under this project.

Relationship to Existing Goals, Objectives and Strategies:
This proposal has been identified in Section 7.4L of the 1994 Council Fish and Wildlife Program as part of NEOH. The need for additional spring chinook production was recognized in the Umatilla Hatchery Master Plan approved by the Council in 1990.

Facilities constructed under this project will be an essential part of the comprehensive Umatilla River Fish Restoration Plans developed by CTUIR and ODFW in cooperation with the Council, BPA, Bureau of Reclamation, NMFS, and various irrigation districts and private landowners. The project will increase smolt production, improve smolt quality, and will help to increase smolt to adult survival and will directly increase adult returns of spring chinook salmon to the upper Columbia and Umatilla Rivers which is consistent with the Council's Fish and Wildlife Program, *US v. OR* Columbia River Fish and Wildlife Plan and the Pacific Salmon Treaty.

This project also addresses the Council's basin-level biological objectives listed in the 2000 Fish and Wildlife Program. More specifically, the project objective of assisting in spring chinook restoration by producing more smolts and ultimately more returning adults directly addresses Section III. C.2.a.1 (Increase total adult salmon and steelhead runs above Bonneville Dam by 2,025 to an average of 5 million annually in a manner that supports tribal and non-tribal harvest). Also, in Section III. D.4, the primary strategy for artificial production states that artificial production can be used to compliment habitat improvements and replace lost salmon and steelhead.

As stated in Section 9.b., artificial propagation is a key element in the comprehensive Umatilla fisheries restoration program and is required in order to achieve spring chinook objectives in the Umatilla Subbasin Summary (CTUIR et al., 2001). The objective of spring chinook adult returning to the mouth of the Umatilla River is 8,000. Current returns are approximately 2,000 – 4,000 annually. Based on smolt-to-adult return rate approximately 0.55% for Carson stock spring chinook produced at Bonneville Hatchery and released into the Umatilla River, approximately 2,800 adult returns to the Umatilla River will result from the additional 515,000 spring chinook production. These adults will contribute towards achievement of natural production, broodstock, and harvest objectives in the Umatilla Basin as well as the Fish and Wildlife Program goals.

Strategy 6 (continue to supplement the recently re-introduced spring chinook population with a hatchery program consisting of Carson stock to provide natural production and harvest) in the Subbasin Summary specifically identifies an action related to this hatchery proposal. Action 6.2 calls for release of additional 515,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat in the upper Umatilla River Basin to achieve the remainder of the spring chinook objectives.

The successes already being achieved in the Umatilla River to return once-extirpated salmon to a tributary to contribute towards natural spawning, broodstock collection, and Indian and non-Indian harvest objectives is being called a rare success in todays challenging times for Columbia River fisheries resources. This proposal will seek to add more benefit to this existing success story.

Review Comments:
Reviewers question the potential for interactions with listed steelhead. These issues will be addressed through NWPPC processes.

Budget:

FY02	FY03	FY04
5,352,043 Category: High Priority	Out-year Budget Category: High Priority	Not Applicable

Project: 198902401 – Evaluate Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River Basin.

Sponsor: ODFW

Short Description:
Assess migration patterns, abundance, survival of hatchery and natural juvenile salmonids in Umatilla basin using PIT tag technology; monitor lamprey and resident fish; assess affects of river variables on fish migration; devel op adult interrogatation

Abbreviated Abstract:

The Umatilla Basin Fisheries Restoration Program includes multi-faceted projects to enhance and reestablish salmonid and lamprey populations in the Umatilla River and restore functioning aquatic ecosystems. The goal of the Outmigration and Survival Study is to determine and strengthen the overall effectiveness of the fisheries restoration effort by evaluating the outmigration success of hatchery and natural juvenile salmonids and natural Pacific lamprey in the lower Umatilla River. The project also proposes to expand on existing PIT-tag interrogation capabilities to assess adult returns. Through project activities, knowledge is gained for improved management of hatchery, river, canal, and transport operations. Trends in natural production, survival, and responses of biological communities to flow enhancement strategies are monitored. Collaboration with other basin projects supplements and augments various databases and M&E efforts. Specific project objectives from 2002-2004 are to: 1) conduct PIT-tag interrogation operations at West Extension Canal (RM 3.7); 2) design and implement PIT-tag interrogation capabilities at the east-bank ladder at Three Mile Falls Dam; 3) determine abundance, migration timing, and in-basin survival of tagged juvenile salmonids representing various hatchery rearing, release, and acclimation strategies; 4) evaluate relative survival between transported and non-transported tagged juvenile salmonids; 5) evaluate migration timing and abundance, and monitor trends in natural production of salmon, steelhead, and Pacific lamprey; 6) assess condition, health, size, and growth of hatchery and natural migrants; 7) investigate effects of river, canal, and fishway operations on anadromous and resident species; 8) document temporal distribution and diversity of resident fish species at trap sites; and 9) participate in planning and coordination activities in the basin and disseminate results.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
199000501	Umatilla Natural Production M&E	Project receives PIT-tag monitoring data on migration timing & estimates of natural migrant abundance; proposed project PIT tags natural salmonids in lower river to augment sample size, provides assistance during CHS spawn surveys, & collects scales
199000500	Umatilla Hatchery M&E	Project receives PIT-tag monitoring data on migration timing and estimates of survival of production fish and strategies; biological information on condition/predation; shares vehicles/ office/equipment/staff with proposed project
199402600	Pacific Lamprey Research & Restoration	Project receives juvenile lamprey data on movement and abundance; uses project trap; receives adult lamprey samples; proposed project participates in Lamprey TWG
198903500	Umatilla Hatchery O&M	Hatchery program provides use of facilities,equipment, and test fish; receives information on migration success of production releases from various rearing and release strategies to assist in adpative management.

Project #	Title/description	Nature of relationship
198373600	Umatilla Passage Facility O&M	Project maintains/repairs/modifies sampling facility for monitoring purposes; receives information from proposed project on juvenile fish passage problems at canal site
198902700	Power Re-pay Umatilla Basin Project	Project receives biological data on survival and migration success of juvenile migrants as related to flow enhancement strategies; proposed project assesses impact of Phase I operation on bypass efficiency at lower canal site.
198343500	Umatilla Satellite Facilities	Project receives data on Coho migration, survival; condition information and migration timing of acclimated fish; provides outmigration information from trap and haul subsampling
198802200	Umatilla River Fish Passage Operations	Project receives and uses migrant data to determine timing of transport operations; proposed project monitors production success of outplanted CHF and evaluates survival of transported juvenile fish;
198710001	Enhance Umatilla Basin Fish Habitat	Propsed project monitors trends in natural production partly associated with habitat improvements and uses thermograph data
183	RPA Action 183:Habitat Effectiveness Monitoring	Proposed project monitors response of salmonid and lamprey populations to instream flow and riparian habitat improvement; monitors water turbidity year-round
184	RPA Action 184: Hatchery Effectiveness Monitoring	Proposed project estimates numbers of progeny produced from outplanted hatchery fish (CHF); monitors size, health, quality of smolts and release locations, timing, and life stages of H/W fish; assess H/W fish interactions through migration timing
192	RPA Action 192: Adult Interrogation	Proposed project proposes to initiate actions to enable adult/juvenile interrogation at ladder facility in Umatilla Basin
	Biological Assessment of Umatilla Basin Project	Proposed project monitors listed steelhead movement in relation to instream flows; estimates seasonal abundance

Relationship to Existing Goals, Objectives and Strategies:
This project is an integral part of achieving the fisheries restoration goal in the Umatilla River basin (Figure 1). It is needed to fulfill and address the many needs identified in various planning documents. The Umatilla Subbasin Summary (Saul et al. 2001) specifically identifies the need to "monitor and evaluate the productivity, abundance, distribution, life history, and biological characteristics of anadromous and resident fish and relationships with instream and riparian habitat conditions within the Umatilla Basin to assess the success of management strategies" (Fish Strategy 14). Through biological

monitoring, information is provided for updating the subbasin plan or for developing a new Plan, for improving management and conservation of natural populations, and for assessing the effectiveness of hatchery rearing and release strategies. It also supplements natural production monitoring of lampreys and salmonids. The ability to remotely detect tagged fish in the lower Umatilla River provides invaluable information on in-basin migration parameters and survival of tagged fish; this information is supplemented by tag detections at lower mainstem dams. The increased sophistication of detection capabilities has also minimized personnel requirements and increased monitoring efficiency. It can also be used as a prototype system for other tributary interrogation sites. Although the Umatilla Basin Fisheries Restoration Program fourth year of work (1997-1998) was scheduled to be the last, strong support for continued monitoring was given by basin managers to provide additional opportunity for obtaining valid survival estimates using PIT-tag technologies. With the use of a remote PIT-tag detection system at West Extension Canal in 1999, 2000, and 2001, the project has been able to obtain improved estimates of trapping efficiency, abundance, and survival of tagged fish groups without stressful handling (Ehlers et al. 2001, Knapp et al. in progress).

Continued monitoring in 2002 - 2004 will provide additional years of remote PIT-tag detection information and biological monitoring data to be applied toward answering the critical uncertainties associated with juvenile salmon and Pacific lamprey. Continued monitoring would provide additional years of data beyond the 1996 floods and the 2001 drought. In addition, natural production is increasing; lower-river monitoring of some species groups is the only means of estimating their abundance. The advent of adult interrogation systems at Columbia River hydropower facilities provides the impetus to implement similar capabilities in the lower Umatilla River. Specific rationale for continued monitoring is described below.

Proposed project objectives are to: 1) conduct PIT-tag interrogation operations at West Extension Canal (RM 3.7); 2) Design and implement PIT-tag interrogation capabilities at Three Mile Falls Dam ladder facility; 3) determine migrant abundance, migration timing, and in-basin survival of PIT-tagged juvenile salmonids representing various hatchery rearing, release, and acclimation strategies; 4) evaluate relative survival between transported and non-transported (in-river) PIT-tagged subyearling migrants; 5) determine migration timing and abundance of tagged natural fish, and monitor trends in natural production of salmon, and steelhead, and Pacific lamprey; 6) assess condition, health, size, and growth of hatchery and natural migrants; 7) investigate effects of river, canal, and fishway operations, and environmental conditions on fish migration and survival; and, 8) document temporal distribution and diversity of resident fish species at trap sites; and, 9) Participate in planning and coordination activities in the basin and disseminate results.

These objectives relate directly and indirectly to objectives, strategies, and actions specified in the Umatilla Subbasin Summary (Saul et al 2001), the 2000 FWP (NPPC 2000), and the recent NMFS Biological Opinion (NMFS 2000). Monitoring information from and activities related to this project are beneficial for making informed decisions regarding fisheries restoration in the Umatilla River. Products of this project will directly contribute to:

- evaluating critical uncertainties about survival potential and production success of natural stocks, including outplanting strategies
- understanding species-specific life history information of anadromous and resident fish
- providing information on species-specific migration timing and characteristics
- assessing the effectiveness of hatchery rearing, acclimation, and release strategies
- assessing the effectiveness of flow enhancement strategies
- acquiring knowledge on lamprey migrations and population status
- acquiring information on juvenile migrant condition and health
- assessing impact of avian predation on juvenile migrants
- understanding environmental effects on salmonid migration and survival
- acknowledging response of anadromous populations to habitat restoration efforts
- understanding benefits to survival for transported juvenile fish
- assessing the feasibility of incorporating adult PIT-tag interrogation capabilities at Three Mile Falls Dam

Indirectly, this project would contribute to:
- improving management and conservation of natural populations
- estimating smolt-to-adult survival for natural steelhead
- improving hatchery strategies
- reestablishing sport and Tribal fisheries in the Umatilla River
- increasing adult returns

One of the primary objectives in the Umatilla basin is to restore natural production of fall and spring chinook salmon as well as coho salmon for off-site mitigation of Columbia River salmon stocks (Saul et al. 2001). For natural populations of salmon, steelhead, and lamprey, lower-river monitoring provides additional information on life history characteristics and production that supplements information obtained in the upper river by the Umatilla Tribes. Continuation of upriver PIT tagging of natural production groups in 2002 (Natural Production M&E) will allow estimates of in-basin abundance and survival with lower river monitoring. Abundance estimates for natural fish sheds light on problems within the early life history stages and helps to establish realistic estimates of production capacity, given current flow regimes, water quality, and river uses. Supplemental tagging of natural species in the lower river also presents opportunity to determine smolt-to-adult survival for natural steelhead and chinook, using PIT tags. Numbers of natural steelhead juveniles sampled at West Extension Canal in the past (>2,000 fish/season) have been more than adequate to tag for a determination of SARs given adult interrogation capabilities in the mainstem.

With the implementation of HB3609, information pertinent to salmonid life histories, natural and hatchery fish interactions, and migrant abundance estimates is needed to perform the necessary risk/benefit analysis of supplementation to natural fish populations. In addition, the foreseen need for a revised subbasin plan will require up-to-date information on each species. ESA concerns regarding summer steelhead also warrant a more complete understanding of steelhead life history in the Umatilla basin. Migration monitoring can supply the information needs for many management policies and programs, especially in relation to instream flow needs. For example, collection of scale samples and length measurements from natural migrants is part of the monitoring protocol. These samples and measurements help to clarify life history patterns, migrant ages, and rearing profiles.

A new supplementation strategy being implemented by the Tribes (outplanting of adults) for fall chinook salmon is showing some success in enhancing the number of juvenile migrants (Knapp et al. 2000). This supplementation strategy will be continued in the future and perhaps expanded to include spring chinook salmon. In 1999, lower-river monitoring detected increased production of natural spring chinook salmon (Ehlers et al. 2001), which may not have been evident at upriver traps; similar results were obtained in 2000 (Knapp et al. in progress). With the substantial spawning escapement of spring chinook salmon in 2000 (> 4,000; CTUIR and ODFW 2000) and the projected high escapement in 2001 (3,000-4,000; ODFW 2000), production of subyearling and yearling migrants is anticipated to be very good in the next few years (given suitable water conditions). Production of coho salmon from natural escapement is also increasing as adult returns improve and production areas expand (e.g., into McKay Creek). To monitor these supplemented and escapement productions, a lower river trapping operation is necessary.

The Umatilla Hatchery Master Plan (CTUIR and ODFW 1990) advocates adaptive management in its goal toward increasing Umatilla River production. The artificial production program relies, in part, on research and monitoring information obtained from this project's activities to assist in making decisions regarding hatchery practices associated with rearing, release or acclimation of specific species. Hatchery practices can be evaluated as to their potential success or failure in the short-term with in-basin monitoring information. This information is used by hatchery managers and researchers to further fine-tune or adjust hatchery practices to optimize production and produce a better product which will ultimately affect adult returns, harvest opportunities, and affect decisions on which species is best suited for Umatilla Hatchery and the Umatilla River.

Development of Hatchery Genetic Management Plans (HGMPs) for production programs in the Umatilla River will require knowledge of species-specific survival and behavior factors (performance indicators) to address performance standards. Performance indicators are measured partly through outmigration monitoring of the juvenile stage. For example, health and survival of migrants, migration timing, natural production abundance estimates, and residualism or holdover of steelhead are determinable from activities contained within this project proposal.

There also exists the potential for improving detection capabilities at Three Mile Falls Dam for both juvenile and adult salmonids. Adult returns of PIT-tagged fish are expected to increase in the coming years. As PIT-tag technology improves, flatplate interrogation of upstream migrants at the east-bank fishway becomes a possibility. Detection of downstream juvenile migrants in the fishway would supplement detections at the west-bank bypass. This project would continue investigating the feasibility of flatplate interrogation at the east-bank ladder for detecting tagged juvenile and adult fish passing through the ladder, with installation and monitoring planned for 2003.

Major limiting factors for salmonid production in the Umatilla basin are poor water quality and quantity. Water quality (temperature, sediment load, chemical concentration) is being addressed in the TMDL monitoring program (DEQ) and the Umatilla Watershed Assessment recently completed by Washington State University. Water quantity is influenced by natural flows, enhanced flows, and irrigation needs. Target flows for natural and hatchery salmonids are currently being debated and tested in conjunction with flow enhancement projects within the Umatilla basin (Umatilla Basin Water Exchange Project). A comprehensive database of information on flow needs for fish is required to justify increases in target flows, particularly during summer months. An understanding of flow needs for and flow affects on fish at specific times of the year is developed from migration monitoring information. Extension and provision of flow in the lower river into the summer months in 2000 may repeat itself in the years to come. For the first time, flow (45 cfs) from McKay Reservoir was provided to the lower river throughout summer in 2000, allowing the operation of both juvenile and adult passage facilities at Three Mile Falls Dam. We observed continual movement of resident fish and subyearling chinook salmon (Knapp et al. In preparation). Future monitoring would further assess the effects of these flow strategies on fish movement and life histories and ascertain the benefit to late migrants. Efforts to enhance natural fall chinook and coho salmon and Pacific lamprey require the understanding of flow benefits and needs for these fish during their mid-summer rearing and migration. Temperature effects on fish are also critical in June and July; monitoring elucidates the nature of those effects.

In 1999, NMFS listed Umatilla River summer steelhead as a threatened species as part of the Middle Columbia Evolutionary Unit (ESU) under the Endangered Species Act (ESA). A Biological Assessment was compiled on effects to federally listed species from the continued operation and maintenance of the Bureau of Reclamation's Umatilla Irrigation Project (Torretta 2000). The proposed project provides migration information to assess instream flow needs for these listed fish.

Much of the work results achieved within this project provide ancillary information for fisheries management and research, including effectiveness of new marking techniques (photonic marking), videography, and use of remote PIT-tag detection at canal bypass facilities. Project staff have developed expertise in PIT-tag technology that would have potential benefits for future work in-basin and out-of-basin. The installation of 134kHz PIT tag detectors at Columbia River dams has provided the impetus to continue using this improved technology in the Umatilla Basin for answering critical uncertainties related to natural production success and hatchery effectiveness. Combined detections of PIT-tagged fish in the Umatilla and at Columbia mainstem dams augment the database for determining minimum survival or survival potential. Work in FY2001 fine-tuned the efficiency of the PIT-tag detection system in the lower river. Future potential exists to apply PIT-tag interrogation technology to the adult fish ladder at Three Mile Falls Dam once prototype systems are designed and tested. Interrogation at this point would detect tagged returning adults and tagged juvenile migrants. Several more years of effort at remote PIT tag monitoring in the Umatilla basin would allow a continuation of and improvement in monitoring to address the many critical uncertainties still left unanswered.

Specific strategies and actions listed in the recently developed Umatilla Subbasin Summary are either directly or indirectly associated with this project proposal. Actions that this project proposal directly addresses include:

Action 4.8 Continue to refine knowledge of flow limited stream reaches and results of flow enhancement efforts to address remaining needs. (Proposal Objs. 1, 7)

Action 7.2 Assess monitoring and evaluation results (on fall chinook supplementation) to determine appropriate program changes to achieve objectives. (Proposal Obj. 5)

Action 10.3 Monitor for increases in larval abundance (of Pacific lamprey), juvenile outmigration, and adult returns. (Proposal Obj.2, 5)

Action 13.2 Evaluate performance of yearling spring chinook salmon reared at various stations and released in the Umatilla River. (Proposal Objs. 1, 3)

Action 13.4 Evaluate juvenile migration performance of fall chinook salmon released in varying locations in the Umatilla River. (Proposal Objs. 1, 3)

Action 13.5 Evaluate performance of yearling and subyearling fall chinook releases in the Umatilla River. (Proposal Objs. 1, 3)

Action 13.7 Monitor performance of summer steelhead reared in Michigan raceways. (Proposal Objs. 1, 3)

Action 14.3 Evaluate juvenile anadromous smolt production, survival, and migration timing by operating smolt collection facilities as necessary. (Proposal Objs. 1, 3, 5)

Action 16.3 Conduct monitoring of migratory fish to determine survival rates, timing, and distribution outside the basin. (Proposal Objs. 1, 3, 5)

Indirectly, this proposal addresses the following Actions:

Action 3.11 Monitor and evaluate efforts to protect, enhance, and restore instream and riparian habitats. (Proposal Obj.5)

Action 13.9 Monitor and evaluate the health and disease status of adults and juveniles for all Umatilla hatchery programs. (Proposal Obj. 6)

Action 14.5 Conduct biological surveys to monitor and evaluate anadromous and resident fish distribution, abundance, condition, habitat use, life history. (Proposal Obj. 8)

Although not specified in the Subbasin Summary, this project would also provide M&E related to the following Actions:

Action 4.2 Continue and build upon instream flow enhancement measures in the mainstem Umatilla River to improve passage for upstream and downstream migrant resident and anadromous salmonids and lamprey in the subbasin. (Proposal Obj. 7)

Action 4.7 Continue trap and haul salvage operations when necessary during low flow periods. (Proposal Obj. 4)

Action 5.4 Monitor river conditions and operation of passage facilities to ensure that adequate passage exists and implementadjustments as necessary to ensure efficient passage. (Proposal Obj. 7)

Action 9.2 Design and implement a comprehensive study to assess whether supplementation activities in the subbasin have been effective in rebuilding natural steelhead while maintaining their genetic structure and long-term viability. (Proposal Obj. 2)

Not addressed in the Subbasin Summary, but identified as a need from previous ISRP reviews of Umatilla Basin projects, is the estimation of smolt-to-adult survival of natural summer steelhead. Smolt-to-adult survival for natural steelhead has not been previously determined through the Natural Production M&E project primarily due to lack of mainstem interrogation systems for adult fish and inability to tag sufficient numbers of juveniles. As adult interrogation systems are developed on the mainstem (and possibly in-basin at Three Mile Falls Dam), an opportunity arises to make this estimate by tagging natural steelhead (and chinook) migrants in the lower river through the proposed project. (Proposal Obj. 5). This tagging effort would supplement upriver efforts conducted by the Natural Production M&E project, and ensure sufficient numbers of fish are tagged are reliable SARs.

This project proposal addresses both objective components of the 2000 FWP. Monitoring describes responses of populations to habitat conditions in terms of abundance, productivity, and life history diversity (biological performance) and describes the environmental conditions experienced by those populations (environmental characteristics). Specifically, the proposal would meet several elements within the FWP program. All aspects of the project relate to the Research, Monitoring, and Evaluation program and are relevant to the Scientific Foundation and Framework. Ecosystem response and evaluation, as ascribed in the FWP, are part of this project's objectives as related to natural anadromous and resident fish populations. Objectives for biological performance that are relevant to this project include anadromous and resident fish losses. Monitoring of artificial production strategies (chapter 4) are also tied to many of this project's objectives.

The proposed project also addresses the RPA of Research, Monitoring, and Evaluation within the NMFS Biological Opinion. Monitoring areas pertinent to the proposal include population status monitoring, environmental status monitoring, and effectiveness monitoring. Population Status Monitoring: Determining areas occupied by juvenile salmonids and spawning adults, assessment of population status (abundance, trend, distribution, variation), reviewing status through time. (Proposal Obj. 5). Environmental Status Monitoring: Assessment of environmental influencespotentially affecting salmonid populations, determining change through time, and determining associations between environmental attributes and salmonid population status. (Proposal Objs. 7).

Effectiveness Monitoring: Assessment of intended effects of management actions on aquatic system and response of salmonid populations to those effects. (Proposal Objs. 1, 2, 3, 4, 5, 6, 7,8).

Specific RPA Actions to which the proposed project responds are:

Action 183: Habitat Effectiveness Monitoring – assess management actions related to attainment of instream flows and compliance with water quality standards. The project proposal specifies tasks that will monitor salmonid response to flow enhancement strategies and monitor water clarity in the lower river.

Action 184: Hatchery Effectiveness Monitoring - assess hatchery reforms and practices partially through monitoring of size, age, health, and smolt quality, as well as release locations, timing, and life stages of hatchery fish. The project proposal specifies tasks that will monitor condition and health of hatchery and natural migrants, determine length-frequency distributions, assess migration parameters and life history characteristics, and estimate survival of production groups.

The Hydropower Action to install adult PIT-tag detectors at FCRPS projects (Action 192) to determine, in part, SARs for listed species and steelhead kelt survival rates is relevant to the pursuit of adult interrogation capabilities in the lower Umatilla River at Three MileFalls Dam (Proposal Obj. 2) for the same purposes.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
286,427 Category: High Priority	305,820 Category: High Priority	306,308 Category: High Priority

Project: 198902700 Power Repay Umatilla Basin Project

Sponsor: BPA

Short description
Provide power or reimbursement of power costs to Bureau of Reclamation for Umatilla Basin Project pumping plants that provide Columbia River water to irrigators in exchange for Umatilla River water left instream.

Abbreviated Abstract
In the 1980's, CTUIR and ODFW began implementing the Umatilla Fisheries Restoration Plan. An integral part of that effort was to address inadequate flow and migration conditions by constructing fish passage facilities, initiating a trap and haul program, and implementing the Umatilla Basin Project flow enhancement effort. The Power Repay Project objective is to increase adult and juvenile migrant survival in the Umatilla Basin. The project produces survival benefits for both hatchery and natural production by providing power or reimbursement of power costs for operation of the Umatilla Basin Project Columbia River pumping plants. These pumping plants provide water for irrigation usage in exchange for instream, natural Umatilla River flows and storage water designated for fish passage enhancement. The Umatilla Basin Project is the key component of the Umatilla Subbasin instream flow enhancement effort.

The project began in 1990 with power cost reimbursement for an interim fish/flow exchange until the Umatilla Basin Project was implemented. Phase I of the Umatilla Basin Project was completed and began operations in 1993. Since then, project costs have increased as Phase II of the Umatilla Basin Project has been implemented and power costs have escalated. Increases in juvenile and adult migration survival associated with the enhancement effort have occurred annually and contribute directly to the NPPC rebuilding goals.

Relationship to Other Projects

Project #	Title/description	Nature of relationship
8802200	Umatilla River Fish Passage Operations	Project 8802200 provides oversite and coordination of Umatilla Basin Project which provides flow enhancement for juvenile and adult migration for which proposed project funds power costs.
8343600	Umatilla Passage Facilities O&M	Projects 8343600 and 8802200 operate and maintain passage facilities to maximize passage benefits associated with the Umatilla Basin Project which proposed project funds power costs for.
8902401	Umatilla River/WEID Screens M&E	Umatilla Basin Project provides flows for operation of passage facilities.
8403300	Umatilla Hatchery O&M	Umatilla Basin Project provides passage flows for juveniles produced at Umatilla Hatchery.
8343500	Umatilla Hatchery Satellite Facilities O&M	Umatilla Basin Project provides passage flows for juveniles released by project 8343500.
9000500	Umatilla Hatchery M&E	Umatilla Basin Project provides passage flows for hatchery adults and juveniles monitored by project 9000500.
9000501	Umatilla Basin Natural Production M&E	Umatilla Basin Project provides passage flows for natural adults and juveniles monitored by project 9000501.

Relationship to Existing Goals, Objectives and Strategies

As stated in Section 9.b., inadequate passage conditions for both upstream and downstream migrants were the primary contributor to the extirpation of salmon and decline of steelhead in the Umatilla Basin. Flow would continue to be a limiting factor in the basin restoration effort if not for the Umatilla Basin Project. The objective of the project is directly related to the goals and objectives stated in the Subbasin Summary by assisting in the restoration of salmon and steelhead populations in the Umatilla River by increasing the tributary survival of migrating adults and juveniles.

There is one specific strategy in the Subbasin Summary which identifies needed actions directly related to the Power Repay Project. Strategy 4 (*Protect, enhance, and restore instream flows to improve passage conditions and increase rearing potential for anadromous and resident fishes in the Umatilla River Basin.*), Action 4.1 is to continue operations of the Umatilla Basin Project.

The project goal of assisting in the restoration and rebuilding of salmon and steelhead populations in the Umatilla Basin is directly related to the Council's mandate to protect, mitigate, and enhance fish and wildlife affected by development and operation of the hydropower system. Though the project falls under the Columbia Plateau Ecological Province for which specific objectives and strategies will be adopted later, the project does address the Council's Basin-level biological objectives listed in the 2000 Fish and Wildlife Program. More specifically, the project objective of increasing tributary survival directly addresses the three items listed in Section III.C.2.a.1. (*Anadromous fish losses*); halt declining population trends, restore natural populations, and increase adult runs.

The Power Repay Project is also directly related to two RPA actions listed in the NMFS 2000 FCRPS Biological Opinion. Although not specifically identified in Action 149 or 151, the project is directly responsible for increasing tributary flows as identified in those actions and as listed under Section 9.6.2.1 (*Actions Related to Tributary Habitat*).

The Power Repay Project was an outcome of the Umatilla Basin Project Act passed by Congress in 1998. As part of the Act, BPA was required to provide power to operate the fish/flow exchanges. This is a non-discretionary requirement and BPA has entered into retail service agreements with Umatilla Electric Co-op and Pacific Power to fulfill this obligation.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
1,750,000 Category: High Priority	1,750,000 Category: High Priority	1,750,000 Category: High Priority

Project: 198903500 Umatilla Hatchery Operation and Maintenance

Sponsor: ODFW

Short Description:
Restore Umatilla River Chinook and steelhead fisheries and populations through release of subyearling and yearling smolts produced at Umatilla Hatchery

Abbreviated Abstract:
This proposal funds operation and maintenance of Umatilla Hatchery. The hatchery proposal is one of six strategies identified by the ODFW, CTUIR, and others to restore anadromous fish production including reestablishing salmon production through hatchery releases and supplementing steelhead populations using endemic broodstock (Umatilla Subbasin Umbrella). The Northwest Power Planning Council (Council) adopted the Master Plan in 1990 as part of its Fish and Wildlife Program (FWP) and Umatilla Hatchery began operating in 1991. Master Plan goals anticipate production of 5.5k adult summer steelhead, 8.0k adult spring chinook, 12.0k adult upriver bright fall chinook, and 6.0k adult coho. These goals include both natural and hatchery production expectations. Since Umatilla salmon were extirpated, non-indigenous stock were used to initiate this program. Steelhead

supplementation uses endemic stock. Initial planning focused on release of 210k endemic summer steelhead smolts, 2.23M Carson spring Chinook, 7.0M upriver bright fall Chinook, and 1.0M Tanner Creek coho to meet these goals. Umatilla Hatchery goals were established based on an anticipated well capacity of 15k gpm and were 210k steelhead, 1.29M spring Chinook and 5.94M fall Chinook. Production from other Columbia Basin hatcheries would produce the remainder. The Three Mile, Pendleton ODFW, Thornhollow, Imeques C-mem-ini-kem (Imeques), Bonifer and Minthorn satellite facilities were planned for the Umatilla basin to support these efforts. Some adjustments to this initial program have been made as a result of program experience and facility limitations. The most notable of these limitations is that Umatilla Hatchery well capacity proved out at only 5k gpm. Umatilla Hatchery production objectives will be 150k summer steelhead (71% of goal), 360k spring Chinook (28% of goal), and 600k fall Chinook (9% of goal). The fall chinook program has been reduced from 2.68M to 600k until factors that limit post release survival of fall chinook are identified and solved. Umatilla Hatchery is operated by ODFW and Umatilla satellite facilities by CTUIR in a coordinated manner under an Annual Operating Plan (AOP) developed under the Umatilla Management, Monitoring and Evaluation Oversite Committee (UMMEOC).

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
20516	Umatilla Subbasin Umbrella	This project provides an overview of all FWP funded projects within the basin and cooridinates of hatchery production, marking, and releases with other projects.
198343500	Operate and Maintain Umatilla Hatchery Satellite Facilities	Umatilla production of chinook and steelhead is transferred to acclimate facilities prior to release in the Umatilla Basin. Broodstock is collected, held and spawned to provide eggs to Umatilla and other basin hatcheries for fish productionng.
198902401	Evaluate Juvenile Salmonid Outmigration and Survival in the Umatilla River.	Determine migration patterns, migrant abundance, and survival of hatchery and natural juvenile salmonids in the Umatilla basin using PIT tag and radio telemetry technology and investigate effects of environmental variables on fish migration.
199000500	Umatilla Hatchery Monitoring and Evaluation	Evaluate juvenile rearing, marking, tagging, survival, stock life history, fish health, mass marking, straying, sport fishing and catch contribution for salmon and steelhead reared in oxygen supplemented and standard raceways at Umatilla Hatchery
199000501	Umatilla and Walla Walla Basin Natural Production M&E Project	Monitor and evaluate natural spawning, rearing, migration, survival, life histories, age and growth characteristics, and genetic characteristics of adult salmon and steelhead and their natural progeny in the Umatilla River Basins.
198802200	Trap and Haul in the	Increase survival of migrating juvenile and adult

Project #	Title/description	Nature of relationship
	Umatilla and Walla Walla Basins	salmon and summer steelhead in the Umatilla Basin by operating passage facilities, flow enhancement measures, trap facilities, and transport equipment to provide adequate passage conditions.

Relationship to Existing Goals, Objectives and Strategies:
The Umatilla Hatchery is an integral part to achieve the artificial production objectives outlined in the draft Umatilla Subbasin Summary (Saul et al. 2001), Umatilla Hatchery Master Plan (CTUIR & ODFW 1990), Columbia Basin System Planning – Umatilla River Subbasin Plan (NWPPC 1990), and A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin (Boyce 1986).

The hatchery is operated by ODFW and co-managed with CTUIR under policies and procedures outlined by Integrated Hatchery Operations Team (IHOT 1995) and in terms and conditions outlined in the NMFS Hatchery Biological Opinion. A portion of the M&E is Fish Health services that fulfill requirements agreed upon in IHOT policies and procedures. The hatchery M&E fulfills requirements identified as terms and conditions in the NMFS Hatchery Biological Opinion (NMFS 2000), the Umatilla Hatchery Master Plan (CTUIR & ODFW 1990), and the Hatchery Genetic Management Plan (HGMP) (Saul et al. 2001).

Production at the Umatilla Hatchery currently includes 150,000 summer steelhead smolts, 360,000 spring chinook, and 600,000 sub yearling fall chinook salmon. A number of out of basin hatchery facilities, Bonneville Hatchery produces yearling fall chinook, Little White Salmon Hatchery produces spring chinook, and Cascade Hatchery and Lower Herman Creek Ponds produce coho salmon, also produce fish for the program to meet artificial propagation objectives outline in the Umatilla Subbasin Summery (Saul et al 2001) and the Umatilla Hatchery Master Plan (CTUIR and ODFW 1990). The adult return goals outlined in the Subbassin summary (Saul et al 2001) include:

1. Reestablish and maintain an average run of 8,000 spring chinook to the Umatilla River mouth by the year 2010.
2. Reestablish and maintain an average run of 12,000 fall chinook to the Umatilla River mouth by the year 2020..
   Achieve and maintain an average run of 5,500 summer steelhead to the Umatilla River mouth by the year 2010.

The artificial propagation program for the basin also includes juvenile acclimation and adult holding and spawning satellite facilities. These facilities are all operated by the CTUIR under the Umatilla Hatchery Satellite Facilities Operation and Maintenance project. There are five acclimation facilities in the basin; Bonifer Pond, Minthorn Springs, Imeques C-mem-ini-kem, Thornhollow, and Pendleton. The first acclimation facility (Bonifer) was constructed and began operations in 1983. With the completion of the Pendleton facility in 2000, all juvenile salmon and steelhead released into the basin are now acclimated.

There are also three adult facilities associated with the Fish Restoration Program. Summer steelhead are held and spawned at Minthorn, fall chinook at Three Mile Dam, and spring chinook at South Fork Walla Walla. Three Mile Dam may also be used for holding and spawning coho salmon. Broodstock for these facilities are collected and transported from the Three Mile Dam Adult Trapping and Handling Complex by the Umatilla River Fish Passage Operations project.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
917,559 Category: High Priority	944,335 Category: High Priority	971,915 Category: High Priority

Project: 199000500 – Umatilla Fish Hatchery Monitoring and Evaluation

Sponsor: ODFW

Short Description:
Evaluate juvenile rearing, adult survival, stock life history, straying, fish health and sport fishing and catch contribution for salmon and steelhead reared in oxygen supplemented and standard raceways at Umatilla Hatchery.

Abbreviated Abstract:
The Umatilla Fish Hatchery is an important component in the effort to reintroduce chinook salmon, supplement summer steelhead and enhance fisheries in the Umatilla River. The Umatilla Hatchery production goals and a comprehensive monitoring and evaluation plan were first presented in the Umatilla Hatchery Master Plan (CTUIR and ODFW 1990). The Comprehensive Plan for Monitoring and Evaluation of Umatilla Hatchery (Carmichael 1990) was approved by the Northwest Power Planning Council as a key adaptive management guide for fisheries rehabilitation in the Umatilla River. The Umatilla Hatchery Monitoring and Evaluation project started in 1991. Past hatchery monitoring and evaluation focused on comparison of the effectiveness and efficiency of producing fish in standard Oregon and oxygen-supplemented Michigan raceways, rearing density effects on the performance of subyearling fall chinook and summer steelhead reared in Michigan raceways, and comparisons of yearling spring chinook reared at Umatilla, Bonneville, Little White Salmon, and Carson hatcheries. The data analyses and reporting for many of the original Umatilla Hatchery evaluations are being completed, allowing for the development of new monitoring and evaluations to address uncertainties identified in the 2001 Umatilla Subbasin Summary. The new objectives and tasks included in this proposal were not identified in the Umatilla Hatchery Master Plan (CTUIR and ODFW 1990), but were developed to address current uncertainties and data gaps to achieve management objectives, identified in the Umatilla Subbasin Summary (Saul et al. 2001). New

objectives in this proposal include monitoring and evaluation of: 1) subyearling fall chinook size, release and acclimation strategies to improve SAR, and straying into the Snake River fall chinook ESU; 2) a yearling spring chinook over-winter rearing strategy to better mimic a natural thermal regime which is lacking at the well-water supplied Umatilla Hatchery; and 3) lower river release strategies to increase SAR of summer steelhead.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
20516	Umatilla Subbasin	Umatilla Subbasin Umbrella
8903500	Umatilla Hatchery O&M	Rearing facility for yearling spring chinook, subyearling fall chinook and summer steelhead released into the Umatilla River.
8343500	Umatilla Hatchery Satelite Facilities O&M	The satelite facilities are used for acclimation and releases of Umatilla Hatchery production, and brood stock collection for the chinook and steelhead production programs.
8902401	Umatilla River Juvenile Salmonid Outmigration and Survival M&E	The Juvenile Salmonid Outmigration and Survival M&E project operates and maintains the PIT-tag interogation station at West Extension Facility. The Hatchery M&E project relies on PIT-tag detection for hatchery smolt survival estimates.
9000501	Umatilla River Natural Production M&E	The Umatilla River Natural Production M&E provides estimates of the Umatilla Hatchery produced fish that spawn and contribute to natural production in the Umatilla River.

Relationship to Existing Goals, Objectives and Strategies:
Hatchery M&E Relationship to Umatilla Subbasin Summary
The Umatilla Hatchery Monitoring and Evaluation project provides information for culture and release of hatchery fish, harvest regulations, and natural escapement that support the effort to attain anadromous adult return and fishery objectives outlined in the Umatilla Subbasin Summary (Saul et al. 2001) and Table 1.

Table 1. Umatilla River Production Objectives and Fish Disposition (Taken from 2001 Umatilla Subbasin Summary, Saul et al. 2001)

	Returned to Umatilla Mouth			Disposition of Returns			
Species	Natural	Hatchery	Total	Escape-ment	Brood-stock	Harvest	Total
Spring Chinook	2,000	6,000	8,000	3,000	1,000	4,000	8,000
Fall Chinook	6,000	6,000	12,000	6,000	1,000[1]	5,000	12,000
Coho	Undetermined	6,000	6,000	To be determined			
Steelhead	4,000	1,500	5,500	4,000	116	1384	5,500

The 2001 Umatilla Subbasin Summary outlines four general management goals that relate to fish species in the basin:

1. Protect, enhance and restore wild and natural populations of summer steelhead, bull trout, shellfish and other indigenous fish in the Umatilla Basin
2. Reestablish runs of extirpated spring chinook, fall chinook, coho salmon and Pacific lamprey into the Umatilla River Basin.
3. Provide sustainable ceremonial, subsistence, and recreational fisheries and non-consumptive fish benefits such as cultural and ecological values.
4. Maintain genetic and other biological characteristics of indigenous populations and genetic viability of reintroduced populations.

The Umatilla Subbasin Summary (Saul et al. 2001) contains strategies and action items needed to attain the above fish related goals. Table 2. presents Umatilla Hatchery M&E proposed objectives and tasks related to strategies and actions identified in the Umatilla Subbasin Summary. The managers identified low smolt to adult returns (SAR) as a primary factor impeding achievement of natural production, broodstock and harvest objectives. Specifically, hatchery production SARs are far below the target levels outlined in the Umatilla Master Hatchery Plan (CTUIR and ODFW, 1990). Specific Umatilla Hatchery M&E objectives (Section F of this proposal) developed to address the low SARs are: fall chinook, objectives 1, 4, 5 and 6, 12 and 13; Spring chinook, objectives 2, 7, 8 and 12 and 13, and summer steelhead, objectives 3, 12 and 13.

Table 2. The relationship between the Umatilla Hatchery Monitoring and Evaluation project objectives and strategies and actions identified in the 2001 Umatilla Subbasin Summary (Saul et al.2001)

Strategy and Action Items Identified in the 2001 Umatilla Subbasin Summary	Proposed Umatilla Hatchery M&E Objectives
Strategy 6. Continue to supplement the recently reintroduced spring chinook population with a hatchery program consisting of Carson stock to provide natural production and harvest. *Action 6.1* Continue releasing 710,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat in the upper Umatilla River Basin to achieve a portion of spring chinook objectives. *Action 6.2* Release an additional 515,000 spring chinook smolts from acclimation facilities into historic spring chinook habitat in the upper Umatilla River Basin to achieve the remainder of the spring chinook objectives.	Obj. 2, task a. and b. Obj. 7, task a and b. Obj. 8, task a.-c. Obj. 9, task a. Obj.12, task a.-d. Obj. 2, task a. and b. Obj. 7, task a and b. Obj. 8, task a.-c. Obj. 9, task a. Obj.12, task a.-d.
Strategy 7. Continue to supplement the recently reintroduced fall chinook population with a hatchery program consisting of upriver bright stock obtained from returns to the Umatilla River and/or returns to Priest Rapids Hatchery.	

Action 7.1 Continue the interim program of releasing 480,000 age 1+ and 600,000 age 0+ fall chinook smolts from acclimation facilities into historic fall chinook habitat in the mid Umatilla River Basin. *Action 7.2* Assess monitoring and evaluation results to determine appropriate program changes to achieve objectives.	Obj. 1, task a and b. Obj. 4, task a. and b. Obj. 5, task a and b. Obj. 6, task a and b. Obj.12, task a.-d. Obj.9, task a. Obj.10, task a. Obj.11, task a.
Strategy 9. Supplement the indigenous summer steelhead population with a hatchery program consisting of local broodstock to enhance natural production and provide harvest opportunities. *Action 9.1* Continue releasing 150,000 steelhead smolts from acclimation facilities into historic steelhead habitat in the mid-to-upper Umatilla River Basin. *Action 9.2* Design and implement a comprehensive study to assess whether supplementation activities in the subbasin have been effective in rebuilding natural steelhead while maintaining their genetic structure and long-term viability.	Obj. 3, task a and b. Obj. 9, task a, b and c. Obj. 10, task a. Obj. 11, task a.
Strategy 12. Implement artificial propagation practices to maintain genetic and biological integrity of supplemented stocks. *Action 12.2* When fish health and disease issues are identified, take appropriate remedial actions to maximize survival of affected fish and prevent spread to other natural and hatchery fish.	Obj. 12 task a.-d. Obj. 13 task a.
Strategy 13. Monitor and evaluate Umatilla hatchery programs to ensure they are successful and minimize adverse effects on listed or other indigenous species. *Actions 13.1-13.9 comprise the same M&E objectives contained in section F. of this proposal*	Objectives 1-13, all tasks.

Hatchery M&E Relationship with NMFS Biological Opinion
The proposed objectives of the Umatilla Hatchery M&E project relate to "Reform Existing Hatcheries and Artificial Production Programs" in the 2000 National Marine Fisheries Service Biological Opinion. Specifically, Actions 107, 169, 174 and 182.

<u>BiOp Action 107</u>
Smolt-to-adult survival estimates are a large component of the Umatilla Hatchery Monitoring and Evaluation projects. Our subyearling fall chinook program is currently in a scaled-down, evaluation mode, prompted by low SAS and high straying rates. The low SAS and high straying rates are being addressed through tests of lower versus upper river release strategies and acclimation strategies. We currently wire-tag 100% of the fall chinook production at Umatilla Hatchery. The wire tags trip traps at Lower Granite Dam, reducing the number of fall chinook strays that escape into the Snake River fall chinook ESU.

<u>BiOp Action 169</u>
Results from the Umatilla Hatchery M&E project have been used to develop the hatchery and genetic management plan (HGMP) for the mid-Columbia steelhead ESU in the Umatilla River.

<u>BiOp Action 174</u>
Umatilla Hatchery produced spring chinook have strayed into the Tucannon River, Washington. One hundred percent of the spring chinook salmon produced at Umatilla Hatchery will have a production mark. This will also allow better estimates of non CWT'd hatchery fish that spawn and contribute to natural production in the Umatilla River.

<u>BiOp Action 182</u>
Endemic Umatilla River stock is reared at the Umatilla Hatchery to supplement steelhead in the Umatilla River. The large number of coded-wire-tagged steelhead will allow better estimates of naturally spawning hatchery steelhead in the Umatilla River.

Umatilla Hatchery M&E Relationship with NPPC Fish and Wildlife Program Objectives
The proposed objectives of the Umatilla Hatchery M&E project relate to Sections 4 "Artificial Production Strategies", and 9 "Research Monitoring and Evaluation" objectives in the 2000 Columbia River Basin Fish and Wildlife Program. Specifically, relating to section 4; results from the Umatilla Hatchery M&E are used to guide the development of the Umatilla Hatchery Annual Operations Plan (AOP). Table 3. presents recommendations from the Umatilla Hatchery M&E project, and subsequent changes in hatchery operation, release strategies and acclimation in the program. All fish reared in Umatilla Hatchery are progeny of broods spawned under IHOT (1995) guidelines. The Umatilla Hatchery M&E project includes creel surveys of the anadromous fisheries on the Umatilla River. The Creel surveys provide information to the managers regarding harvest of hatchery and wild mid-Columbia ESU steelhead, section 5, 2000 FWP.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
626,178 Category: High Priority	631,381 Category: High Priority	572,848 Category: High Priority

Project: 199000501 – Umatilla Basin Natural Production Monitoring and Evaluation Project

Sponsor: CTUIR

Short Description:
Monitor and evaluate natural spawning, rearing, migration, survival, age and growth characteristics and life histories of adult salmon, steelhead, bull trout and mountain whitefish, and their naturally produced progeny in the Umatilla River Basin.

Abbreviated Abstract:
Our project goal is to provide quality information to managers and researchers working to restore anadromous salmonids to the Umatilla River Basin. This is the only project that monitors the restoration of naturally producing salmon and steelhead in the basin. The project objectives are to measure, estimate and report salmonid spawning success, rearing densities and abundance, habitat quality and quantity, production capacity of the basin, life history characteristics, and migration timing and success. This project also monitors tribal harvest (roving creel and telephone surveys) and water temperatures (Ryan and Vemco thermographs) in coordination with ODFW, USFS and other CTUIR projects.

Researchers and managers from throughout the basin examine and modify this project during monthly and annual coordination meetings. We strive to provide the best information for adaptive management of local salmon and steelhead. The information generated by this project also has utility for salmonid restoration efforts throughout the Columbia River Basin.

While certain monitoring activities are conducted each year, others objectives are already completed or were deferred to future years through prioritization, need, and limitations in personnel and funding. Adult passage facility evaluations, physical habitat surveys and genetic monitoring are examples of this. Currens and Schreck (1993, 1995) developed a genetic baseline for endemic steelhead in the Umatilla Basin from samples collected in 1992 and 1994 (allozyme and mtDNA). Genetic characteristics will be examined again FY 2005. Geneticists under contract will use both electrophoresis and DNA techniques to examine the null hypothesis that current artificial propagation of endemic steelhead has not compromised population's genetic characteristics. The Management Oversight Committee will likely request genetic monitoring again in 2015.

We communicate findings to researchers and managers through formal reports, monthly oversight committee meetings, annual basin operation meetings, and formal presentations at various conferences and forums. This project is developing a web site where raw data, summarized data, reports, analyses and findings will be available on line.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
	Develop Progeny Marker for Salmonids to Evaluate Supplementation	After the Progeny Marker Project develops and tests the mark, our M&E project will use it to evaluate the reproductive success of hatchery reared endemic steelhead allowed to spawn naturally in the Umatilla Basin (beginning in 2005).
9000500	Umatilla Hatchery M&E	Our M&E project coordinates monitoring throughout the basin with the Hatchery M&E program. Our M&E project collects coded wire tags form hatchery reared adults found during spawning surveys. Tag recoveries are critical to the Hatchery M&E programs.
8902401	Evaluation of Juvenile Salmonid Outmigration and Survival	Our M&E project relies on the Outmigration project to maintain the PIT tag detector at Three Mile Dam, to detect the natural smolts we tag, to estimate detector efficiency rates, and to augment our tagging of naturally produced smolts.
8805302	Design and Consturct Umatilla Hatchery, Supplement	The hatchery supplement will increase hatchery adults spawning in the wild with increases in returning adults. Our M&E project monitors these spawners and their progeny as well as residualism rates of hatchery smolts.
8373600	Umatilla Passage Facility Operations and Maintenance	Our project measures the success of this project indirectly in terms of increased natural production.
8902700	Power Repay Operations and Maintenance of USBR CRP Project	
8343500	Umatilla Hatchery Satellite Operation and Maintenance	The acclimation facilities release hatchery reared smolts to increase natural production through returning adult spawners. Our M&E project monitors these spawners and their progeny as well as residualism rates of hatchery smolts.
8802200	Umatilla Fish Passage Operations	Passage Operations provides quality adult return data for our M&E project to estimate adult return rates. Passage Operations also coordinates water storage releases that benefit hatchery and natural smolt and adult migrations.
9506000	Lamprey Restoration	We provide the Lamprey Project with any information we collected on juvenile and adult lamprey while completed project tasks.
9008000	PIT Tag Information System	We depend on the PIT tag system to coordinate and store PIT tag data and interrogate and detect our PIT tagged smolts throughout the Columbia Basin.
8710001	Umatilla Fish Habitat Enhancement	Our M&E project monitors salmonids and habitat features within and adjacent to habitat enhancement projects.

Relationship to Existing Goals, Objectives and Strategies:
This project is the measuring tool of natural production restoration efforts in the Umatilla River Basin as outlined in the NPPC Columbia River Basin Fish and Wildlife Program (section 3.1B, 1994). The Umatilla Basin fisheries restoration program is a direct result of planning and restoration efforts of CTUIR (1984), ODFW (1986), BPA (1994) and NPPC (1990). We provide detailed information regarding the natural spawning, rearing and migration success of spring chinook salmon, fall chinook salmon, coho salmon and summer steelhead. This project's fundamental purpose is to measure the success of the salmon and steelhead restoration efforts and provide information for adaptive management. Information we provide also has utility for restoration efforts throughout the Columbia River Basin.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
280,716 Category: High Priority	300,000 Category: High Priority	310,000 Category: High Priority

Project: 199402600 – Pacific Lamprey Research and Restoration

Sponsor: CTUIR

Short Description:
Implement and monitor Pacific lamprey restoration plan developed for the Umatilla River. Assess ability of Pacific lampreys to detect migratory pheromone emitted by larvae, test for genetic differences.

Abbreviated Abstract:
The purpose of this study is to provide the critical information to restore Pacific lampreys *Lampetra tridentata* in the Umatilla River that is called for in the Umatilla Subbasin Summary. This information is essential for restoration of lampreys and to provide tribal members opportunities to practice cultural use and provide ecosystem function. Pacific lampreys are vital components of intact ecosystems that have been affected directly and indirectly by dams, habitat deterioration, and possibly food web shifts in the ocean. The project has objectives: (1) increase larval abundance in the Umatilla River, (2) determine reproductive success of adult lamprey outplants, (3) estimate the numbers of adult lampreys entering the Umatilla River, (4) monitor larval population trends in the Umatilla River, (5) estimate the numbers of recently metamorphosed lampreys migrating out of the Umatilla River, (6) Evaluate the potential role of bile salts released by larval lampreys as a migratory cue to upstream migrating Pacific lampreys, and (7) Describe genetic differences among Pacific lampreys.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
871001	Umatilla Fish Habitat Enhancement	habitat improvements in Umatilla
8802200	Umatilla Fish passage Operations	water in river is good for lampreys

Relationship to Existing Goals, Objectives and Strategies:
This project is essential to evaluate recovery efforts for Pacific lampreys in the Umatilla River. The project addresses the needs outlined in the Umatilla Subbasin Summary and the provisions of the *Fish and Wild Program.* The Umatilla Subbasin Summary calls for strategies to "Develop and implement a Pacific lamprey restoration plan for the Umatilla Basin." Our first objective addresses Action 10.1, which is to "Continue outplanting of adults as detailed in the Umatilla River Basin Pacific Lamprey Restoration plan (CTUIR 1999). Our second objective addresses Action 10.2, which is to "Determine reproductive success of adult outplants. Our third, fourth, and fifth objectives addresses Action 10.3, which is to "Monitor for increases in larval abundance, juvenile outmigration, and adult returns." Our sixth objective is not mentioned in the subbasin summary, however CTUIR needs this research to better understand the lampreys ability to detect pheromones, which may be very important for management and restoration in the Umatilla Basin. Our seventh objective addresses Action 10.5, which is to "Continue genetic assessment of lamprey populations among and within the Umatilla and selected Columbia River subbasins."

Pacific lampreys are also covered under Section III.C.2.a).1. of the *2000 Columbia River Basin Fish and Wildlife Program.* This states "Obtain the information necessary to begin restoring the characteristics of healthy lamprey populations."

Pacific lampreys are again covered in the National Marine Fisheries Service's Biological Opinion (NMFS 2000), section 7.3 'Tribal Actions' state, 1) Halt the decline of salmon, lamprey, and sturgeon populations above Bonneville Dam within 7 years, and 2) Increase lamprey and sturgeon to naturally sustaining levels within 25 years in a manner that supports Tribal harvest.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
520,464 Category: High Priority	500,000 Category: High Priority	510,000 Category: High Priority

Project: 199506001 – Protect and Enhance Wildlife Habitat in Squaw Creek Watershed

Sponsor: CTUIR

Short Description:
Protect and enhance watershed resources to provide benefits for eight HEP Target Species and anadromous and resident salmonids.

Abbreviated Abstract:
Protection and enhancement of habitats within Squaw Creek Watershed provide dual benefits for fish and wildlife by 1) providing perpetual protection of watershed resources, 2) enhancing habitats to provide partial mitigation for McNary and John Day Hydroelectric Power Projects impacts, and 3) improving natural salmonid habitat and production. Habitats within the 24,200 acre Squaw Creek subbasin provide approximately 3,832 Habitat Units of protection credit for eight target mitigation species, including the western meadowlark, downy woodpecker, black capped-chickadee, blue grouse, mule deer, yellow warbler, mink, and great blue heron. Squaw Creek provides 23 miles of anadromous and resident fish habitat and is critical to natural production of Threatened summer steelhead in the Umatilla Basin. In 1992 approximately 25% of summer steelhead spawning in index areas of the Umatilla Basin spawned in Squaw Creek. Other salmonids benefiting from perpetual habitat protection and enhancement include Threatened bull trout, redband trout, and re-introduced spring chinook and coho salmon. Project objectives include; 1) continue operations and maintenance to provide 3,832 Habitat Units of wildlife habitat protection credit, 2) implement enhancements to contribute towards the provision of 5,554 enhancement credits. Operations and Maintenance objectives will be achieved by 1) leasing and resting 20,000 acres of BIA-administered grazing allotments, 2) allotment fence maintenance, 3) noxious weed control, and 4) access and travel management. Enhancement objectives will be achieved by; 1) obliterating 6 miles of road, 2) continuing implementation of a co-operative project with the Environmental Protection Agency to add large woody debris to Squaw Creek, 3) continuing conifer, hardwood, and shrub plantings in riparian and floodplain habitats, and 4) collecting/propagating native plant material for out-year restoration projects. Monitoring and evaluation elements in FY02 will focus on the large wood addition project.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
8710001	Umatilla Basin Habitat Enhancement	Project incorporates Squaw Creek Watersjed due to its critical contribution of summer steelhead spawning/rearing habitat to the Umatilla Basin. Opportunities exist to share personnel, vehicles, and equipment to minimize project expense.
9000501	Umatilla Basin Natural Production Monitoring and Evaluation.	Fish habitat monitoring and evaluation surveys for the Squaw Creek Watershed will be conducted under this project, and will help quantify benefits of activities accomplished under this proposal.

Relationship to Existing Goals, Objectives and Strategies:
Rationale for this proposal are provided in the part by the Umatilla Subbasin Summary (Saul, D.; Craig, R; and A. Davidson. 2000), which identifies fish and wildlife habitat limiting factors, goals, objectives, strategies, and needs. Additional project rationale are

provided in the principals of the 1994 Fish and Wildlife Program. Appropriate Subbasin Summary information will be presented first, followed by applicable Fish and Wildlife Program principals.

Umatilla Subbasin Habitat Areas and Quality - Fish

Salmonid habitat in the Umatilla subbasin has been considerably reduced over the last century. Since the late 1800's, habitat has been fragmented and degraded from increasing land use and disturbance (Oregon Department of Environmental Quality 2000). Approximately 70% of the Umatilla River has been levied or channeled (observation, aerial photography, CTUIR habitat survey), effectively disconnecting major portions from the floodplain (Shaw and Sexton 2000). Similarly, it is estimated that 70% of all Umatilla tributaries are in need of riparian improvement (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife 1990).

Extensive vegetation removal and disturbance associated with urban development, cultivation, forestry, transportation corridors, flood control and navigation has occurred and continues to occur in the subbasin (Oregon Department of Environmental Quality 2000). This results in an aquatic landscape which suffers from inadequate streamflows, excessive temperatures, structural impediments, inadequate riparian corridors, simplified and reduced instream habitat, and excessive erosion (e.g., CTUIR 1996; Crabtree 1996; Shaw and Sexton 2000; ODFW 1990). These factors have jeopardized stronghold habitats, reduced the number of adult spawners and have contributed to decreased smolt-to-adult returns in anadromous species. According to the Oregon Statewide Assessment for the Umatilla River Basin, "[t]he most commonly cited causes of beneficial use degradation were vegetation removal along streambanks, removal of thermal cover over streams, and surface erosion. The land uses most commonly cited in connection with these problems were irrigated and non-irrigated agriculture, grazing, and associated vegetation management within grazing and agriculture" (Oregon Department of Environmental Quality 1988; Purser, 1994).

In 1984, the CTUIR established riparian area restoration priorities, totaling more than 130 miles (Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish and Wildlife 1990; Shaw 1996-1997). The following are priority streams for restoration

- Meacham and lower North Fork Meacham Creeks
- South Fork Umatilla River and Thomas Creek
- Mainstem Umatilla River (Meacham Creek to North and South Forks of Umatilla River)
- Squaw Creek
- East Fork, West Fork and mainstem Birch Creek
- Buckaroo Creek
- Ryan Creek
- Mainstem Umatilla River (Pendleton to Meacham Creek)
- Spring Creek and Shimmiehorn Creek

Umatilla Subbasin Limiting Factors - Fish

The primary limiting factors to salmonid abundance and distribution were defined by the Columbia Basin Fish and Wildlife Authority (Draft Annual Implementation Work plan 2000) as

- Inter-related water quantity and quality problems (e.g., low flows/high temps. & pollutants) result in poor survival during juvenile rearing and migration in the lower Umatilla River.
- Low flows and diversion barriers restrict adult migration
- Riparian degradation and lack of pools reduces adult holding and juvenile rearing survival in the upper reaches of the Umatilla subbasin
- Water quantity, quality, and sediment problems limit salmonid spawning and rearing.

Umatilla Subbasin Needs, Strategies, and Actions Incorporated into this Proposal

Needs, strategies, and actions for improving the population status of key fish species listed in the Umatilla/Willow Subbasin Summary and incorporated into this proposal include:

- Need: Improve Stream Flows

  Strategy 4. Protect, enhance and restore instream flows to improve passage conditions and increase rearing potential for anadromous and resident fishes in the Umatilla River Basin.

  Action 4.8 Continue to refine knowledge of flow limited stream reaches and results of enhancement efforts to address remaining needs.

- Need: Improve Stream Temperatures

  Strategy 2. Protect, enhance or restore water quality to improve the survival, abundance and distribution of indigenous resident and anadromous fish.

  Action 2.1 Reduce stream temperatures by restoring or enhancing riparian vegetation, floodplain function and increasing hyporehic and instream flows.

  Action 2.5 Support timely updates and resource inventories related to local land use plans to prevent further development and degradation of floodplains, wetlands, riparian and other sensitive areas.

  Action 2.6 Properly maintain, relocate, or eliminate forest, public, and private roads in riparian or other sensitive areas.

  Action 2.8 Use existing cooperative or regulatory programs to reduce sediment delivery to stream channels from roads, agriculture, logging, and other land use activities.

Action 2.9	Monitor and evaluate efforts to improve water quality and utilize data to assist in management decisions.

- Need: Improve Riparian Habitats and Instream Habitat Quality/Diversity

Strategy 3: Protect, enhance or restore instream and riparian habitat to improve the survival, abundance and distribution of indigenous resident and anadromous fish.

Action 3.1	Enforce Federal, Tribal, State and local land use regulations designed to protect fish habitats.
Action 3.2	In the short term, plant native vegetation, construct pools and place large woody debris in streams to provide adequate pools and cover for fish. Maintain operation and maintenance of projects already in place.
Action 3.3	Over the long term, implement improvements to stream geomorphic features (sinuosity, width/depth ratio, pool frequency, depth and dimension, entrenchment, etc.) that will result in benefits to fish habitat quantity and quality.
Action 3.4	Over the long term, restore riparian vegetation and adjacent valley bottom and upland vegetation to result in the natural long term recruitment of large woody debris into streams.
Action 3.5	Implement provisions of the Umatilla River Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan.
Action 3.6	Reduce sediment deposition in area streams by reducing erosion and sediment delivery to waterways.
Action 3.7	Improve watershed conditions to reduce human-induced increases of flood peak flows and duration to reduce instream substrate scour, deposition or movement.
Action 3.8	Improve floodplain function to improve stream channel stability, hyporehic flows and instream habitat diversity.
Action 3.9	Improve or eliminate stream fords and other substrate disturbances.
Action 3.10	Protect critical habitat to improve production and survival of indigenous fish. Continue to refine delineation of stronghold areas.
Action 3.11	Monitor and evaluate efforts to protect, enhance and restore instream and riparian habitats.

- Need: Reduce Sediment Inputs

  Apply Strategies 2 and 3 as listed above.

- Need: Protect Stronghold Habitats

Strategy 3: Protect, enhance or restore instream and riparian habitat to improve the survival, abundance and distribution of indigenous resident and anadromous fish.

Action 3.10 Protect critical habitat to improve production and survival of indigenous fish. Continue to refine delineation of stronghold areas.

Umatilla Subbasin Objectives and Strategies – Wildlife

The following Objectives and Strategies, selected and incorporated directly from the Umatilla Subbasin Summary (Saul, et al 2000), provide the rationale for activities contained in this funding proposal. Riparian habitat enhancement objectives and grassland protection objectives are the focus of FY02 of this proposal, while other objectives are addressed in years three through six.

Habitat Objectives

Forest Habitats

- Restore and maintain late seral ponderosa pine habitat
- Maintain and restore habitat connectivity across forest landscapes
- Increase heterogeneity in species composition and structural stage
- Increase snag and down wood density
- Restore fire as an ecological process

Strategies

- Design vegetative management strategies consistent with historical succession and disturbance regimes

Grassland/Shrub Steppe Habitat

- Protect and enhance remaining shrub steppe habitats
- Minimize further degradation of shrub steppe habitat (e.g., reduce, eliminate or improve livestock grazing practices)
- Maintain cryptogamic crusts where they occur, and seek ecologically appropriate sites for restoration to ensure proper functioning native plant communities.
- Maintain sites dominated by native vegetation and initiate actions to prevent infestations of exotic vegetation

Riparian and Wetland Habitats

- Protect and enhance riparian and wetland habitat.

Strategies

- Institutionalize a policy of "no net loss" of riparian and wetland habitat (i.e., discourage loss and conversion of habitat, but when unavoidable, mitigate with equal or greater restoration efforts)
- Initiate actions to increase high quality riparian and wetland habitat through restoration

of degraded riparian habitat
- Maintain all tracts of contiguous cottonwood gallery forest >50 acres, regardless of understory composition
- Maintain multiple vegetation layers and all age classes (e.g., seedlings, saplings, mature, and decadent plants) in riparian woodlands
- Initiate actions to increase size (width and length) and connectivity of existing riparian patches (i.e., reduce fragmentation) through restoration and acquisition efforts
- Limit grazing intensity to maintain the integrity of native species composition and health

Habitat Needs

Forest

1. Protect, maintain, and enhance late-seral dry forest habitats
2. Maintain large patch size late-seral dry forest stands
3. Restore and maintain snag and downed wood densities of a variety of species to meet nesting and foraging requirements of forest dwelling landbirds
4. Move mid-elevation and foothill big game winter range habitat into protected status
5. Protect, enhance, and restore aspen groves.
6. Reduce road densities and associated impacts to watershed functions

Grasslands

1. Enhance and restore native perennial grassland habitats
2. Reduce non-native annual grasses in shrub-steppe and grassland habitat
3. Pursue and implement effective biological controls on noxious weeds including yellow-star thistle and knapweeds

Riparian

1. Control noxious weeds in specific high value habitat areas (e.g. reed canary grass in wetland and riparian communities)
2. Restore riparian understory shrub communities
3. Maintain and improve large structure riparian cottonwood galleries for Lewis's woodpeckers

Wildlife Populations - Goals

1. Achieve and sustain levels of species productivity to mitigate for wildlife and wildlife habitat losses caused by the development and operation of the hydropower system (NWPPC 1995).
2. Maintain wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout natural geographic ranges (Puchy and Marshal 1993).
3. Restore and maintain self-sustaining populations of species extirpated from the state or regions within the state, consistent with habitat availability, public acceptance, and other uses of the lands and waters of the state (Puchy and Marshal 1993).

4. Provide recreational, educational, aesthetic, scientific, economic and cultural benefits derived from Oregon's diversity of wildlife (Puchy and Marshal 1993).
5. Ensure long-term maintenance of healthy populations of native landbirds (Altman and Holmes 2000a, 2000b)
6. Identify, establish standards, and implement management measures required for restoring threatened and endangered species, preventing sensitive species from having to be listed as threatened or endangered, and maintaining or enhancing other species requiring special attention (Puchy and Marshal 1993).

Wildlife Populations - Objectives

1. Restore anadromous fish populations to support dependent wildlife and promote natural nutrient cycling
2. Maintain, protect and enhance big game winter range

Proposed riparian and instream enhancement activities designed to address limiting factors described in the Technical Background section assist in meeting the objective or restoring anadromous fish populations. Outyear grassland enhancements and reductions in total and open road density meet the second objective of maintaining, protecting, and enhancing big game.

Mule Deer (Squaw Creek Watershed Mitigation Species)

Objectives

Maintain healthy populations of mule deer in the subbasin

Strategy

Move heavily used critical winter range to protected status, managed for optimum big game winter habitat

Mule deer are one of the mitigation species of the Squaw Creek Watershed project, and the species utilizes Squaw Creek year round, though use is highest in winter. During the course of ODFW/CTUIR co-operative big game herd composition surveys, as many as 90 mule deer have been counted during a single survey flight. The habitat protection activities, and out-year project activities including grassland enhancements and reducing total and open road density, benefit mule deer and assist in meeting the above objectives.

Elk

Objectives

- Maintain healthy Rocky Mountain elk populations
- Maintain, enhance, and restore elk habitat
- Minimize conflicts between wintering wild ungulates and commercial agricultural activities.
- Enhance consumptive and non-consumptive recreational uses of Oregon's elk resource

Strategies

- Ensure both adequate quantity and quality of forage to achieve elk population management objectives in each management unit

- Ensure habitat conditions necessary to meet population management objectives on critical elk ranges
- Maintain public rangeland in a condition that will allow elk populations to meet and sustain management objectives in each unit
- Move heavily used critical winter range to protected status, managed for optimum big game winter habitat.
- Increase forage quality and quantity in big game winter range.

Squaw Creek also provides critical big game winter range for Rocky Mountain elk. As many as 490 elk have been observed in the watershed during the course of herd composition surveys. Activities designed in part to benefit mule deer, are also expected to benefit elk. Beneficial activities include habitat protection, grassland enhancements, and reductions in total and open road density.

Project Rational and Significance to the 1994 Fish and Wildlife Program

In addition to addressing the goals, objectives, strategies, and needs identified in the Umatilla Subbasin Summary, the Squaw Creek Watershed Project contributes to the 1994 Fish and Wildlife Program goals and objectives of achieving and *sustaining levels of habitat and species productivity* as a means of fully mitigating wildlife losses caused by construction and operation of the federal and non-federal hydroelectric system (11.1). Northwest Power Planning Council program measures 7.6.A, 7.6B, 7.6C, 7.6D, 11.3A, and 11.3D are addressed by this project. More specifically, the project area addresses the following goals and principles listed in FWP Section 11.2D.1, which states, “In developing wildlife mitigation plans and projects, demonstrate to the extent to which the plans/projects comply with the following principles:”

- **Are the least-costly way to achieve the biological objective.**

Perpetual protection of the habitat types (riparian/wetland, native grassland, and coniferous forest) provided by the Squaw Creek project has been accomplished primarily through fee title acquisition. In a study comparing various mitigation methods (i.e., fee title acquisition and easements), Prose et. al. (1986) concluded that “Fee title land acquisition and subsequent management is generally more cost-effective than easements.” Similarly, wildlife agency acquisition specialists have also consistently found fee title acquisition to purchase land for wildlife mitigation is usually more economical in the long-term compared with the purchase of easements (Oregon Trust Agreement Planning Project, BPA et al. 1993).

- **Have measurable objectives, such as the restoration of a given number of habitat units**.

Management objectives for target wildlife mitigation species are based on the U.S. Fish and Wildlife Service Habitat Evaluation Procedures (USFWS, 1980). Habitat surveys are currently underway to assess baseline conditions. Under the CTUIR-BPA MOA, the CTUIR has identified an estimated baseline of 3,832 habitat units. An estimated 5,554 HU’s can be developed through habitat enhancements for a total project benefit of 9,386 habitat units.

- **Protect high quality native or other habitat or species of special concern, whether at the project site or not, including endangered, threatened, or sensitive species.**

The project area provides suitable habitat for the species listed as 'threatened,' including the northern bald eagle and the bull trout, as well as proposed threatened summer steelhead. Squaw Creek provides critical summer steelhead spawning and rearing habitat in the Umatilla Basin. Approximately 25% of the summer steelhead production in the Umatilla Basin occurs in Squaw Creek.

- **Provide riparian or other habitat that can benefit both fish and wildlife.**

The subbasin contains approximately 23 miles of anadromous and resident fish habitat and over 50 miles riverine habitat, providing dual benefits for fish and wildlife. The subbasin supports spring chinook and coho salmon, summer steelhead, and native redband and bull trout.

- **Where practical, mitigate losses in-place, in-kind.**

The Squaw Creek Wildlife Area was prioritized and developed by the CTUIR because of the size of the project (watershed scale) and its ability to achieve dual benefits for both fish and wildlife. Although the project area is located offsite, it located within about 36 air miles of Lake Wallula on the Columbia River and provides in-kind grassland, riparian hardwood and shrub, and sand/gravel/cobble/mud cover types. Habitat units for five John Day and McNary target wildlife species are provided by the project.

- **Help protect or enhance natural ecosystems and species diversity over the long term.**

By virtue of its size, the Squaw Creek project area lends itself to the protection and enhancement of biological diversity and ecological integrity in the Umatilla River basin. The property contains 4,898 acres of forested environments, which benefit target wildlife mitigation species such as the downy woodpecker, black-capped chickadee, mule deer and blue grouse. The area also supports a wide variety of wildlife including Rocky Mountain elk, mule deer, white-tailed deer, black bear, cougar, numerous birds of prey, beaver, primary and secondary cavity excavators and various other forest ecosystem species. Approximately 8,042 acres of native grasslands provide suitable habitat for target species such as western meadowlark. In addition, 958 acres of riparian/floodplain cover types provide habitat for the yellow warbler, great blue heron, and mink. The inter-agency HEP team supported the incorporation of mule deer and blue grouse into the analysis in order to address native upland and forested environments of the watershed. Because of its size and location adjacent to National Forest System lands, the property will contribute to the protection and enhancement Blue Mountain ecosystems.

- **Complement the activities of the region's state and federal wildlife agencies and Indian tribes.**

The location of the Squaw Creek area and its management for resident and migratory wildlife and anadromous fish and water quality directly complements federal and state land manager efforts to manage and protect resources region. The property adjoins Umatilla National Forest system lands on the east and is located within the diminished boundary of the Umatilla Indian Reservation. Its location therefore provides opportunities to complement resource management on lands administered by the USDA Forest Service and USDOI Bureau of Indian Affairs (BIA). The BIA-administered Trust lands (Tribal trust lands, individual Tribal allotments, and grazing leases) within the project area were included in the 1998 Squaw Creek watershed proposal and will provide an estimated 4,335 enhancement credits for this project.

Habitat protection and enhancement of the property also meets CTUIR goals of protecting, restoring, and enhancing key wildlife habitat (CTUIR Wildlife Mitigation Plan for the John Day and McNary Dams, Columbia River Basin, 1997). Furthermore, it promotes other key Tribal goals and activities including: 1) increasing opportunities for tribal members to exercise treaty rights reserved in the Treaty of 1855; 2) developing and promoting Tribal co-management and cooperative agreements with other federal, state, and tribal agencies for the benefit of biological and cultural resources in the Columbia Basin; 3) promoting regional/landscape biological diversity; 4) maintaining consistency with the Power Council Fish and Wildlife Program; 5) assisting BPA in meeting their wildlife mitigation obligations in a cost-efficient manner; 6) minimizing expenditures on mitigation planning and maximizing on-the-ground mitigation, enhancement, and protection of wildlife habitats.

- **Encourage the formation of partnerships with other persons or entities, which would reduce project costs, increase benefits and/or eliminate duplicative activities.**

Because of its location adjacent to the Umatilla National Forest and within the Umatilla Indian Reservation Boundary, Squaw Creek offers a variety of co-operative project opportunities with the Umatilla National Forest and Bureau of Indian Affairs. As is provides year round range for white-tailed deer and mule deer, and winter range for Rocky Mountain elk, co-operative project opportunities are also available with the Oregon Department of Fish and Wildlife and Rocky Mountain Elk Foundation. Primary project opportunities include forage enhancement and range improvements such as spring developments.

Relation to Umatilla/Willow Subbasin Summary

This proposal addresses Subbasin goals, objectives, and needs as described in the "Technical Background" section.

Review Comments:

No comments.

Budget:

FY02	FY03	FY04
222,268 Category: High Priority	228,245 Category: High Priority	240,161 Category: High Priority

New Projects

Project: 25016 – Assessment of habitat improvement actions on water temperature, streamflow, physical habitat, & aquatic community health in the Birch Creek Watershed

Sponsor: USGS

Short Description:
This study will explore the reach- and watershed-scale impacts of stream-habitat improvement actions on water temperature, streamflow and the food web in the Birch Creek watershed of the Umabilla subbasin.

Abbreviated Abstract:
The work proposed here will quantify the impacts of stream-habitat improvement actions on water temperature, streamflow, physical habitat, and the food web in Birch Creek, a tributary to the Umatilla River in northeastern Oregon. We will collect data at both the stream-reach and watershed scales to (1) identify, evaluate, and quantify fundamental processes that govern water temperature, streamflow, physical habitat, and the food web, (2) measure how habitat restoration actions alter these processes, and (3) assess the impact on target fish species of changes in these processes. Information gained through this work will be useful for comparing and contrasting the effectiveness of different habitat-improvement actions and optimizing future restoration work and monitoring strategies throughout the Columbia Basin.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
198710001	Umatilla Subbasin Fish Habitat Enhancement Project	The proposed study will measure the impact of habitat restoration actions

Relationship to Existing Goals, Objectives and Strategies:
The work proposed here is designed to rigorously monitor and evaluate the effectiveness of habitat-restoration activities at both the reach and watershed scales in the Birch Creek Basin. Results of this work will provide important information for optimizing future habitat-restoration work and associated monitoring strategies in many watersheds throughout the Columbia Basin. For example, the results of this work will be helpful for other restoration work such as that in the Trout Creek Basin, Oregon, where the Oregon Department of Fish and Wildlife (ODF&W), U.S. Army Corps of Engineers , and Jefferson County are developing long-term restoration plans. Other such projects are being funded throughout the Columbia Plateau Province as part of the BPA's Fish and Wildlife Program.

The methods developed in this study will be applicable throughout many areas in the Columbia Plateau Province.

Review Comments:
No comments.

Budget:

FY02	FY03	FY04
403,000 Category: Recommended Action	386,000 Category: Recommended Action	454,000 Category: Recommended Action

Project: 25029 – Westland-Ramos Fish Passage and Habitat Restoration Pilot Project

Sponsor: WID

Short Description:
Improve the upstream passsage for anadromous fisheries resources (migration, spawning and rearing), and enhace bedload transport function, by notching two diversion dams within a 1.25-mile river reach of the lower Umatilla River.

Abbreviated Abstract:
This project is a cost share with Westland Irrigation District and local landowners.

Problems

1. Upstream migration of summer steelhead is delayed at the Feed Dam near river mile 28 on the Umatilla River near Echo, Oregon. Current facility design is the primary problem for migrating adult salmonids (Contor et al., 1997). Late returning steelhead, spring chinook, fall chinook, and coho salmon are impacted. Timing for these fish is critical; migration delay and repeated attempts to negotiate the structure may promote pre-spawn mortality, impact distances migrated, and influence selection of spawning sites.

2. Bedload movement is impaired at the Feed and Westland Dams, and through the 1-mile intermediate channel. Maintenance activities are required to remove sediment accumulations at the fishway entrances in the forebays of the dams, and may pose an incidental take of listed and non-listed salmonids resulting from mechanical injury or temporarily degraded water quality. Bedload accumulations between the dams degrades fish habitat due to channel shifting, reduced complexity, high width-to-depth ratio, bank instability, and loss of riparian cover.

Objectives

1. Enhance fish passage by notching the Feed dam. In-stream grade control structures would be used to stabilize the notch, and ensure retention of diversion capacity. Structures would be set at bed elevation to eliminate obstacles to passage.

2. Minimize bedload removal operations that may pose incidental take of listed and non-listed salmonid species. Notching of both dams is necessary to route bedload past the Westland fishway structure.

The following generally outlines work components and timeframes to meet project objectives:

1. Consider and select preferred alternative (August 1998-April 1999);
2. Engineering feasibility of preferred alternative; develop preliminary monitoring and evaluation plan (June 1999-January 2000);
3. Sub-basin stakeholder consensus; landowner solicitation for conservation corridor (August-December 2000);
4. Final design and permitting (October 2001-June 2003);
5. Implementation (July-September 2003);
6. Develop, implement final monitoring/evaluation plan for physical and biological performances (October 2001-ongoing)
7. Adaptive modifications/O&M (October 2003-ongoing).

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
199000501	Umatilla Basin Natural Production M&E: Evaluate natural production of salmon & steelhead resulting from the Fisheries Restoration Program. Evaluate the implementation of the Umatilla Hatchery Master Plan for adult salmon & steelhead passage, etc.	Inventories & assessments (e.g. Contor et al 1997, Contor et al. 1996, and Contor et al. 1995) support the necessity to improve passage and habitat conditions in the river reaches affected by the Westland/Feed Canal diversion dams.
198710001	Umatilla Habitat Improvement/CTUIR: Conduct watershed planning & education. Identify problems & develop solutions. Implement & maintain anadromous habitat enhancement for Meacham Cr., etc.	Westland-Ramos project supports upriver habitat treatments since it complements the process of reconnecting fragmented sub-basin habitats, and improves the survival & productivity of upriver stocks using the reach as a migratory & rearing corridor.
198710002	Umatilla Habitat Improvement/ODFW: Improve habitat access, and the quantity & quality of spawning and rearing habitats for steelhead in the	Westland-Ramos project supports upriver habitat treatments since it complements the process of reconnecting fragmented sub-basin habitats, and improves the survival & productivity of upriver stocks using the reach

	Umatilla Basin Streams …	as a migratory & rearing corridor.
8710400	Umatilla Passage Improvements-Westland Diversion: Construct new fish ladder, fish screens, and fish bypass & trapping facilities at Westland I.D diversion dam.	The project would provide a dam notching supplement that would complement the existing upstream passage facility by minimizing bedload aggradations at the entrance/exit points. It would preserve trap haul facilities & operations at Westland' Diversion.
8710402	Improvements at Westland Diversion: Work at Westland diversion dam to improve fish passage.	The project preserves and enhances BPA Project #8710402 investments by relieving chronic bedload issue that impair operations at the fishway entrance/exits and diversion headgates.
8343600	Umatilla Passage O &M: Operate and maintain passage facilities at five irrigation diversion sites- Three Mile Dam. Westland ladder and canal screens, Feed Canal ladder and screens.	The project would reduce annual costs of BPA Project #8343600 since it will reduce costs relative to removal of gravel/materials aggradations that impair operations of the diversion headgate and fishway entrance/exit at Feed and Westland Diversions.
8802200	Umatilla River Basin Trap & Haul Program: Provide low-water fish passage in lower Umatilla R. by trapping & hauling fish and hauling to river sections with adequate water.	The project does not negatively impact BPA Project #8802200, but complements passage objectives in the Lower Umatilla in the Westland-Feed Canal reach.
8401000	Umatilla Basin Salmon & Steelhead Restoration Plan: Develop a comprehensive plan for rehabilitation of anadromous stocks, both wild and hatchery raised, in the Umatilla Basin.	The project would complement Project #8401000 objectives by significantly improving fish passage and restoring both spawning and rearing habitat.

Relationship to Existing Goals, Objectives and Strategies:
The Westland/Ramos Project and its objectives are consistent and compatible with the vision, objectives, and strategies of the NWPPC Fish & Wildlife Program (2000) as outlined below in Table 1. Likewise, project objectives are also generally consistent and compatible with the performance standards and objectives of the NMFS Biological Opinion (2000) as outlined below in Table 2. Relative to the Umatilla Sub-Basin Summary (2001), the project's objectives address specific strategies and associated actions for meeting sub-basin goals and objectives (Table 3).

Contor et al. (1997) concluded that the Feed Canal Dam is the only significant barrier to upstream migrating salmonid fishes, particularly adult summer steelhead and spring chinook, in the Umatilla river reach from above Three Mile Dam to above Stanfield Dam (RM 4 to RM 32.4) under adequate flow conditions. In the absence of removing this impediment to migration, delays in migration and injury will continue to occur at the expense of listed and non-listed salmonid species. Figures H-1, H-3, and H-5 (Contor et al., 1997) (*H-1 Link*, *H-3 Link*, *H-5 Link*) compare the upstream passage times for summer steelhead and spring chinook at the Westland, Feed, and Stanfield Dams, and illustrate the significant delay in adult passage at the Feed Dam. Table 4 (below) provides recommended actions for various fish passage barriers in mainstem and tributary reaches of the Umatilla Sub-basin below McKay. One of these recommended actions is the removal or modification of the Feed Canal Dam. "It is paramount, that appropriate strategies for revision at Feed Canal Dam are begun. If not, upstream migrants will continue to be severely delayed with some migrants completely unable to negotiate the structure." (Contor et al., 1997). Thus, notching of the dams is an action compatible with the aforementioned recommendation.

Bed load constantly accumulates at the irrigation head gates (HID and WID) and fishway entrances in the forebays of the Feed and Westland Dams. In-water maintenance activities, using heavy equipment, are periodically required to remove these bed load accumulations (gravel, sand, and silt). These activities may pose an incidental take of listed and non-listed salmonid fishes resulting from mechanical injury and/or temporally degraded water quality during low water conditions.

The notching the Feed Canal and Westland Dams will significantly reduce the potential for the incidental take of listed and non-listed salmonids by removing an upstream migration impediment and reducing the frequency of in-water activities to remove bed load accumulations. The dam notching action for the Feed Canal and Westland diversion structures addresses and is related to:

1. Action 5.2 of Strategy 5 of the Sub-Basin Summary – "Modify or remove culverts, bridges, grade controls and water diversion structures as necessary to improve fish passage." Table 4 provides recommended actions for various fish passage barriers in mainstem and tributary reaches of the Umatilla Sub-basin below McKay

2. An Objective Related To Listed Fish Habitat Needs & Tributary Efforts in Section 9.0 of the NMFS Biological Opinion- "Passage and diversion improvements that address in-stream obstructions and diversions that interfere with/or harm listed species."

3. An Overarching Objective in the NWPPC Fish and Wildlife Program (2000)- "Recovery of fish & wildlife under ESA."

Also, dam notching is an action that will provide a proportional improvement in the base survival rate of listed Umatilla summer steelhead, which is consistent with the Reasonable and Prudent Alternative of the 2000 FCRPS Biological Opinion.

Table 1. Project Objectives Relative to Addressing the Vision, Objectives, and Strategies Described in the NWPPC Fish and Wildlife Program (2000)

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
Vision-Related • Restore natural ecological functions, habitats, and biological diversity	YES	YES	YES
Over-Arching Objectives • Sustain an abundant, productive, and diverse community of fish & wildlife • Mitigate across the basin for adverse effects to fish & wildlife • Sufficient populations of fish & wildlife for abundant opportunities tribal trust and treaty and non-treaty harvest • Recovery of fish & wildlife under ESA	YES	YES	YES
Basin-Level Biological Objectives ***Anadromous Fishes*** • Halt declining trends in salmon & steelhead populations above Bonneville Dam by 2005 • Restore the widest possible set of healthy naturally reproducing population of salmon & steelhead by 2012 • Increase total adult salmon & steelhead runs above Bonneville by 2025	YES	YES	YES

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
Basin-Level Biological Objectives ***Resident Fishes*** • Maintain and restore healthy ecosystems and watersheds, which preserve links among ecosystem elements • Protect and expand habitat & ecosystem functions to increase abundance, productivity, and life history diversity	YES	YES	YES
Primary Habitat Strategy Identify the current condition & biological potential of the habitat, and then protect or restore it to the extent described in biological objectives. • Build from strength • Restore ecosystems, not just for single species	YES	YES	YES
Primary Monitory & Evaluation Strategy Monitor, evaluate, and apply results, and make information readily available.	YES	YES	YES

Table 2. Compatibility and Consistency of Project Objectives Relative to Performance Standards and Actions Related to Tributary Habitat as Described in Section 9.0, Reasonable & Prudent Alternative, of the NMFS Biological Opinion (2000)

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
Biological Performance Standards • Evaluate status of stock relevant to life-stage specific performances • Evaluate how effectively actions produce expected biological responses per actions • Include a robust and comprehensive M& E effort	YES	YES	YES
Physical Performance Standards • Supplement and serve as surrogates for biological performances • Use key habitat attributes to evaluate performances of strategies & associated actions, relevant to riparian conditions, bank integrity, maintenance of channel complexity, habitat access.	YES	YES	YES
Objectives Related To Listed Fish Habitat Needs & Tributary Efforts[1] • *Water quality*-Compliance with standards for spawning & rearing areas and	YES	YES	YES

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
migratory corridors • *Passage and diversion improvements*- Address in-stream obstructions and diversions that interfere with/or harm listed species • *Watershed health*- Manage both riparian and upland habitat, consistent with needs of the species • *Mainstem Habitat (e.g. Lower Umatilla River)*- Improve mainstem habitat on an experimental basis and evaluate results			

1/ Section 9.6.2.1, Page 9-133.

Table 3. Project Objectives Relative to Addressing Goals, Objectives, Strategies, and/or Actions Described in the Umatilla Subbasin Summary (2001)Fish Goals

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
• Protect, enhance and restore wild and natural populations of summer steelhead, bull trout, shellfish, and other indigenous species. • Reestablish runs of extirpated spring chinook, fall chinook, coho salmon, and Pacific lamprey. • Provide sustainable ceremonial, subsistence, and recreational fisheries and non-consumptive benefits such as cultural and ecological values	YES	YES	YES
Fish Objectives • Reestablish and maintain an average run size of spring chinook @ 8000 by 2010. • Reestablish and maintain an average run size of fall chinook @ 12,000 by 2020. • Reestablish and maintain an average run size of coho @ 6000 by 2010. • Achieve and maintain an average run size of summer steelhead @ 5500 by 2010. • Achieve and maintain an self-sustaining populations and fisheries of Pacific lamprey, bull trout and other indigenous fishes by 2010.	YES	YES	YES

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
Fish Strategies & Associated Actions			
Strategy 2: Protect, enhance or restore water quality to improve the survival, abundance and distribution of indigenous resident & anadromous fishes • *Action 2.1*: Reduce stream temperatures by restoring or enhancing riparian vegetation, floodplain function, and increasing hyporehic and instream flows. • *Action 2.9*: Monitor & evaluate efforts to improve water quality and utilize data to assist in management decisions.	YES	YES	YES
Strategy 3: Protect, enhance, or restore instream and riparian habitat to improve the survival, abundance and distribution of indigenous & anadromous fishes • *Action 3.2*: In short-term, plant native vegetation, construct pools and large woody debris in streams to provide adequate pools and cover for fish. Maintain O&M of projects in place. • *Action 3.3*: Over long-term, implement improvements to stream geomorphic features (sinuosity, width/dept ratio, pool frequency, depth and dimensions, entrenchment, etc.) that will result in benefits to fish habitat quantity and quality. • *Action 3.4*: Over the long term, restore riparian vegetation and adjacent valley bottom and upland vegetation to result in natural recruitment of large woody debris into streams.	YES	YES	YES

	Project Objective 1 *Improve Fish Passage*	**Project Objective 2** *Restore Channel Habitat*	**Project Objective 3** *Restore Riparian Habitat*
• *Action 3.8*: Improve floodplain function to improve stream channel stability, hyporehic flows and instream habitat diversity. • *Action 3.11*: Monitory and evaluate efforts to protect, enhance and restore instream and riparian habitats.			
Strategy 5: Improve fish passage conditions at all human-made passage impediments for resident and anadromous upstream and downstream migrants • *Action 5.2*: Modify or remove culverts, bridges, grade controls and water diversion structures as necessary to improve fish passage. • *Action 5.4*: Monitor river conditions and operations of passage facilities to ensure that adequate passage exists and implement adjustments as necessary to ensure efficient passage.	YES		
Strategy 14: Monitor and evaluate the productivity, abundance, distribution, life history and biological characteristics of anadromous and resident fish and relationship with instream and riparian habitat conditions within the Umatilla River Basin to assess the success of management strategies • *Action 14.2*: Conduct redd and carcass surveys to monitor adult salmonid spawning escapement. • *Action 14.5*: Conduct biological surveys to monitor and evaluate anadromous and resident fish distribution, abundance, condition, habitat use, life history, etc. • *Action 14.7*: Measure the quantity and quality of fish habitat in the basin.		YES	YES

Table 4. Known Fish Passage Barriers below McKay (A. Sexton, CTUIR, personal communication, February, 2001)

STREAM	RIVER MILE	BARRIER TYPE	COMPOSITION	STEP HEIGHT (m)	DEGREE	RECOMMENDED ACTION
Umatilla River	1.5	Channel Modification	Concrete	0.7	Partial	Modify
Umatilla River	2.4	Irrigation Dam	Concrete	1.0	Partial	Modify
Umatilla River	28.8	Feed Canal Irrigation Dam	Concrete	1.5	Partial	Modify / Remove
Umatilla River	49.0	Vacated Irrigation Dam	Unknown	1.2	Unknown	Remove
Jungle/ Windy Spring	0.1	Culvert	Steel	0.15	Partial	Modify
McKay Creek	6.0	Earthen Dam	Earth/ Concrete	40	Complete	Leave
Butter Creek	7.9	Flash Boards	Wood	2.3	Complete	Modify
Butter Creek	27.2	Irrigation Dam	Concrete	1.4	Complete	Modify
Butter Creek	43.0	Irrigation Dam	Concrete	1.2	Complete	Modify
Johnson Creek Tributary of Butter Creek	0.3	Culvert	Wood	0.8	Partial	Modify
Stewart Creek	0.6	Bridge	Concrete	0.4	Partial	Modify
Birch Creek	0.5	Pipe Casing	Concrete	1.4	Partial	Modify
Birch Creek	5.0	Irrigation Dam	Concrete	1.2	Partial	Modify/ Remove
Birch Creek	10.0	Irrigation Dam	Concrete	1.0	Partial	Modify
Birch Creek	15.0	Irrigation Dam	Concrete	1.0	Partial	Remove/ Modify
W. Birch Creek	3.8	Bridge	Concrete	1.2	Partial	Modify
W. Birch Creek	3.5	Irrigation Dam	Concrete	2.1	Partial	Modify

STREAM	RIVER MILE	BARRIER TYPE	COMPOSI-TION	STEP HEIGHT (m)	DEGREE	RECOM-MENDED ACTION
W. Birch Creek	5.5	Irrigation Dam	Concrete	1.4	Partial	Modify
W. Birch Creek	8.5	Irrigation Dam	Concrete	Unknown	Partial	Modify/ Remove
W. Birch Creek	9.0	Irrigation Dam	Concrete	Unknown	Partial	Modify/ Remove
W. Birch Creek	?	Culvert	Steel	Unknown	Unknown	Unknown
E. Birch Creek	9.0	Irrigation Dam	Concrete	0.8	Partial	Modify/ Remove
Stewart Creek	0.6	Bridge	Concrete	0.4	Partial	Modify

This is a new table supplement that will be included in a revised Umatilla Sub-Basin Summary (2001) (pers. com. Gary James, CTUIR).

Review Comments:
This project addresses NMFS RPA (will be provided during Committee reviews). This project would address current passage problems for all species.

Budget:

FY02	FY03	FY04
203,020 Category: High Priority	1,044,080 Category: High Priority	40,000 Category: High Priority

Project: 25047 – Morrow County Buffer Initiative

Sponsor: Morrow SWCD

Short Description:
Implements ripairan buffer program using cost share provided by USDA, State of Oregon, and private landowners.

Abbreviated Abstract:
Morrow SWCD provides local leadership in implementing several projects focused on improving watershed health. Working in close partnership with NRCS, Morrow SWCD provides a framework for a team that has the ability to develop and implement scientifically sound and economically feasible resource management plans for private landowners. This partnership also helps satisfy the four essential elements of the Oregon Plan in the areas of 1) coordination of effort by all parties, 2) development of action plans

with relevance and ownership at the local level, 3) monitoring progress, and 4) making appropriate corrective changes in the future.]

Morrow SWCD proposes to implement riparian buffer systems in the Mid-Columbia and address limiting factors identified in the Umatilla Subbasin Summary, March 2, 2001; and the John Day Subbasin Summary, March 2, 2001. This project will dedicate 1.0 FTE to provide program outreach and promotion of the programs along with the technical planning support needed to implement at least 40 riparian buffer system contracts on approximately 1000 acres covering an estimated 50 miles of streams in Morrow County. Additionally, this person will provide input and assistance to the subbasin assessment and planning process.

Buffer widths will vary from 35 to 180 feet on each side of the stream. Implementation will include prescribed plantings, fencing, and related practices. Actual implementation costs, lease payments, and maintenance costs will be borne by existing USDA and state of Oregon programs: Continuous Conservation Reserve Program (CCRP) and Conservation Reserve Enhancement Program (CREP). Leases will be for 10 to 15 year periods. These programs provide a critical opportunity for the protection of streams that have little to no riparian area protection. Lack of staffing to conduct assessments, develop and follow-up on plans has resulted in a significant drop in program participation and even the cancellation of some contracts. Contracts for CCRP buffers dropped from the development of 7 contracts in FY1999 to 1 so far in FY2001. There have been no contracts developed for the 31 miles of the Morrow County portion of Rock Creek. Rock Creek is designated as an anadromous fish stream. Landowners have shown interest in participating in the buffer programs, but with the lack of staff that can concentrate their efforts on buffers, this interest has diminished.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
	B.O. RPA 153	This proposal focuses on accelerating the protection of riparian areas on private lands by utilizating the Conservation Reserve Enhancement Program.
	B.O. RPA 154	Through this proposal staff assistance will be provided to the Subbasin Assessment and Planning process to coordinate local input and needs.

Relationship to Existing Goals, Objectives and Strategies:

This project to develop and implement CCRP/CREP buffer plans supports the Morrow SWCD action plan, action Item #IVb – 'Help landowners address wildlife habitat needs through the promotion and use of buffers through various programs such as CCRP and CREP. CCRP or CREP buffer plans will also address some of the needs and limiting factors of the John Day and Umatilla Subbasin Summaries. Some of the needs include improved riparian habitat, reduced sediment input, and decreased stream temperature.

Buffers remove sediment and nutrients, stabilize stream banks, improve fish habitat, and provide food sources, nesting cover and shelter for wildlife. More details on buffers and their effects can be found in a fact sheet on the Conservation Technology Information Center (CTIC) web site:

www.ctic.purdue.edu/Core4/news/annc/Bufferfact.html or at the Natural Resources Conservation Service (NRCS) web site.

The Oregon Plan calls for "community based actions" to conserve and restore habitat facilitated by "government coordination: to provide consistent and effective programs. For habitat, the Oregon Plan emphasizes the need to protect and restore riparian areas. Implementation of the CREP has been a major objective of the State of Oregon and is an emphasis of this proposal.

The 2000 Federal Columbia River Power System (FCRPS) biological opinion identifies three reasonable and prudent alternatives (RPAs) addressed by this proposal. RPA 152 requests the action agencies to coordinate their efforts and support for offsite habitat enhancement measures undertaken by other Federal agencies, states, Tribes and local governments. RPA 153 specifically requests BPA to work with agricultural incentive programs such as the CREP to protect 100 miles of riparian buffers per year. This project will implement riparian buffers on at least 50 miles of streams. Also, this project will address RPA 154 by providing input to the development and updating of subbasin assessments and plans.

This project to implement buffer systems supports the 1994 NWPPC Fish and Wildlife Program Habitat Goal, Policies and Objectives described in Section 7.6, particularly 7.6B1 helping private parties be proactive, 7.6B3integration of habitat work in broader watershed improvement efforts. Section 7.6B4 provides for higher priority for actions that maximize effect for the dollar, given this proposal seeks only funding to make technical assistance available, with other entities picking up the implementation and lease costs, it shows outstanding leverage of funds. The project supports the provisions of 7.6C for Coordinated Habitat Planning. Establishment of riparian buffers clearly supports actions identified in section 7.6D to reduce sediment, improve bank stability, and water quality. Tree establishment in riparian buffers will help stabilize banks, and provide shade that will help reduce heating rates on hot summer days. Direct planning with private landowners supports the concepts discussed in Section 7.7.

The Tribes'Anadromous Fish Restoration Plan, Wy-Kan-Ush-Mi Wa-Kish-Wit, page 35 identifies 7 actions of which 2 are directly addressed by establishing riparian buffers: Action 6 - Protect and enhance aquatic and riparian habitat; Action 9 – Increase stream bank cover, decrease water temperatures during the summer and increase stream flow.

Review Comments:

If there is a permanent or long-term easement, this proposal will address NMFS RPA 152 . Although money exists in the State of Oregon CREP program, the SWCD is statutorily unable to use the existing money. Managers question the appropriateness of allocating F&W Program money to administer (i.e., fund FTE) USDA projects. This project needs to be implemented consistent with limiting factors and problem locations identified in subbasin summaries and eventually subbasin planning to insure fisheries benefits to target species. There needs to be oversight by the COTR to insure that actions taken will benefit fish and wildlife.

Budget:

FY02	FY03	FY04
75,086 Category: High Priority	77,337 Category: High Priority	79,657 Category: High Priority

Project: 25055 – Echo Meadows Artificial Recharge Extended Groundwater and Surface Water Modeling

Sponsor: PNNL

Short Description:
Assess impacts of artificial recharge design on stream temperature, effluent chemistry, and pulse duration. This project is designed to establish tools and protocols that can be ported to additional candidate sites.

Abbreviated Abstract:
An increase of thermal gradient in a river where juvenile salmon are hatched can have a significant detrimental effect on salmon survival and the number of salmon that return to the tributary to spawn. One potential mechanism to resolve increased temperature in the tributary stream is through an increase of groundwater recharge to the tributary. Groundwater temperature is not subject to the seasonal temperature fluctuations observed in surface streams and is often constant year around at about 50 degrees Fahrenheit. The Echo Meadows site, Oregon, which is adjacent to the Umatilla River, is currently funded by the Northwest Power Planning Council (NWPPC, ProjectID 22010) to perform a pilot test to induce a groundwater pulse to the Umatilla River during summer, at low flow, by means of artificial recharge. The current proposal is a supplement to the existing project to extend the surveillance and modeling effort. The current effort encompasses modeling the pulse and timing the arrival time at the river and actually flooding the Echo Meadows site to initiate the pulse. The pulse is then tracked by measurements at monitoring wells and the plume is observed at the groundwater/surface water interface by thermal imaging the river. This proposal is intended to include consideration of land use for potential mobilization of contamination (nitrates, salts, phosphates) and thermal regime in the subsurface. This will be achieved using a numerical model to predict contaminant release and transport as well as thermal gradients. A surface water model will also be used to predict chemical and thermal mixing in the river adjacent and down gradient from the groundwater pulse discharge zone. Staff at the Pacific Northwest National Laboratory (PNNL) will perform model conceptualization, design, implementation, and analysis.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
22010	Echo Meadow Project - Winter Artificial Recharge to Cool Rivers	IRZ will supply data to PNNL from which models will be designed, and calibrated.

Relationship to Existing Goals, Objectives and Strategies:
In the “Draft Umatilla Subbasin Summary”(NPPC, 2001), under “Umatilla Subbasin Summary, Temperature”, there is a section that recognizes temperature effects during the summer months have an adverse affect on juvenile salmon development. This proposal is directed at assessment of improvement of temperature gradients in the stream as well as assessment of potential degradation of water quality associated with high recharge activities.

The Washington Department of Ecology and Oregon Department of Environmental Quality (Oregon DEQ, 2000) have also acknowledges thermal pollution (Total Maximum Daily Load, TMDL) as a detrimental factor affecting tributaries used by spawning salmon. In the report by Stohrs and Leskie (WDOE, 2000), the potential benefits that groundwater has on cooling the stream are noted. Lower temperatures from groundwater have been linked with a reduction in predation of juvenile salmon (McMicheals et. al., 1999) and also provide a better environment during incubation by increasing oxygen and nutrient flow through the stream sediments. In addition to state agencies, tribal governments have also recognized the problems of temperature variation on salmon recovery efforts.

The potential benefits of “banking” excess surface water as groundwater for use during greatest need possess the best possible means of reducing stream temperature at a relatively low cost. The first step in siting any recharge basin must begin with an assessment of the hydrogeologic properties of the site and simulation of performance parameters necessary for basin design.

Review Comments:
The modeling effort should be recommended action but the monitoring of pollutants should be high priority.

Budget:

FY02	FY03	FY04
390,283 Category: High Priority (pollutant work) Recommended Action (modeling effort)	390,283 Category: High Priority (pollutant work) Recommended Action (modeling effort)	0

Project: 25059 – Develop Progeny Marker for Salmonids to Evaluate Supplementation

Sponsor: CTUIR

Short Description:
A chemical progeny mark would be developed and tested to evaluate natural reproductive success of supplemented steelhead . The mark would be administered to female parents and would be detectable in the otolith of their progeny.

Abbreviated Abstract:
The proposed research would include the development and testing of a progeny mark. A progeny mark is a material or chemical administered to female parents that is detectable in the tissue of their progeny. Ideally, a benign compound (or element such as strontium) would be injected either into the female adult's peritoneum or dorsal sinus and be assimilated into the eggs. The marker would be tested in laboratory conditions at three different concentrations against a control group. The hypothesis is that after the marker is incorporated into the egg, it would be laid down in the otolith of the progeny where it would be detectable using an electron microprobe. A nested ANOVA would be used to test within-female variation and between-treatment variation. This work would be an extension of work done by Kalish (1990) and Rieman et al. (1994) on sockeye salmon to determine if juvenile salmon had an anadromous or resident female parent. Researchers found that the higher strontium concentrations in anadromous sockeye (because of the higher strontium concentrations in the ocean) were passed on to their progeny and were detectable in the center of the progeny's otoliths. In the development of a progeny mark we would be artificially manipulating marker concentrations in adult females during their upstream migration.

If successful, researchers would now have a tool to evaluate the success of their supplementation programs by determining the natural reproductive success of hatchery fish spawning in the wild in relation to wild spawners. After an effective progeny mark is developed, the new marker would be injected into adult, hatchery, female steelhead collected at traps and weirs (such as the Three Mile Falls Dam Trap on the Umatilla River). The marked adults would be released for natural spawning. The chemical compositions of otolith centers from a sample of naturally produced progeny would indicate the ratios of progeny from marked (hatchery) and unmarked (wild) females.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
8903500	Umatilla Hatchery O&M	The marker will be used as a tool to help evaluate the success of the Umatilla Hatchery program.
198343500	Umatilla Hatchery Satellite Facilities O&M	The marker will be used as a tool to help evaluate the success of the Umatilla Hatchery program
9000500	Umatilla Hatchery M&E	The marker will be used as a tool to help evaluate the success of the Umatilla Hatchery program
8802200	Umatilla Fish Passage Operations	The Umatilla River Fish Passage project has facilities necessary to capture and mark hatchery females with the progeny marker as they migrate up river over Three Mile Dam.

Project #	Title/description	Nature of relationship
9000501	Umatilla Natural Production M&E	The Umatilla Natural Production project will be the primary user of marker when developed and is currently set up to monitor natural production, including sampling outmigrating salmonids.

Relationship to Existing Goals, Objectives and Strategies:
Until the conception of this proposal, no one has developed a tool that could be used to monitor the natural reproductive success of hatchery fish from endemic broodstock, because the hatchery fish are genetically identical to the wild fish. The development of a progeny marker would allow the evaluation of any supplementation program using endemic broodstock throughout the Pacific Northwest. In this manner, fisheries managers would be able to support the hypothesis that these hatchery supplementation programs are providing fish to rebuild naturally spawning populations, not just providing fish for harvest, as consistent by the 2000 Fish and Wildlife Program (FWP). This project is also consistent with the 2000 FWP Artificial Production Strategies that states that “artificial production must be implemented within an experimental, adaptive management design that includes an aggressive program to evaluate the risks and benefits and address scientific uncertainties”. This research project would allow the CTUIR to effectively evaluate their supplementation program, and provide a tool for other fish managers to do the same.

This project is also consistent with the Research, Monitoring, and Evaluation Strategies listed in the 2000 FWP:

1. Identify and resolve key uncertainties for the program,
2. Monitor, evaluate and apply results, and
3. Make information from this program readily available.

An uncertainty in the CTUIR Artificial Production Project is whether hatchery produced females from endemic broodstock are spawning successfully in the wild. This has been identified as an unknown (section 10.5) in the Draft Umatilla Hatchery Genetics and Management Plan (HGMP) (CTUIR and ODFW, 2000). The development of a progeny marker would allow fish managers to monitor and evaluate this uncertainty. This is consistent with Action 14.4 of the Umatilla/Willow Subbasin Summary (CTUIR et al., 2001), which states the need to “evaluate natural reproductive success of hatchery supplemented steelhead”. After the marker has been developed, this technology will be made available to other supplementation programs for the purpose of monitoring. This information will be made available through BPA, published journal articles and postings on a proposed CTUIR research, monitoring and evaluation website.

The NMFS Biological Opinion (December, 2000) states in section 9.6.5.3.2 that “reproductive success of naturally spawning hatchery fish is a critical uncertainty.” Action 182 states that “the Action Agencies and NMFS shall work within regional priorities and congressional appropriations processes to establish and provide the appropriate level of FCRPS funding for studies to determine the reproductive success of hatchery fish relative to wild fish.” The marker that would be developed under this proposal would provide a tool to be used for this evaluation. This proposal also meets the hatchery effectiveness monitoring required under Action 184 of the NMFS Biological Opinion. As previously stated, the development of progeny marker would allow the CTUIR to effectively monitor the reproductive success of hatchery steelhead. It would also provide a tool to meet the overall research, monitoring, and evaluation needs of artificial propagation throughout the entire Pacific Northwest.

Review Comments:
This project addresses NMFS RPA 184. If this work is successful the technique could be a useful management tool for evaluation programs. Cost share will consist of in-kind from the CTUIR. This project was viewed as having merit since the supplementation project has been ongoing for a number of years. Pending the results, this may be especially valuable due to universal applications.

Budget:

FY02	FY03	FY04
149,665 Category: High Priority	152,151 Category: High Priority	198,661 Category: High Priority

Project: 25077 – Umatilla County Conservation Buffer Project

Sponsor: Umatilla - SWCD

Short Description:
Implement buffer program using cost share provided by Confederated Tribes Umatilla Indian Reservation, USDA, State of Oregon, and private landowners.

Abbreviated Abstract:
The Conservation Partnership in Oregon is a unique coalition of local, tribal, state, and federal groups that mobilizes staff and program funding to help people and communities address natural resource conservation issues. The Partnership, working side by side with landowners and land users, has made great strides in conserving natural resources since the 1939 Oregon Legislature passed enabling legislation to create Conservation Districts. Guiding this assistance are Conservation District Boards of local leaders who know the people in their communities and who are familiar with conservation needs in the district. The Conservation Partnership blends individual member resources to offer technical and financial assistance in planning and applying natural resource conservation practices and systems. It also works together in other areas, such as resource inventories, conservation education, and conservation technology. This is a “tried and true” process that is trusted and relied upon by farmers and ranchers to get conservation on-the-ground.

Umatilla County Soil and Water Conservation District is involved in the implementation of several full-scale watershed enhancement projects and programs on private land. The Umatilla SWCD jurisdiction follows the county boundaries including portions of the Umatilla, Walla Walla and North Fork John Day subbasins. Working in close partnership with NRCS our team's strength is our ability to develop and implement scientifically and economically sound resource management plans for private landowners. Private ownership is predominant in the Umatilla Basin, covering roughly 80 percent of the Basin land area (1,456,000 acres). The US Forest Service manages about 13 percent of the land area while approximately 12 percent (CTUIR, 1999), lies within the boundaries of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Agricultural and rangelands comprise more than 80 percent of the Basin area and the remainder consists of roughly 15 percent forest and 3 percent urban and developed area. The Walla Walla subbasin is predominately private ownership (81.7 %), with (17.2%) US Forest Service, (.6%) BLM and (.01 %) State of Oregon. Agriculture and rangeland cover most of the subbbasin area with the remainder in forest and urban area.

The Umatilla County Conservation Buffer project will install buffer systems throughout the Umatilla Subbasin including tribal lands(CTUIR), Walla Walla and Upper John Day Subbasins. Specific watersheds targeted for this project will include Umatilla River, Walla Walla River, Wildhorse, Tutuilla-Patawa, Birch, Squaw-Buckeroo, Meacham, and McKay. The project will address limiting factors identified in the Umatilla Subbasin Summary, June 30, 2000 and Walla Walla Subbasin Summary, March 2, 2001. BPA funding will provide 2.0-2.5 FTE technical staff to implement at least 1600 acres of conservation buffers covering an estimated 132 miles and averaging 100 feet in width. One staff person will be housed at the CTUIR and one position at the NRCS Pendleton field office. Implementation will focus on the installation of riparian buffers, filter strips, and wetland enhancement conservation practices. Buffer installations will be installed and maintained using NRCS standards & specifications, and operation and maintenance standards. Actual implementation costs, lease payments, and maintenance costs will be borne by existing USDA programs: Conservation Reserve Enhancement Programs (CREP) and the Continuous Conservation Reserve Program (CCRP). Leases will be for 10-15 year periods and provide cost share for implementation. This program meets a critical need in Umatilla & Walla Walla Basin Watershed in particular where existing ODFW riparian lease agreements begin to expire soon. Current lack of staffing to market the buffer program, conduct assessments and develop plans has created a growing backlog of potential projects. Ten participants are signed up, awaiting assessment and plan development. Landowners on 40 additional reaches have expressed interest in entering into long term buffer contracts. The majority of the proposed work will be done in the Umatilla and Walla Walla Subbasins with a small amount in adjacent North Fork John Day Subbasin.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
8710001	Anadromous habitat enhancement in the Umatilla Basin	Complimentary, ODFW * CTUIR Riparian lease agreement
9604500	Instream and riparian habitat enhancement in Buckaroo, Mission, Wildhorse, and	Complimentary, CTUIR 1996

Project #	Title/description	Nature of relationship
	McKay Creek	
	B.O. RPA 153	This proposal focuses on accelerating the protection of riparian areas on private lands by utilizating the Conservation Reserve Enhancement Program.
	B.O. RPA 154	Through this proposal staff assistance will be provided to the Subbasin Assessment and Planning process to coordinate local input and needs.

Relationship to Existing Goals, Objectives and Strategies:
As described above, this project is both timely and potentially highly effective for improving and expanding the riparian protection work already undertaken in the Umatilla and Walla Walla Subbasins. This project to develop and implement CCRP/CREP riparian buffer plans directly supports strategies and actions identified in the Umatilla Subbasin Summary and Walla Walla Subbasin Summary currently under review by the Northwest Power Planning Council:

Strategy 2 - Protect, enhance or restore water quality to improve the survival, abundance and distribution of indigenous and anadromous fish: Action 2.1 Reduce stream temperatures by restoring or enhancing riparian vegetation, floodplain function and increasing hyporehic and instream flows; Action 2.3 Implement and enforce provisions of the Umatilla River Ag. Water Quality Management Plan; Action 2.7 Implement the Conservation Reserve Enhancement Program (CREP), Continuous Conservation Reserve Program (CCRP) Wetlands Reserve Program (WRP) and other pertinent State, Tribal and local programs along riparian zones and in other sensitive areas; Action 2.8 Use existing cooperative or regulatory programs to reduce sediment delivery to stream channels for roads, agriculture, logging and other land use activities.

Strategy 3 - Protect, enhance or restore instream and riparian habitat to improve water the survival, abundance and distribution of indigenous and anadromous fish: Action 3.4(Walla Walla 3.5) Over long term, restore riparian vegetation and adjacent valley bottom and upland vegetation to result in the long term recruitment of large woody debris; Action 3.6 Reduce sediment deposition in area streams by reducing erosion and delivery to waterways.

In addition to supporting actions identified above for fish, it supports the wildlife objective and associated strategies called out in the summary (pp.142, Umatilla).

Objective: Protect and enhance riparian and wetland habitat.

Strategy: Initiate actions to increase high quality riparian and wetland habitat through restoration of degraded riparian habitat; Initiate actions to increase size (width & length) and connectivity of existing riparian patches (i.e. reduce fragmentation) through restoration and acquisition efforts.

At the local level, this project supports the objectives for the Umatilla Basin Agricultural Water Quality Management Area Plan (AWQMAP) (September1999) to improve the quality of water in the Umatilla Subbasin through planning and implementation of scientifically based conservation practices (page 5) The Walla Walla Basin AWQMAP committee is nearing completion of a draft for public review. The CTUIR will be developing a separate AWQMAP to address agricultural resource concerns on the reservation. www.oda.state.or.us/Natural_Resource/agwqmpr.htm

Umatilla AWQMAP Goals and Objectives 1.A. Promote upland and stream-side management practices to limit soil erosion and pollution caused by agricultural activities as close to the source as possible, through compliance with the Soil Erosion and Sediment Control prevention and control measures.

Umatilla AWQMAP Streamside Area Management1.C. Promote streambank stabilization and the restoration and enhancement of wetlands and riparian habitat through implementation for appropriate Management Practices.

Buffers remove sediment and nutrients, stabilize stream banks, improve fish habitat, provide food sources, nesting cover and shelter for wildlife. More details on buffers and their effects can be found in a fact sheet at the Conservation Technology Information Center (CTIC) website: www.ctic.purdue.edu/Core4/news/annc/Bufferfact.html or at the Natural Resources Conservation Service (NRCS) web site: www.nhq.nrcs.usda.gov/CCS/Buffers.html.

BPA is identified as the lead agency to support development of the 303(d) lists and TMDL's in the course of planning. Objective 1 states, " Support development of state or tribal 303(d) lists and TMDLs (the Walla Walla Basin is in development); Objective 2 states, "provide funding to implement measures with direct ESA benefit and are recommended in approved TMDL's". (The Umatilla Basin expects EPA approval by April 12, 2001) www.salmonrecovery.gov/strategy.shtml

Riparian vegetation is considered a high priority management action by the Umatilla Basin TMDL/WQMP and is emphasized because it has dual advantage of being one of the most readily available measures and most beneficial to a wide variety of water quality and habitat impairments, and is corollary to other key attributes such as ground water input and channel narrowing. (U. WQMP page 352) This project compliments the management Plan, Areas of Emphasis by Management Category, A. Riparian Vegetation (restore to site potential), use active restoration, plant and manage, improve conditions over time, move toward site potential.

The 2000 Federal Columbia River Power System (FCRPS) identifies two reasonable and prudent alternatives (RPAs) this proposal address. RPA 152 requests the action agencies to coordinate their efforts and support for offsite habitat enhancement measures undertaken by other Federal agencies, states, Tribes and local governments. RPA 153 specifically requests BPA to work of leverage agricultural incentive programs such as the CREP to protect 100 miles of riparian buffers per year. This project will implement riparian buffers on at least 45 miles of streams.

This project to implement riparian buffer systems supports the NWPPC Fish and Wildlife Program Habitat Goal, Policies and Objectives described in Section 7.6, particularly 7.6B.1 helping private parties be proactive, 7.6B.3 integration of habitat work in broader watershed improvement efforts, Section 7.6B.4 provides for higher priority for actions that maximize effect for the dollar, given that this proposal seeks only funding to make technical assistance available, with other entities picking up the implementation and lease costs, it shows outstanding leveraging of funds.   The project supports the provisions of 7.6C for Coordinated Habitat Planning. Establishment of Riparian Buffers clearly supports actions identified in section 7.6D to reduce sediment, improve bank stability, and water quality. Tree establishment in riparian buffers will help stabilize banks, and provide shade, reducing heating rates on hot summer days. Direct planning with private landowners supports the concepts discussed in Section 7.7.

The Tribes' Anadromous Fish Restoration Plan, Wy-Kan-Ush-Mi Wa-Kish-Wit, p.35 identifies 7 actions of which 2 are directly addressed by establishing riparian buffers: Action 6. Protect and enhance aquatic and riparian habitat; Action 9. Increase stream bank cover, decrease water temperatures during the summer and increase stream flow.

Review Comments:
Although money exists in the State of Oregon CREP program, the SWCD is statutorily unable to use the existing money. Managers question the appropriateness of allocating F&W Program money to administer (i.e., fund FTE) USDA projects. This project needs to be implemented consistent with limiting factors and problem locations identified in subbasin summaries and eventually subbasin planning to insure fisheries benefits to target species. There needs to be oversight by the COTR to insure that actions taken will benefit fish and wildlife.

Budget:

FY02	FY03	FY04
152,368 Category: Recommended Action	156,939 Category: Recommended Action	161,647 Category: Recommended Action

Project: 25081 – Improve Upstream Fish Passage in the Birch Creek Watershed

Sponsor: ODFW

Short Description:
Improve upstream fish passage in the Birch Creek watershed (Umatilla River tributary) for the benefit of summer steelhead and redband trout by removing structures or building fishways over existing irrigation diversion dams.

Abbreviated Abstract:
While most passage problems in the mainstem Umatilla River have been addressed, much remains to be done in regard to tributary upstream passage. The Umatilla Subbasin Summary identifies eleven passage barriers in the Birch Creek drainage that have yet to be treated. These passage barriers limit production by causing delay or injury to summer steelhead adults and by causing mortality to juveniles by not providing connectivity

between habitats. The proposed project will address five of the identified barriers over the next three years. Two of the barriers will be addressed in 2002. Three barriers will potentially be removed and two will have new fishway's constructed.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
198710002	Umatilla Fish Habitat Improvement	Use of equipment and personnel for project design

Relationship to Existing Goals, Objectives and Strategies:
This project is linked to the Oregon Plan for Salmon and Watersheds by addressing factors for the decline of wild summer steelhead in the Umatilla subbasin. Executive Order No. EO 99-01 states in paragraph 1 "The Oregon Plan first addressed coho salmon on the Oregon Coast, was then broadened to include steelhead trout on the coast and in the lower Columbia River, and is now expanding to all **at-risk wild salmonids throughout the state** [emphasis added]. The Oregon Plan addresses all factors for the decline of these species, including watershed conditions and fisheries, to the extent those factors can be affected by the state."

With regard to anadromous fish losses due to the Columbia River Hydropower System, the Columbia River Basin Fish and Wildlife Program provides three objectives: 1) halt declining trends, 2) restore the widest set of healthy naturally reproducing populations of salmon and steelhead in each relevant province, and 3) increase runs above Bonneville to five million fish by 2025. The proposed project will assist the NWPPC in accomplishing each of these objectives by increasing steelhead production in the Umatilla subbasin.

The Columbia River Basin Fish and Wildlife Program, "directs significant attention to rebuilding healthy, naturally producing fish and wildlife populations by protecting and restoring habitats and the biological systems within them. The proposed restoration project will result in better connectivity of habitats in the Birch Creek watershed and decrease injury associated with negotiating passage barriers. These results support this fish and Wildlife program directive.

Under "Habitat Actions" the National Marine Fisheries Service (NMFS) Biological Opinion regarding the Columbia River Hydropower system provides three overarching objectives: 1) protect existing high quality habitat, 2) restore degraded habitats on a priority basis and connect them to other functioning habitats, and 3) prevent further degradation of tributary and estuary habitats and water quality." The proposed project specifically addresses objective number two. Additionally, under section 9.6.2.1 Actions Related to Tributary Habitat, one of the objectives is "Passage and diversion improvements – address in-stream obstructions and diversions that interfere with or harm listed species. The proposed project will accomplish this objective in the Birch Creek watershed."

The proposed project is directly tied to the goals and objectives of the Umatilla Subbasin Summary. Goal one of the subbasin summary states, "Protect, enhance and restore wild and natural populations of summer steelhead, bull trout, shellfish and other indigenous fish. . ." Strategy 5 of the subbasin summary states, "improve fish passage conditions at all man made passage impediments for resident and anadromous, upstream and downstream migrants." More specifically, action 5.1 states, modify or remove culverts, bridges, grade controls and water diversion structures as necessary to improve fish passage.

Passage needs in the Birch Creek watershed are specifically identified in the Umatilla Subbasin Summary as both a limiting factor and a fish need in the Birch Creek system.

Review Comments:
Project addresses NMFS RPA (numbers will be provided by NMFS). Repairing barriers is a high priority and should be funded. Repairs will be consistent with NMFS criteria. Reviewers question the need to monitor each passage improvement. However, M&E activities are viewed as a recommended action.

Budget:

FY02	FY03	FY04
300,410 Category: High Priority (correcting passage barriers)	210,410 Category: High Priority (correcting passage barriers)	233,535 Category: High Priority (correcting passage barriers)

Project: 25093 – Characterize Genetic Differences and Distribution of Freshwater Mussels

Sponsor: CTUIR

Short Description:
Conduct freshwater mussel surveys to assess their status and test for geographical genetic differences among the western pearlshell mussel, *Margaritifera falcata.*

Abbreviated Abstract:
The purpose of this study is to provide the critical information on the status of freshwater shellfish—especially the western pearlshell mussel, *Margaratifera falcata*—that is called for in the Umatilla Subbasin Summary. This information is essential for restoration of freshwater mussels and associated traditional and cultural uses. Freshwater mussels were vital components of intact salmonid ecosystems that have been affected directly and indirectly by dams, habitat deterioration, and decline in salmon; they are culturally important to Native Americans; and little is known about their distribution, status, and population structure to guide recovery actions. The project has three objectives: 1) to survey the distribution and status of freshwater mussels in the Umatilla River, where they may be extinct, and the Middle Fork John Day River, where they may remain using the first stage of two-stage adaptive cluster sampling; 2) to determine macro and microhabitat factors that control distribution and abundance; and 3) to test whether genetic population structure exists in *M. falcata* by examining five aggregations in the Columbia River and an

outgroup using microsatellite DNA variation. Both these objectives provide information that will be useful for restoration efforts elsewhere in the Basin.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
9000501	Umatilla Basin Natural Production Monitoring and Evaluation	This project is part of the overall goal to recover an intact, fully functioning, salmonid-producing river in the Umatilla River. The CTUIR has numerous projects focusing on recovery of the Umatilla River Basin for salmonids and other species, such as
8373600	Umatilla Passage Facility Operations and Maintenance	Pacific lampreys. The restoration project for the Pacific lampreys has the closest relationship to this project, because both focus on restoration of species that require healthly salmon populations for their persistence.
8802200	Umatilla Fish Passage Operations	
9506000	Pacific Lamprey Research and Restoration	
8710001	Umatilla Fish Habitat Enhancement	

Relationship to Existing Goals, Objectives and Strategies:
This project is essential to conserve and restore freshwater mussels in the Umatilla River. The project addresses the needs outlined in the Umatilla Subbasin Summary and the provisions of the *Fish and Wild Program.* The Umatilla Subbasin Summary calls for strategies to "conduct initial investigations and develop a restoration plan for freshwater shellfish in the Umatilla River." Our first objective addresses Action 15.1, which is to "conduct qualitative and quantitative surveys to assess shellfish populations." Our second objective addresses Action 15.3, which is to "determine macrohabitat and physiochemical factors controlling distribution and abundance. Our third objective addresses Action 15.2, which is to "survey genetic variation within and among Umatilla and selected Columbia River subbasins."

Mussels are also covered under Section 10 (Resident Fish) of the *1994 Fish and Wild Program.* The stated goal of the program is "to recover and preserve the health of native resident fish injured by the hydropower system." Dams affected mussels directly through habitat loss and indirectly through the impacts on host salmon. Our first and second objectives are addressed in Section 10.1A.2, which states that Bonneville shall "fund the fishery managers' efforts to complete assessments of resident fish losses throughout the Columbia River Basin." Section 10.2A.1 prioritizes projects for "weak, but recoverable, native populations" and projects that "also provide benefits for wildlife and/or anadromous fish." Our third objective—a survey of genetic diversity in *M. falcata*—falls under Section 10.2B.1, which notes that for efforts that might involve artificial propagation (including transfers) "a thorough and comprehensive approach to conserving genetic diversity is needed for native species." It also notes that it is necessary to develop "a plan for conserving genetic diversity as called for in measure 7.1D.1." An assessment of genetic diversity is crucial to fulfill both of these.

Review Comments:
Historically, freshwater mussels were an important subsistence species for the CTUIR. However, mussel populations have declined and as a result mussels can no longer be used for purposes of subsistence. Mussels have been listed as candidate species in the Willamette River. However, little, if anything, is known about freshwater mussel distribution, abundance and habitat quality east of the Cascades. The ODFW suggests that there is a need to initiate this type of work. The reviewers recommend that preliminary genetic analyses should be limited to mtDNA (RFLPs) analyses. Microsatellite analyses should only be used if mtDNA data are not conclusive.

Budget:

FY02	FY03	FY04
311,907 Category: High Priority	343,097 Category: High Priority	377,406 Category: High Priority

Project: 200002300 – Securing Wildlife Mitigation Sites – Oregon, Horn Butte (Philippi Property)

Sponsor: ODFW

Short Description:
Protect and enhance shrub-steppe and native bunch grass habitat in the Horn Butte area to mitigate for wildlife impacts by the Columbia River Federal hydropower system.

Abbreviated Abstract:
The intent of this project is to protect and enhance shrub-steppe and native bunch grass habitat in the Horn Butte area within the Willow Creek watershed near the town of Arlington, Oregon. This project has been on-going since FY 1999 when it was proposed under the Oregon Wildlife Coalition's (OWC's) programmatic land acquisition project, *Securing Wildlife Mitigation Sites – Oregon* (Project No. 199705900). Horn Butte was included in the OWC's list of priority project sites to be funded with dollars made available to the OWC. Two parcels totaling about 7,000 acres were identified in the Horn Butte area and targeted for potential land acquisition and/or conservation easement. The NWPPC made funding recommendations for the OWC's continued acquisition project in FY 1999 ($4 million), FY 2000 ($3.96 million), and FY 2001 ($2.6 million). In FY 2000, ODFW also submitted a request for $400,000 for acquisition/easement of the Boeing Tract (BAIC Tract) and first-year implementation funds for the Horn Butte Philippi parcel ($42,302). These were approved for funding by the NWPPC.

Since 1998, discussions have been occurring with multiple landowners in the Horn Butte area. On February 1, 2001 the Trust For Public Land signed an option to purchase agreement with the Philippi Family, owners of one of the parcels targeted for acquisition. The OWC currently has $50,000 available through their programmatic project allocations which will pay for pre-acquisition activities at Philippi. Funds that had been intended to be used for property purchase at Horn Butte were re-directed by the OWC to other Council approved land acquisition projects. This project proposal outlines how the previously allocated $50,000 will be spent and shows out-year funding requests for purchase and enhancement of the Philippi property.

The Philippi property is 4,761 acres and lies adjacent to about 4,300 acres of Bureau of Land Management (BLM) lands, known as the Horn Butte Curlew Area of Critical Environmental Concern. The Philippi property is one of the few remaining contiguous tracts of native shrub-steppe and grassland habitats. The project will benefit numerous shrub-steppe obligate species such as long-billed curlew, ferruginous hawk, Swainson's hawk, burrowing owl, loggerhead shrike, grasshopper sparrow, sagebrush lizard, and Washington ground squirrel. Wildlife mitigation target species associated with the Lower Columbia River mainstem hydrofacilities will also benefit (e.g., California quail, western meadowlark).

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
	Status Review of Wildlife Mitigation at Columbia Basin Hydroelectric Projects, Col. Mainstem and Lower Snake Facilities (BPA 1984)	Reviewed past, present and proposed future wildlife planning and mitigation programs at BPA's hydrofacilities. Called for quantitative and qualitative assessment of wildlife losses attributable to the dams and implementation of mitigation plans.
	Wildlife Impact Assessment: Bonneville, McNary, The Dalles, and John Day projects. (Rasumssen and Wright 1990).	Evaluated pre- and post- dam construction/inundation habitat conditions and estimated wildlife losses using the HEP methodology.
199208400	Oregon Trust Agreement Planning (OTAP) Project (BPA 1993)	Identified and evaluated potential wildlife mitigation sites within Oregon
9565	Assessing OTAP Project Using Gap Analysis (ODFW 1997)	Refinement of OTAP Project. Identified and evaluated potential wildlife mitigation sites in Oregon using Gap Analysis techniques
199705900	FY 1999 Securing Wildlife Mitigation Sites - Oregon	OWC's programmatic project proposal that included the Horn Butte project on a list of priority projects. The requested and approved $4 mill would fund projects from the list as they were ready to be implemented. Horn Butte project budget for acq: $1 mill

Project #	Title/description	Nature of relationship
199705900	FY 2000 Securing Wildlife Mitigation Sites - Oregon	OWC's programmatic project proposal that included the Horn Butte project in priority list. OWC requested $5 mill, NWPPC approved $3.96 mill to fund projects from priority list as they were ready. Horn Butte project budget for acquisition: $400,000
20116	FY 2000 Securing Wildlife Mitigation Sites - Oregon, Horn Butte	ODFW FY 00 project proposal for Horn Butte. Project request was $400,000 for continued land acquisition/easement (to be funded under OWC's Project No. 199705900) and $42,302 for first-year project implementation
199705900	FY 2001 Securing Wildlife Mitigation Sites - Oregon	OWC's budget update proposal that included the Horn Butte project in priority list. OWC requested $6 million of new funds. NWPPC approved $2.6 million. Horn Butte project budget: $1 million
200002300	FY 2001 Securing Wildlife Mitigation Sites - Oregon, Horn Butte	ODFW's FY 01 budget update proposal that requested carrying forward NWPPC-approved FY 00 funds ($42,302) for first -year project implementation.
200002300	Securing Wildlife Mitigation Sites - Oregon, Horn Butte (BAIC Tract)	TNC/ODFW joint FY 02 Columbia Plateau solicitation proposal to acquire 22,642 acres of native shrub steppe and grassland habitat near Boardman, OR. Complements Horn Butte - Philippi property purchase.

Relationship to Existing Goals, Objectives and Strategies:
This project will help achieve the wildlife goals and objectives within the Umatilla/ Willow Creek Subbasin. As outlined in the Umatilla River Subbasin Summary, the primary goal of natural resource managers within the subbasin is restore and/or stabilize native fish, wildlife and plant species. The following specific goals and objectives identified in the subbasin summary will be addressed by this project:

Wildlife

- Achieve and sustain levels of species productivity to mitigate for wildlife and wildlife habitat losses caused by the development and operation of the hydropower system.
- Maintain wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout natural geographic ranges.
- Provide recreational, educational, aesthetic, scientific, economic and cultural benefits derived from Oregon's diversity of wildlife.
- Ensure long-term maintenance of healthy populations of native landbirds

- Identify, establish standards, and implement management measures required for restoring threatened and endangered species, preventing sensitive species from having to be listed as threatened or endangered, and maintaining or enhancing other species requiring special attention.

Shrub Steppe Habitat

- Acquire high quality privately owned shrub steppe habitats and move them to protected status
- Protect and enhance remaining shrub steppe habitats
- Initiate actions to enhance size and connectivity of existing quality shrub steppe patches (i.e., reduce fragmentation)
- Minimize further degradation of shrub steppe habitat (e.g., reduce, eliminate or improve livestock grazing practices)
- Maintain cryptogamic crusts where they occur, and seek ecologically appropriate sites for restoration to ensure proper functioning native plant communities
- Maintain sites dominated by native vegetation and initiate actions to prevent infestations of exotic vegetation
- Improve habitat for grassland-associated wildlife species by managing non-native grasslands (e.g., agricultural lands, inactive grasslands such as CRP and fallow fields) as suitable habitat where biologically appropriate (i.e., where viable landbird populations can be maintained).
- Expand shrub steppe focal species distribution and abundance by establishing Shrub Steppe Bird Conservation Areas
- Implement land use practices consistent with growth of native plants and forbs

Riparian and Wetland Habitat

- Protect and enhance riparian and wetland habitat by limiting grazing intensity to maintain the integrity of native species composition and health

The Horn Butte Project addresses the following wildlife needs identified in the Umatilla River Subbasin Summary:

Protect Stronghold Habitats – emphasize habitat acquisition where opportunities exist.

Grassland and Shrub Steppe Habitat

- Protect, maintain and enhance shrub steppe habitats
- Improve connectivity between existing shrub steppe fragments
- Enhance and restore native perennial grassland habitats
- Reduce non-native annual grasses in shrub-steppe and grassland habitat
- Pursue and implement effective biological controls on noxious weeds including yellow- star thistle and knapweeds

As a habitat protection and restoration project, this project addresses the NWPPC's primary wildlife strategy to complete the current mitigation program for construction and inundation losses as described in the 1995 and Draft 2000 Fish and Wildlife Programs (NWPPC 1995 and NWPPC 2000). NWPPC strategies and guidelines related to the determination of habitat credit through use of Habitat Evaluation Procedures, allocation of Habitat Units, and protection of habitat through fee-title are also addressed. This project will provide mitigation credits to BPA for losses to wildlife and wildlife habitat resulting from the John Day Dam. NWPPC 1995 and 2000 Fish and Wildlife Program Table 11-4 losses will be addressed, specifically for the following John Day Dam target species: western meadowlark and mink California quail associated with the riparian/riverine and shrub steppe priority habitats.

The Horn Butte area has been identified as a high priority project site by the Oregon Wildlife Coalition. The project helps the Oregon managers achieve the goal of helping BPA fully mitigate for impacts to fish and wildlife caused by the development and operation of the federal hydropower system.

Purchase and enhancement of the Philippi property is consistent with the guidelines of the Oregon Plan. As called for the Oregon Plan, protection and improvement of upland and riparian/riverine habitats will provide protection for resident western redband trout.

Review Comments:
This parcel is the last contiguous area of shrub steppe habitat and is home to many imperiled species. Through this project (I.e., acquisition) shrub steppe habitat would be protected .

Budget:

FY02	FY03	FY04
50,000 Category: Crediting Resolution	1,350,000 Category: Crediting Resolution	65,000 Category: Crediting Resolution

Project: 200020116 – Securing Wildlife Mitigation Sites – Oregon, Horn Butte (BAIC Tract)

Sponsor: TNC

Short Description:
Protect and enhance the BAIC Tract in the Horn Butte area, which includes 22,642 acres of shrub-steppe and native bunchgrass, to mitigate for wildlife impacts from the Federal Columbia River Hydropower System.

Abbreviated Abstract:
The 22,642-acre BAIC Tract is located within the Horn Butte Wildlife Mitigation Project Area (WMP) near Boardman, Oregon. The site has been identified as a significant wildlife habitat in both the Mainstem Columbia and Umatilla Subbasins (Ward et al. 2001, Saul et al. 2001). Together with the adjacent 46,126-acre Naval Weapons System Training Facility, the Oregon Department of Fish and Wildlife’s Willow Creek Wildlife

Management Area, and the Bureau of Land Management's Horn Butte Curlew Area of Critical Environmental Concern, the Horn Butte WMP constitutes the largest remaining undeveloped shrub-steppe habitat in the Oregon portion of the Columbia Basin. The BAIC Tract has high-quality occurrences of bitterbrush (*Purshia tridentata)* shrub steppe, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis)* steppe, basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) steppe, bluebunch wheatgrass (*Pseudoregneria spicata*) grasslands and needle-and-thread (*Stipa comata*) grasslands. At least nine state and federally listed threatened, endangered, and sensitive wildlife species occur at the Tract.

The property is owned by the State of Oregon and administered by the Department of Administrative Services. The State entered into a 77-year lease over the property in 1963 with the Boeing Company (now BAIC) for space-age industrial and agricultural development. The lease gives BAIC exclusive control over the property.

This proposal seeks $5,518,669 to acquire the forty-year private leasehold interest over 22,642 acres and then transfer the property for use as wildlife mitigation; and complete NEPA review, baseline assessments, and a mitigation and management plan for the tract. This project would take advantage of a time-limited opportunity to permanently protect the BAIC Tract and thereby enhance the survival of numerous species that are closely associated with declining shrub-steppe habitat in the Columbia Plateau Province, and achieve direct and immediate benefits for wildlife. Significant cost sharing for the project includes a permanent commitment of up to $130,000/year for annual operations and maintenance from BAIC and in-kind contributions from The Nature Conservancy, and the Oregon Department of Fish and Wildlife to complete the transaction and baseline assessments of the property.

Relationship to Other Projects:

Project #	Title/description	Nature of relationship
199208400	Oregon Trust Agreement Planning Project	Identified Horn Butte Area as priority for wildlife mitigation
199506500	Assessing OTAP Process Using GAP Analysis	Identified Horn Butte Area as priority for wildlife mitigation
199705900	Securing Wildlife Mitigation Sites - Oregon	Umbrella project identified acquisition of shrubsteppe and grassland habitats in Horn Butte area as a priority
200020116	Securing Wildlife Mitigation Sites - Horn Butte, Oregon	Complements this ODFW project to acquire and protect lands in Horn Butte area

Relationship to Existing Goals, Objectives and Strategies:
Protection of the BAIC Tract will provide direct habitat benefits on over 22,642-acres of high quality shrub steppe and grassland habitat and enhance habitat values on the adjacent Naval Weapons Systems Training Facility at Boardman (46,126 acres), the Bureau of Land

Management's Curlew Area of Critical Environmental Concern at Horn Butte (4,300 acres) and the proposed Philippi/Horn Butte Acquisition (4,761 acres) by providing connectivity and improved habitat management to this critical intervening parcel. In addition, the project will complement wildlife management efforts on the nearby Oregon Department of Fish and Wildlife's Willow Creek and Irrigon Wildlife Areas, the Confederated Tribes of the Umatilla's Wanaket Wildlife Area, and the Umatilla and Cold Springs National Wildlife Refuges. In addition, acquisition of the 22,642-acre BAIC Tract will further conservation goals of Partners in Flight (Altman and Holmes 2000) and the Oregon Biodiversity Project (1997).

This acquisition will also advance policies, guidelines, goals, strategies, and actions described in the following plans:

Mainstem Columbia River Subbasin Summary

Wildlife

1. Protect, enhance, or restore wildlife populations to sustainable levels, and provide ecological, cultural, and sociological benefits
2. Maintain or increase wildlife species diversity
3. Protect, enhance, and restore wildlife habitat in the subbasin
4. Acquire or lease lands with priority habitats to permanently protect wildlife habitats in the subbasin
5. Protect federal and state threatened, endangered, and sensitive wildlife species
6. Provide protection for federal and state threatened, endangered, and sensitive wildlife species in all resource management plans
7. Various steps to effectively protect shrub-steppe associated raptors, migratory songbirds, and sage grouse

Shrub-Steppe Habitat

1. Reduce (through restoration) and prevent further degradation and fragmentation of large contiguous blocks of shrub-steppe habitat
2. Evaluate shrub-steppe restoration techniques and share information between agencies, tribes, private landowners and other groups involved in shrub-steppe restoration
3. Develop and implement shrub-steppe restoration techniques that are economically feasible over large landscapes

Umatilla Subbasin Summary

Wildlife

1. Achieve and sustain levels of species productivity to mitigate for wildlife and wildlife
2. habitat losses caused by the development and operation of the hydropower system.
3. Maintain wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout natural geographic ranges.
4. Provide recreational, educational, aesthetic, scientific, economic and cultural benefits derived from Oregon's diversity of wildlife.
5. Ensure long-term maintenance of healthy populations of native landbirds

6. Identify, establish standards, and implement management measures required for restoring threatened and endangered species, preventing sensitive species from having to be listed as threatened or endangered, and maintaining or enhancing other species requiring special attention.

Shrub Steppe Habitat

1. Acquire high quality privately owned shrub steppe habitats and move them to protected status
2. Protect and enhance remaining shrub steppe habitats
3. Initiate actions to enhance size and connectivity of existing quality shrub steppe patches (i.e., reduce fragmentation)
4. Minimize further degradation of shrub steppe habitat (e.g., reduce, eliminate or improve livestock grazing practices)
5. Maintain cryptogamic crusts where they occur, and seek ecologically appropriate sites for restoration to ensure proper functioning native plant communities
6. Maintain sites dominated by native vegetation and initiate actions to prevent infestations of exotic vegetation
7. Improve habitat for grassland-associated wildlife species by managing non-native grasslands (e.g., agricultural lands, inactive grasslands such as CRP and fallow fields) as suitable habitat where biologically appropriate (i.e., where viable landbird populations can be maintained).
8. Expand shrub steppe focal species distribution and abundance by establishing Shrub Steppe Bird Conservation Areas
9. Implement land use practices consistent with growth of native plants and forbs

Protect Stronghold Habitats – emphasize habitat acquisition where opportunities exist.

Grassland and Shrub Steppe Habitat

1. Protect, maintain and enhance shrub steppe habitats
2. Improve connectivity between existing shrub steppe fragments
3. Enhance and restore native perennial grassland habitats
4. Reduce non-native annual grasses in shrub-steppe and grassland habitat
5. Pursue and implement effective biological controls on noxious weeds including yellow-star thistle and knapweeds

2000 Fish and Wildlife Program

Vision – A Columbia Basin ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects for fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region.

Wildlife Mitigation Objectives 2, 4, 5, and Habitat Strategies 1 and 2, NWPPC 2000, page 26).

Wildlife

1. Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses
2. Maintain existing and created habitat values
3. Monitor and evaluate habitat and species responses to mitigation actions

Habitat

1. Identify current condition and biological potential of the habitat, and then protect or restore it to the extent described in the biological objectives
2. Build from strength
3. Restore ecosystems, not just single species

Review Comments:
This parcel is the last contiguous area of shrub steppe habitat and is home to many imperiled species. Through this project (I.e., acquisition) priceless shrub steppe habitat would be protected.

Budget:

FY02	FY03	FY04
5,518,669 Category: Crediting Resolution	120,000 Category: Crediting Resolution	120,000 Category: Crediting Resolution

Research, Monitoring, and Evaluation Activities

BPA began funding salmonid monitoring and evaluation projects in the Umatilla subbasin in 1980, with many projects completed by the mid-1990s (Table 56). Additional fish and wildlife monitoring and evaluation projects have also been completed using non-BPA funding sources (Table 57). An oversight committee (Umatilla Management, Monitoring and Evaluation Oversight Committee; UMMEOC) composed of key management personnel and research project leaders carefully coordinates fisheries monitoring and evaluation activities in the subbasin. The committee ensures that projects are coordinated and address the most important monitoring needs. Furthermore, a formal Annual Operation Plan (AOP) is developed each year to further coordinate monitoring and evaluation activities with hatchery, passage and other projects. Initial monitoring and evaluation efforts examined salmonid abundance, age, growth, life history characteristics, and distribution. Evaluations also addressed instream and riparian habitat conditions, salmonid flow needs, water temperature, and the effectiveness of new adult ladders and juvenile by-pass screens. Monitoring activities also examined steelhead genetics, artificial production issues, and smolt to adult survival rates

Monitoring natural and artificial production of salmonids has been streamlined, but remains important for management and restoration in the Umatilla subbasin. Long-term monitoring includes enumeration of adult returns at Three Mile Dam, harvest monitoring, redd surveys, stream and riparian habitat surveys, artificial production evaluations, fish health monitoring, smolt migration survival and timing estimates, and annual index site sampling for long-term trend data on species composition and parr densities (Table 56). Some monitoring is conducted annually, such as redd surveys and water temperature monitoring, but other factors are evaluated less often, such as the assessment of instream and riparian habitat, and population genetic characteristics.

Wildlife surveys and inventories (e.g., big game aerial surveys) are coordinated and conducted regularly within the Umatilla Subbasin by ODFW and CTUIR. Population monitoring addresses species responses to enhancement projects and provides important information for harvest and other wildlife management activities. Wildlife mitigation projects are habitat based and use the USFWS's Habitat Evaluation Procedure (HEP) for evaluating their success. Treatment specific monitoring techniques are also employed to evaluate treatment methods.

Table 59. BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities (Columbia Basin Fish and Wildlife Authority 1999; Bonneville Power Administration and Northwest Power Planning Council 1999; Pacific States Marine Fisheries Commission 2001)

Completed Monitoring and Evaluation Projects	BPA #	Sponsor	Duration
Identify the genetic composition of endemic steelhead	7900100	NMFS	1980, 1982
Assess passage improvements in the lower three miles of the Umatilla River and determine if sites still impede fish passage	8201000	CTUIR	1982
Compile a data base for a coordinated approach to restoring and enhancing anadromous fish	8110600	CTUIR	1981
Evaluate survival of acclimated and unacclimated coho salmon, chinook salmon and summer steelhead tagged and released into the Umatilla River	8383400	ODFW	1984-1985
Monitor and evaluate adult salmon and steelhead passage at five irrigation dams in the middle and lower Umatilla River. Conduct instream and riparian habitat surveys on the mainstem and major tributaries in the Umatilla Basin	9000501	CTUIR	1992-1996
Study hardwood riparian recovery in N.E. OR	9141	OSU	1999
Assess adult salmon and steelhead passage at the Umatilla River mouth	9204101	USACE	1996
Assess status and survival limitations of Pacific lamprey and develop restoration and monitoring plans	9402600	CTUIR	1995-1999
Hatchery oversight and auditing of the Umatilla Hatchery	9500200	Montgomery Watson	1995
Determine status, life history, genetic, habitat needs, and limiting factors for bull trout populations in the North and South Fork	9405400	ODFW, OS Systems	1994-1997

Completed Monitoring and Evaluation Projects	BPA #	Sponsor	Duration
Umatilla River			
Develop preliminary design criteria for the Bonifer and Minthorn acclimation sites on the Umatilla Indian Reservation.	7900100	NMFS	1980, 1982
Evaluate artificial production facilities to raise chinook salmon and steelhead	8805300	Montgomery Watson	1991-1993, 1995-1997
Develop restoration and monitoring plan for Pacific lamprey	9402600	CTUIR	1995-1999
Analyze the potential effects of a the new Westland diversion ladder on Umatilla River subbasin streamflow	8741602	USBR	1989
Ongoing Monitoring and Evaluation Projects	**BPA #**	**Sponsor**	**Duration**
Standardize fish health monitoring programs with Columbia River anadromous hatcheries	8343500	CTUIR	1984-2004
Monitor and evaluate the natural production of adult salmon and steelhead including spawning, rearing, juvenile migration and adult returns. Monitor water temperatures in coordination with other projects.	9000501	CTUIR	1992-2004
Study natural and hatchery juvenile salmonid migration survival and timing in the lower Umatilla River	8902401	ODFW	1989-2004
Monitor in hatchery growth and production and smolt to adult survival of general hatchery production groups. Evaluate experimental rearing and release strategies used during the artificial propagation of salmon and steelhead.	9000500	ODFW	1991-2004
Initiate the restoration and monitoring plans for Pacific lamprey in the Umatilla Subbasin.	9402600	CTUIR	1999-2004
Pre and post habitat enhancement project monitoring			
Identify problems and develop solutions to land use issues impacting fisheries habitat	8710000, 8710001, 8710002	UNF, CTUIR, ODFW	1987-2000

Needed Future Actions

Fish and wildlife managers in the Umatilla subbasin continue to seek solutions to resolve problems affecting the productivity, stability, and perpetuity of natural resources. The first step in accomplishing this task is to identify factors known to limit the productivity of the resources. Upon their definition, resource specialists are able to prescribe specific strategies or actions needed to rectify or adjust the limitation.

Lead management agencies in the subbasin have a common goal of restoring and/or stabilizing native fish, wildlife and plant species. Given the conditions and large number of critical resource needs, it will likely take an appreciable amount of time before noticeable gains are made. For instance, fisheries managers have pointed to the need for rectifying flow and temperature problems in the subbasin for years, and considerable gains have been made; however, problems with flow and temperature continue to persist. Similarly, today's wildlife managers recognize the need to improve habitat connectivity, reduce invasion of exotic species, and restore the structural complexity of vegetation types; yet, these problems continue to be among the greatest threats to species persistence.

Fortunately, core refugia for plant and animal species in the Umatilla exists, albeit at reduced levels from historic conditions. Conservation and expansion of these areas is a common need recognized by both fish and wildlife managers. Specific needs for fish and wildlife managers are listed below.

Fish Needs

Needs for the improvement of population status of key fish species in the Umatilla subbasin are identified in Table 58. Fisheries resource management needs have been repeatedly identified in multiple planning, restoration and research documents and many are referenced in Table 58. The identified needs are a response to limiting factors, and constitute what the strategies and actions are designed to address. The table illustrates the linkage between needs, life history, and management strategies, and provides external reference information directly associated with the identified limiting factor.

Table 60. Fisheries resources management needs in the Umatilla subbasin

Needs	Reference from this document		Other References
	Limiting Factor	**Strategy/Action**	
Improve Stream Flows	Tables 34, 38, 39 and 43	4.1-4.7	(CTUIR & ODFW 1990; CTUIR 1990; CTUIR 1999; ODEQ 1998; ODEQ 2000; Shaw 2000; CBFWA 1999; Evans 1984; Contor et al. 1998; CRITFC 1996b; Towle 1935; Reeve 1988; Boyce 1986; CTUIR 1984; OWRD 1988; USFWS & CRITFC 1981; BOR 1988
Improve Stream Temperatures	Table 43	1.1-1.3 2.1-2.8	(ODEQ 2000; Boyd et al. 1999; Shaw 2000; CTUIR & ODFW 1990; Bond 1963; Buchannan et al. 1997; Contor et al. 1995-1998; Bull Trout Working Group 1999; Umatilla National Forest 2000; CBFWA 1999; Reeve 1988; Boyce 1986; CTUIR 1984; Smith and Pitney 1973; OWRD 1988; CRITFC 1996b
Address Passage Impediments	Table 36, 39, 40 and 43	5.1-5.6	(Knapp and Ward 1990; BOR 1988; ODEQ 2000; Buchanan et al. 1997; CRITFC 1996b; CTUIR & ODFW 1990; Reeve 1988; Boyce 1986; Contor et al. 1998; CTUIR 1984; BOR 1988

Needs	Reference from this document		Other References
	Limiting Factor	Strategy/Action	
Improve Riparian Habitats	Table 31 and 43	1.1-1.3 2.1-2.8 3.1-3.9	(Shaw 1996, 1997, 2000; Contor et al. 1995-1998; Buchanan et al. 1997; CTUIR & ODFW 1990; ODEQ 2000; Kagan et al. 2000; USACE 1997; CRITFC 1996b; Reeve 1988; Boyce 1986; CTUIR 1984; CRITFC 1996b
Improve Instream Habitat Quality and/or Diversity	Table 31 and 43	3.1-3.9	(Shaw 2000; Contor et al. 1997; Buchanan et al. 1997; Northrop 1997; Bull Trout Working Group 1998; ODEQ 2000; CTUIR 1994, 1996; Crabtree 1996 CRITFC 1996b; Umatilla National Forest 2000; CTUIR & ODFW 1990; Reeve 1988; Boyce 1986; CTUIR 1984; CRITFC 1996b
Reduce Sediment Inputs	Table 32 and 43	1.1-1.3 2.1-2.8 3.1-3.9	(Shaw 2000; CRITFC 1996b Harris and Clifton 1999; CTUIR & ODFW 1990; Reeve 1988; Boyce 1986; CTUIR 1984;
Protect Stronghold Habitats	Table 30 and 43	3.10	(Umatilla National Forest 2000; CTUIR & ODFW 1990; Boyce 1986; CTUIR 1984; CRITFC 1996b;
Law Enforcement for Protection of Fish and Wildlife and their Habitats	Table 42	1.2-1.3 2.2 3.1 4.3 5.8 16.2	CRITFC 1996b
Increase Adult Spawners (parental base)	Table 42	all strategies/ actions listed above plus 6.1-6.2 7.1-7.2 8.1 9.1-9.2 10.1 12.1-12.2	(Bradbury et al. 1995; Contor et al. 1997, 1998; CTUIR & ODFW 1990; CRITFC 1996b; Boyce 1986; CTUIR 1984; CTUIR & ODFW 1990b
Increase SARs (smolt-to-adult returns)	Table 42	12.1-12.2 16.1	CTUIR 1999; Contor et al. 1995-1998; CRITFC 1996b; CTUIR & ODFW 1990; Boyce 1986; CTUIR & ODFW 1990b

Needs	Reference from this document		Other References
	Limiting Factor	Strategy/Action	
Address Research Monitoring &Evaluation and Data Gaps		2.9 3.11 4.8 10.2-10.5 11.1-11.2 13.1-13.9 14.1-14.9 15.1-15.5 16.2	(CTUIR 1990; CTUIR & ODFW 1990; Busby 1996; CRITFC 1996b; CTUIR & ODFW 1990b

Improve Stream Flows

Historically, Umatilla Basin fish populations have been severely impacted by low stream flows due to out-of-stream uses. Dewatering was the primary contributing factor in the extinction of several species of indigenous salmonids. To ameliorate some of these impacts, the Umatilla Basin Water Exchange Project was implemented by the Bureau of Reclamation and Bonneville Power Administration (O & M power costs). This project delivers Columbia River water to three of the five major irrigation districts in the Umatilla Basin in exchange for leaving instream flows in the Umatilla River for anadromous fish passage and rearing (Heirs 1996). The purpose of this exchange was not to increase year-round flows, but rather to increase flows in the lower Umatilla River during critical migration and rearing periods. However, little has been done to address flow problems in the upper Umatilla and tributaries basin-wide. Many tributaries suffer low flow situations as a result of both out-of-stream uses and watershed-scale degradation. Lack of summer rearing habitat due to low flows is a primary limiting factor in the Umatilla Basin (Contor et al. 1998). Ongoing efforts to restore floodplain/riparian function should continue.

Where out-of-stream uses are causing low flow problems, attempts should be made to mitigate them. One possible solution is acquisition of water rights. Oregon's Instream Water Rights Law allows water right holders to donate, lease, or sell some, or all, of their water right for transfer to instream use. Oregon Water Trust (OWT), a private, non-profit group, negotiates voluntary donations, leases, or permanent purchases of out-of-stream water rights. These rights are converted to instream water rights in those streams where they will provide the greatest benefits to fish and water quality. Where watershed land use practices have led to lowered summer flows, management should focus on developing "flow friendly" land use practices.

An immediate need is the continuation of funding for the power costs associated with the Umatilla Basin Water Exchange Project. While this project has successfully improved flows in the lower Umatilla, target flows developed for the project are not always met during the identified time period. Also, managers have found additional flow needs for addressing species and life histories phases that were not included in project Phase I and II flow target and times. A Phase III of the Umatilla Basin Flow Augmentation Project is being pursued by CTIUR. Phase III, as proposed, would fund feasibility studies to identify the most efficient flow enhancement options for addressing outstanding flow problems. Phase III could also involve local partnerships (for example,. City of Pendleton municipal needs).

ODFW and OWRD have established priorities for restoration of streamflow as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). ODFW has prioritized streamflow restoration needs by ranking biophysical factors, water use patterns, and the extent that water limits fish production in a particular area (Figure 40). OWRD watermasters will incorporate the priorities into their field work activities as a means to implement flow restoration measures. The "needs" priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects. Watershed councils and other entities may also use the needs priorities as one piece of information to determine high priority restoration projects

Improve Stream Temperatures

Excessively high water temperatures are a basin-wide problem as indicated by the number of streams listed for temperature on the DEQ 303 (d) list (Table 3). Elevated water temperatures are a result of anthropogenic changes in the basin. Primary causes for elevation of stream temperatures include loss of shade producing vegetation, reduced stream flows, reduced hyporheic flows, loss of effective floodplain function, and changes in stream channel geomorphology.

Areas with high water temperatures that need to be addressed in the short term include the mainstem Umatilla from the confluence of Meacham Creek to the mouth (excluding the reach immediately below the cool water inflow from McKay Reservoir), Meacham Creek from mouth to headwaters, and Birch Creek from mouth to headwaters. Ongoing activities to restore riparian vegetation and improve stream channel morphology and floodplain function should be continued. Efforts to improve streamflows through water exchanges and through lease or purchase of out-of-stream water rights for transfer to instream should be accelerated.

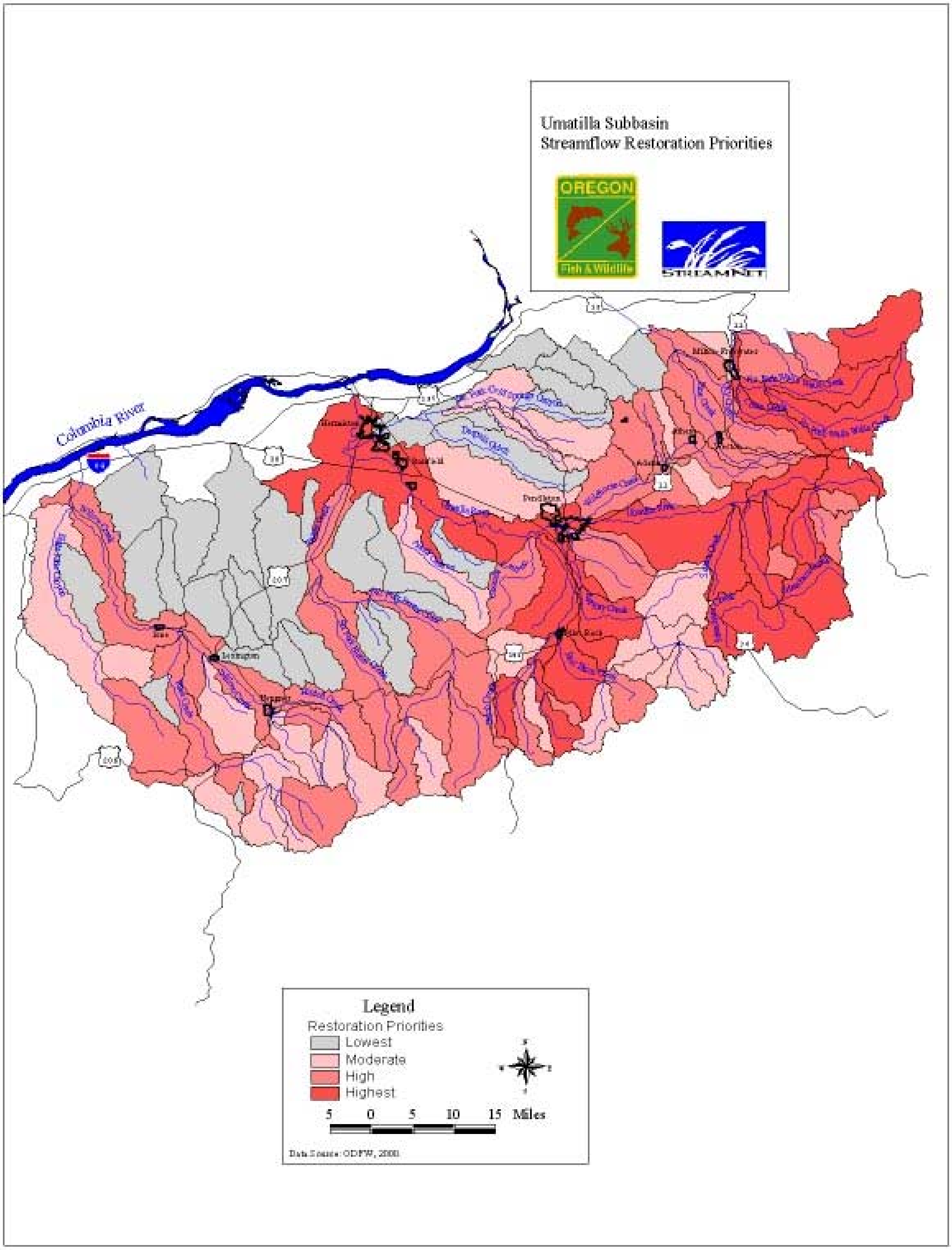


Figure 41. Umatilla/Willow subbasin streamflow restoration priorities (also includes Oregon portion of the Walla Walla subbasin).

Address Passage Impediments

As with instream flows and temperature, passage impediments have severely impacted fish populations in the Umatilla subbasin and were a major cause of the extinction of native salmon stocks. Passage problems on the mainstem Umatilla River from the construction of diversion dams have been largely mitigated, as have many passage problems on tributaries; however, a number of significant passage barriers remain, particularly in Birch, Butter, and Willow Creeks. Birch Creek continues to produce very significant numbers of summer steelhead. Butter and Willow Creeks historically supported summer steelhead, but no longer do so because of passage barriers and low streamflows. Both continue to support populations of interior redband trout. The remaining passage barriers in the Birch Creek watershed should be addressed to improve production of summer steelhead. Passage barriers in both Butter and Willow Creeks should be inventoried and a plan developed for addressing them.

While ladders and screens are in place at all lower Umatilla River Irrigation diversions, these facilities must be properly operated and maintained to provide optimum protection for salmonid fish. Ongoing efforts to operate and maintain these facilities should continue. All fish screens and passage structures in the basin need to be maintained to provide optimum benefits.

As with upstream passage barriers, unscreened water diversions have also had a substantial impact on anadromous fish in the Umatilla Basin. All known gravity feed diversions in the anadromous portion of the basin are screened. It is not known to what extent pump diversions have been screened in the anadromous portion of the subbasin. An inventory of pump installations should be conducted to determine screening needs; all unscreened pumps should be appropriately screened. The number of unscreened diversions in Butter and Willow Creeks is unknown. An inventory of all surface water diversions should be conducted and a plan developed for screening all unscreened diversions.

Improve Riparian Habitats

Riparian vegetation is a critical component of a stable, functioning stream ecosystem. Degradation of riparian vegetation leads to changes in both the physical and biological parameters important for salmonids and other aquatic organisms. Riparian vegetation provides multiple benefits, including streambank stability, stream channel shading, insect drop, organic matter for terrestrial and aquatic insects to feed upon, thermal cover for wildlife, nesting and roosting areas for song birds, and recruitable instream wood. Reeves et al (1988) found that approximately 70% of 422 miles of streams in the Umatilla Basin inventoried by ODFW would benefit from riparian improvements. Since 1988, the ODFW, CTUIR and UNF have implemented habitat enhancement projects on nearly 38.15 miles of streams on UNF and private owned lands. These areas are currently in early recovery. Numerous small properties, fragmented ownerships, and lack of cooperative landowners frequently make it difficult to recover a contiguous riparian buffer in high priority areas.

Activities to improve riparian habitat should continue, particularly in subwatersheds with temperature, sediment and/or flow problems such as Birch, Meacham, Wildhorse, and Butter Creeks. Activities should include operation and maintenance of existing projects; implementation of new restoration projects (e.g., fencing, revegetation, bioengineering, noxious weed control); purchase of critical habitat for fish and wildlife; and acquisition of grazing, timber, mineral and water rights.

Improve Instream Habitat Quality and/or Diversity

Intensive land uses throughout the basin have negatively affected watershed function, altered natural channel and floodplain characteristics, and have destroyed or deteriorated riparian zones. Many streams in the subbasin have been channelized, resulting in channel incision below the water table. Such incision lowers the surrounding water table, which reduces the amount of water available to riparian plant communities, thus lowering the viability of native riparian plant species. Other outcomes of channelization include streams losing their bank strength, channel widening, and lateral channel extension. This has resulted in large, unstable gravel bars and wide, shallow stream flow. The cumulative effects of such stream channel alterations result in unstable channels and poor fish habitat. Ongoing efforts in the basin to restore historic stream channel dynamics and native riparian vegetation should continue. Many miles of stream in the subbasin are still in need of treatment.

Reduce Sediment Inputs

Many streams in the Umatilla basin have excessively turbid waters and a high percentage of fine sediment in spawning substrates (DEQ 2000). Some of the highest suspended sediment loads were found in the Wildhorse Creek, Tutuilla Creek and Butter Creek drainages. Most areas of the basin exceed the water column turbidity target of 30 NTU developed for the TMDL requirement. DEQ found that water column sediment in the Umatilla Basin is derived from both streambank (bed and banks of the stream) and upland sources; however, the primary source (71% to 96% of the sediment load) was from streambanks. As with instream habitat quality, reduction of streambank erosion can be accomplished by restoring stream channel morphology and natural flow regimes, and by restoring riparian vegetation. Upland sources should be addressed by implementing Best Management Practices (BMPs) as documented in the TMDL Water Quality Management Plans (DEQ 2000).

Protect Stronghold Habitats

Particular areas of the basin provide habitat strongholds. For example, the North Fork Umatilla provides stronghold habitat for bull trout and spring chinook, and Squaw Creek provides stronghold habitat for summer steelhead. Stronghold habitats are paramount to conservation of salmonid species in the Umatilla Basin. These areas are the life-blood of the basin and account for the majority of fish production. Should catastrophic events occur, these areas would likely be instrumental in maintaining a basin-wide population base. Current management and/or protective strategies that have allowed stronghold habitats to persist should be continued. Above all else, stronghold habitats should be protected to maintain their current status. Additionally, all salmonid habitats should be protected to at least maintain their current quantity and quality. Habitat acquisition should be emphasized where opportunities exist to protect stronghold fish and wildlife habitats or to enhance areas to stronghold status.

Increase Adult Spawners

Salmonid species in the subbasin currently limited by the number of adult spawners include bull trout (Hansen et al. 2001), and summer steelhead (Chilcote 2001 unpublished draft). Reintroduced salmon species (chinook and coho) are likely also limited by lack of adult spawners. While natural production has been documented for these reintroduced species, it is far below the level needed to provide replacement of adult returns. This is not unusual considering Umatilla reintroduction efforts (utilizing non-endemic stocks) is still in the "start-up" stage. Most endemic salmon and steelhead populations in the mid to upper Columbia River system are currently not replacing themselves; therefore there may be factors other than in-subbasin instream habitat influencing fish recovery. Even if replacement was occurring, populations would still not be at a level that could meet natural production and harvest objectives. As a result, key needs for Umatilla fish recovery include habitat enhancement, both in and out of the subbasin, as well as the continuation of artificial production efforts in order to increase the number of natural spawners.

There are numerous strategies for increasing natural spawning escapement. These include improvements in total survival, reduction of sport and commercial harvest, artificial propagation, habitat enhancement, and passage improvement. Current efforts to increase bull trout spawner abundance include prohibiting sport harvest, improving habitat and passage, and improving the survival of fish with a "fluvial" life history. These efforts should be continued, and improvements made through monitoring and evaluation of the "fluvial" life history pattern.

Steelhead abundance below objectives should be addressed through habitat improvement and continued hatchery supplementation with endemic Umatilla stock (CTUIR). Spring chinook abundance below objectives should be addressed through habitat improvement and continued hatchery supplementation with the additional production proposed by CTUIR. Fall chinook abundance below objectives should be addressed through habitat improvement and hatchery supplementation utilizing 0+ and 1+ juvenile releases, and adult outplants. Adult return success should also continue to be evaluated. Coho salmon abundance below objectives should be addressed through habitat improvement and continuation of the existing hatchery reintroduction program. Pacific lamprey research and restoration efforts utilizing supplementation should continue in order to meet restoration objectives (CTUIR). Monitoring of survival and adult return success (for anadromous species) should be continued.

Increase SARs (smolt to adult returns)

Low SARs continue to impede efforts to achieve natural production, broodstock, and harvest objectives in the Umatilla Basin. This has been a problem for both natural and hatchery produced smolts. According to Chilcote (1998), Umatilla wild summer steelhead have been below estimated population equilibrium since the 1994 spawning year. Actual

SARs for hatchery produced smolts have been far below the target planning levels identified in the Umatilla Hatchery Master Plan (NWPPC 1990). This is believed to be caused by conditions both inside and outside the subbasin.

The survival rate of smolts initiating downstream migration in the Umatilla River is estimated at 60-70% (Knapp and Ward 1990). While the specific survival bottlenecks have not yet been identified, it is presumed that improved passage conditions (in-river flows, water quality, management of smolt by-pass facilities, and decreased avian predation) will result in higher smolt survival. The Umatilla River Fish Passage Operations Project should continue to oversee operation of fish by-pass facilities, monitor river conditions, and direct implementation of the Umatilla Basin Water Exchange Project to optimize in-river smolt migration conditions. Fish managers should support implementation of actions to achieve the waste load allocation adopted by the Umatilla TMDL (DEQ 2000) to improve water quality conditions for smolt outmigration.

In 2000, fish managers modified the Umatilla hatchery fall chinook production program because of low smolt to adult returns from subyearling's released in the Umatilla. Smolt to adult returns have been low since fall chinook production at the Umatilla Hatchery began. While the bottleneck(s) for fall chinook SARs are not currently known, managers hypothesize that size of release, low streamflows, and high water temperatures in the Umatilla River at the time of release, are the primary problems (ODFW and CTUIR 2000, unpublished). Over the next several years, managers will implement different release strategies to improve survival. These strategies will be evaluated to determine which actions are most successful.

Problems with low SARs for spring chinook smolts reared at Umatilla Hatchery and released into the Umatilla have been observed in recent years. Managers believe that this survival problem is tied to the water supply in which the fish are reared. The fish are reared in warm well water with a temperature regime unlike natural conditions. This has resulted in early maturation of fish. In past years, juveniles were smolting in the hatchery prior to transfer to acclimation facilities for release. Managers hypothesize that early transfer to acclimation ponds with natural temperature regimes will increase survival. To test this hypothesis, one group of spring chinook smolts will be transported to acclimation facilities in mid November for release in March.

The major problem affecting SAR that occurs outside the subbasin is outmigration through the Columbia River hydropower system. Reducing the mortality of downstream migrants through the impounded Columbia River mainstem will be necessary before any upriver subbasins can be expected to meet production and harvest objectives. There is a need for special emphasis on addressing problems with fish passage, water quality, predation, and estuary conditions in the Columbia. These problems will be elaborated in the mainstem "subbasin" assessments as a part of the NWPPC fish and wildlife restoration planning and implementation process. Without appropriate sharing of the conservation burden throughout the fish's life history, concentrated efforts in the subbasins will have limited results.

Address Research/Data Gaps

Natural Production

- Continue collecting trend data for salmonid distribution, abundance, densities, age, and growth throughout the subbasin at established index sites
- Continue collecting trend data for natural adult returns and the natural spawning of hatchery and natural produced steelhead, spring chinook, fall chinook, coho, bull trout and lamprey
- Maintain regular collections and archives of genetic material for *O. mykiss* and bull trout
- Maintain artificial production monitoring and evaluation programs
- Monitor juvenile salmonid outmigrant timing and survival
- Evaluate existing flow enhancement efforts and define the most feasible options to meet additional needs
- Evaluate salmonid supplementation programs
- Continue research and restoration of Pacific lamprey and develop a research and restoration plan for shellfish
- Monitor and evaluate patterns of fluvial bull trout
- Monitor distribution and abundance of spawning hatchery-reared steelhead
- Inventory pump diversions and determine screening needs
- Inventory irrigation diversions in the Butter and Willow Creek drainages and determine passage and screening needs

Artificial Production

- Maintain artificial production monitoring and evaluation programs

Flows/Passage

- Evaluate existing flow enhancement efforts and define most feasible options to meet additional needs
- Inventory pump diversions and determine screening needs
- Inventory irrigation diversions in the Butter and Willow Creek drainages and determine passage and screening needs

Planning

- Continue research and restoration of Pacific lamprey
- Develop a research and restoration plan for shellfish

Wildlife Needs

Habitat

Grassland and Shrub Steppe

7. Protect, maintain and enhance shrub steppe habitats
8. Improve connectivity between existing shrub steppe fragments

9. Move savannah grassland with potential brooding , leking and wintering sharp-tailed grouse habitat into protect status
10. Enhance and restore native perennial grassland habitats
11. Reduce non-native annual grasses in shrub-steppe and grassland habitat
12. Pursue and implement effective biological controls on noxious weeds including yellow-star thistle and knapweeds

Forest

7. Protect, maintain, and enhance late-seral dry forest habitats
8. Maintain large patch size late-seral dry forest stands
9. Restore and maintain snag and downed wood densities of a variety of species to meet nesting and foraging requirements of forest dwelling landbirds
10. Move mid-elevation and foothill big game winter range habitat into protected status
11. Protect, enhance, and restore aspen groves
12. Reduce road densities and associated impacts to watershed functions

Riparian

5. Control noxious weeds in specific high value habitat areas (e.g. reed canary grass in wetland and riparian communities)
6. Restore riparian understory shrub communities
7. Maintain and improve large structure riparian cottonwood galleries for Lewis's woodpeckers
8. Identify and protect remaining ferruginous hawk nest sites and associated habitats in the subbasin

Wildlife Populations

13. Restore anadromous fish populations to support salmon dependent wildlife and promote natural nutrient cycling
14. Evaluate status of avian species that are inadequately surveyed by standardized survey protocols
15. Evaluate the importance of individual habitat fragments to native wildlife species on private lands in the subbasin
16. Assess methods to reduce cowbird parasitism on native bird species
17. Inventory herptile and small mammals and their habitats in the subbasin
18. Maintain, protect and enhance big game winter range
19. Reduce bullfrog predation on juvenile western painted turtle and other native herptiles
20. Reduce domestic sheep/bighorn sheep conflicts in primary Rocky Mountain bighorn sheep habitat
21. Reintroduce Rocky Mountain bighorn sheep into suitable habitats
22. Reestablish harvestable populations of mountain quail
23. Assess impacts of ravens, cowbirds, crows, starlings, and magpies on species at risk
24. Assess the impacts of shed antler collecting on deer and elk herds and associated habitats

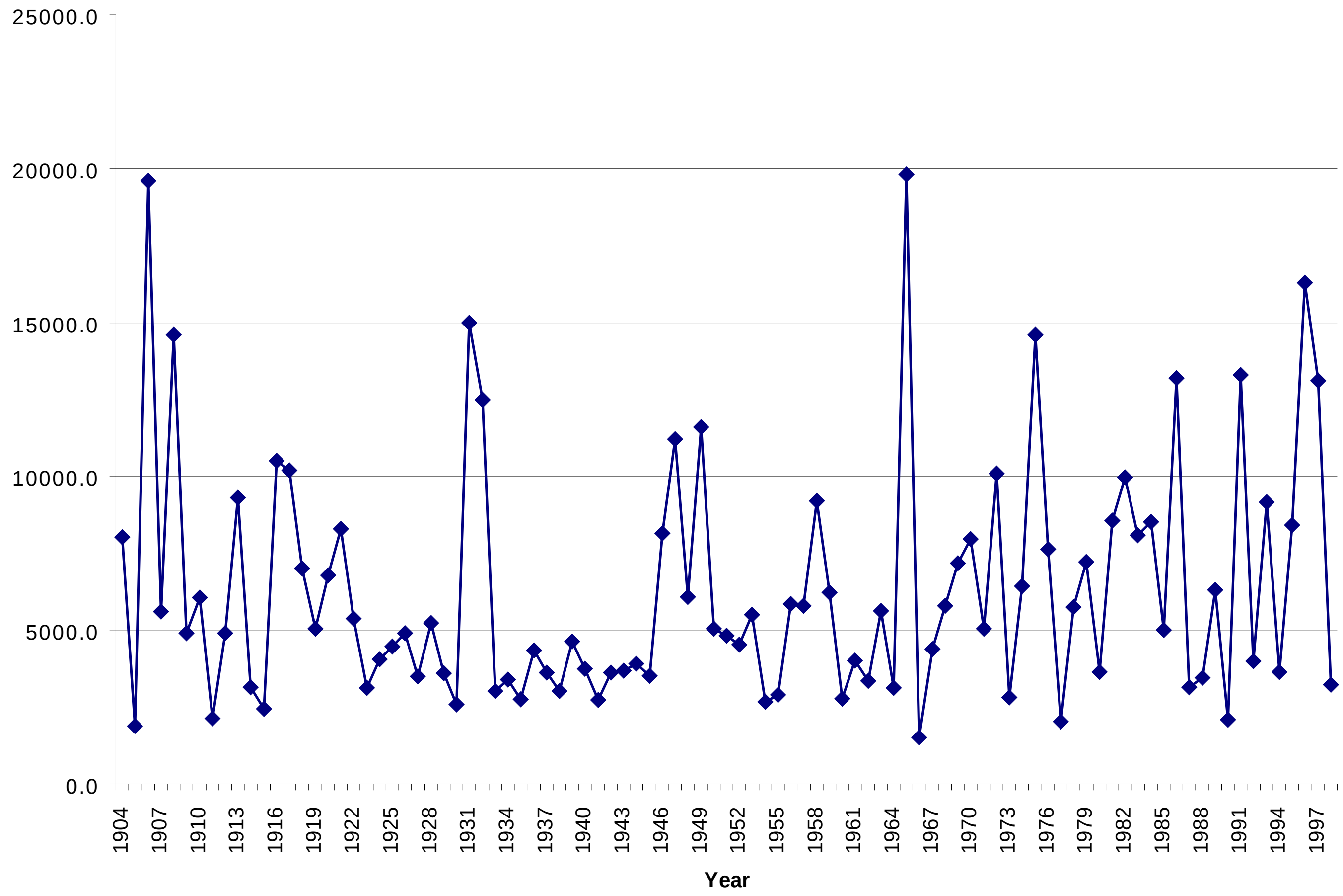
Actions by Others

Table 61. Non BPA-funded fish and wildlife activities within the Umatilla River subbasin (Shaw 1997; Oregon Department of Environmental Quality et al. 2000; U. S. Forest Service 1990; Mark Kirsch, ODFW, personal communication January 11, 2001)

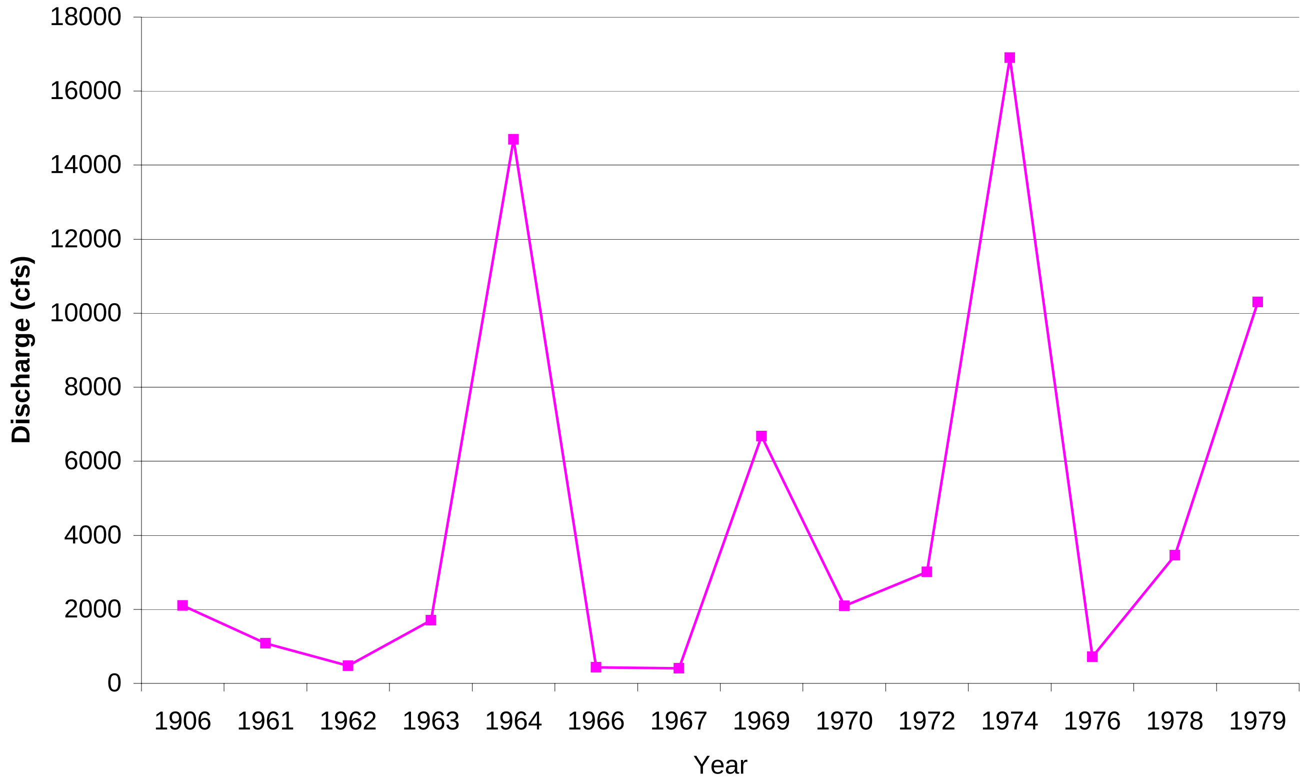
Project	Funding/Lead Agency	Status
Passage Improvement		
Culvert replacement	UBWC, landowners, ODF, ODFW, NRCS, UCSWCD	ongoing
Flow Enhancement		
Streamflow Restoration Prioritization. ODFW has established priorities for streamflow restoration needs in the Umatilla based on individual rankings of several factors.	OWEB-OWRD/ODFW, WRD	ongoing
Habitat Enhancement		
Subbasin-wide habitat enhancement	CTUIR, EPA	2000
Riparian vegetation improvement in Buckaroo and Butter Creeks	NRCS, CTUIR, BIA	1999 - ongoing
Watershed improvement, Butter Creek drainage	NRCS, Umatilla County, SWCD	1998 - ongoing
Improvement of 5.25 RM in Meacham, Mission, Wildhorse, Greasewood, and Spring Hollow Creeks		1993
Improvement of 7.45 miles of riparian habitat on lower Boston Canyon Creek, lower Meacham Creek, and upper Umatilla River	CTUIR	1988-1992
Spray winter range to control noxious weeds	ODFW	ongoing
Riparian enhancement through restrictive grazing, limits on timber harvesting, and correction of road problems	UNF	ongoing
Conservation agriculture	UCSWCD	ongoing
Tree planting, channel engineering, and instream structures on Birch Creek	ODFW	ongoing
Road maintenance and repair	ODT	ongoing
Riparian planting, conservation agriculture, and road improvement	UBWC, landowners, ODF, ODFW, NRCS, UCSWCD	ongoing
Forestry Incentive Program to reforest and treat forest stands	ODF	ongoing
Stewardship Incentive Program to treat forest stands, conduct fish and/or wildlife habitat improvements, soil conservation, and riparian and wetland improvements	ODF	ongoing
Environmental Quality Incentives Program to make stream, riparian, and vegetation improvements, provide grazing and water management, improve agricultural practices	NRCS	ongoing
Riparian area planting and instream projects	ODFW	ongoing
Implement BMPs and other water quality-specific standards and guidelines for federal forestlands	USFS	ongoing
On-site evaluation, technical project design, stewardship/conservation plans, and referrals for funding	ODF, ODFW, NRCS, USWCD	ongoing
Transportation system maintenance on private forestlands	ODF	ongoing
Water protection rules for non-federal forest operation BMPs	ODF	ongoing

Project	Funding/Lead Agency	Status
Agricultural Water Quality Management Program	ODA	ongoing
Regulation of instream work and stream relocation	ODSL	ongoing
Enhance deer and elk habitat on private land in winter range and fund damage relief projects	ODFW	ongoing
Natural resource programs	CTUIR	ongoing
Forest Resource Trust to convert under-producing forestland into productive forests	ODF	ongoing
Umatilla Basin Project	BOR	ongoing
Oregon forest practices	ODF	ongoing
Storm water programs	EPA	ongoing
Oregon agricultural management plans	ODA	ongoing
Management Coordination		
Annual blue and ruffed grouse wing collection from hunters	ODFW	ongoing
Hunter checks stations	ODFW, OSP	ongoing
Permit programs for wastewater	ODEQ	ongoing
Outreach and project coordination	UBWC	ongoing
Project development and coordination	UCSWCD	ongoing
Education		
Educate landowners on forest and agriculture-related topics	OSU	ongoing
Private Lands Forest Network to educate landowners/managers about reforestation and aforestation	PLFN	ongoing
Research Monitoring & Evaluation		
Limiting factors report draft required by WA state legislature to compile information about the WRIA	WCC	2000
Monitoring for nonpoint source water pollution control projects	UCSWCD, UBWC, CTUIR	2000
Special report on blue grouse in NE OR	ODFW	1995
Sampling and analysis	ODFW, CTUIR	1993, 1996-1999
Watershed assessment report	Various/CTUIR, CEED	ongoing
Annual blue and ruffed grouse sex, age, and hatch date analysis	ODFW	ongoing
Annual harvest reports for pronghorn, bear, cougar, deer, elk, waterfowl, and upland game birds	ODFW	ongoing
Annual inventory of trend and production data for upland game birds, deer, and elk	ODFW	ongoing
Mount Emily elk herd delineation wildlife research report	ODFW	ongoing
Annual mule deer fall herd composition counts	ODFW	ongoing
Annual mule deer and elk spring composition counts	ODFW	ongoing
Annual upland bird brood counts	ODFW	ongoing
Winter raptor surveys	ODFW	ongoing
Develop winter-range, grassland, and shrub steppe areas to establish native habitats for either deer and elk winter range and sharp-tailed grouse habitat	ODFW, NRCS	ongoing
Wildlife population monitoring programs	CTUIR, ODEQ, USFS, ODFW, OWRD	ongoing
Population modeling for both mule deer and elk populations	ODFW	ongoing

Appendix A - Peak annual discharge for the Umatilla River at Umatilla for the years 1904 – 1998



Appendix B - Peak annual discharge (above baseflow of 400 cfs) for Willow Creek near Arlington, OR



Appendix C - Wildlife species in the Umatilla/Willow subbasin

Wildlife species occurring in Umatilla subbasin
(generated using ICBEMP species range maps and verified by local biologists)

Amphibians

Rana catesbeiana	bullfrog
Spea intermontana	great basin spadefoot
Ambystoma macrodactylum	long-toed salamander
Rana pipiens	northern leopard frog
Pseudacris regilla	pacific chorus frog
Rana luteiventris	spotted frog
Bufo boreas boreas	western boreal toad
Bufo woodhousii	woodhouse's toad

Birds

Recurvirostra americana	American avocet
Botaurus lentiginosus	American bittern
Fulica americana	American coot
Corvus brachyrhynchos	American crow
Cinclus mexicanus	American dipper
Pluvialis dominica	American golden-plover
Carduelis tristis	American goldfinch
Falco sparverius	American kestrel
Anthus rubescens	American pipit
Setophaga ruticilla	American redstart
Turdus migratorius	American robin
Spizella arborea	American tree sparrow
Pelecanus erythrorhynchos	American white pelican
Anas americana	American wigeon
Calidris bairdii	baird's sandpiper
Haliaeetus leucocephalus	bald eagle
Riparia riparia	bank swallow
Hirundo rustica	barn swallow
Strix varia	barred owl
Bucephala islandica	barrow's goldeneye
Ceryle alcyon	belted kingfisher
Thryomanes bewickii	Bewick's wren
Chlidonias niger	black tern
Picoides arcticus	black-backed woodpecker
Pluvialis squatarola	black-bellied plover
Pica pica	black-billed magpie
Parus atricapillus	black-capped chickadee

Birds

Archilochus alexandri	black-chinned hummingbird
Nycticorax nycticorax	black-crowned night heron
Pheucticus melanocephalus	black-headed grosbeak
Himantopus mexicanus	black-necked stilt
Dendragapus obscurus	blue grouse
Cyanocitta cristata	blue jay
Anas discors	blue-winged teal
Bombycilla garrulus	bohemian waxwing
Larus philadelphia	bonaparte's gull
Euphagus cyanocephalus	Brewer's blackbird
	Brewer's sparrow
Certhia americana	brown creeper
Molothrus ater	brown-headed cowbird
Bucephala albeola	bufflehead
Athene cunicularia	burrowing owl
Larus californicus	california gull
Callipepla californica	california quail
Stellula calliope	calliope hummingbird
Branta canadensis	canada goose
Aythya valisineria	canvasback
Catherpes mexicanus	canyon wren
Sterna caspia	caspian tern
Carpodacus cassinii	Cassin's finch
Bombycilla cedrorum	cedar waxwing
Parus rufescens	chestnut-backed chickadee
Parus rufescens	chestnut-backed chickadee
Spizella passerina	chipping sparrow
Alectoris chukar	chukar
Anas cyanoptera	cinnamon teal
Aechmophorus clarkii	Clark's grebe
Nucifraga columbiana	clark's nutcracker
Hirundo pyrrhonota	cliff swallow
Tyto alba	common barn owl
Bucephala clangula	common goldeneye
Gavia immer	common loon
Mergus merganser	common merganser
Chordeiles minor	common nighthawk
Phalaenoptilus nuttallii	common poorwill
Corvus corax	common raven
Carduelis flammea	common redpoll
Gallinago gallinago	common snipe
Sterna hirundo	common tern
Geothlypis trichas	common yellowthroat

Birds

Accipiter cooperii	Cooper's hawk
Empidonax occidentalis	cordilleran flycatcher
Junco hyemalis	dark-eyed junco
Phalacrocorax auritus	double-crested cormorant
Picoides pubescens	downy woodpecker
Calidris alpina	dunlin
Empidonax oberholseri	dusky flycatcher
Podiceps nigricollis	eared grebe
Tyrannus tyrannus	eastern kingbird
Sturnus vulgaris	European starling
Coccothraustes vespertinus	evening grosbeak
Buteo regalis	ferruginous hawk
Otus flammeolus	flammulated owl
Sterna forsteri	forster's tern
Passerella iliaca	fox sparrow
Larus pipixcan	franklin's gull
Anas strepera	gadwall
Larus glaucescens	glaucous-winged gull
Aquila chrysaetos	golden eagle
Regulus satrapa	golden-crowned kinglet
Zonotrichia atricapilla	golden-crowned sparrow
Ammodramus savannarum	grasshopper sparrow
Dumetella carolinensis	gray catbird
Empidonax wrightii	gray flycatcher
Perisoreus canadensis	gray jay
Perdix perdix	gray partridge
Leucosticte tephrocotis	gray-crowned rosy finch
Ardea herodias	great blue heron
Casmerodius albus	great egret
Strix nebulosa	great gray owl
Bubo virginianus	great horned owl
Grus canadensis tabida	greater sandhill crane
Aythya marila	greater scaup
Anser albifrons	greater white-fronted goose
Tringa melanoleuca	greater yellowlegs
Pipilo chlorurus	green-tailed towhee
Anas crecca	green-winged teal
Picoides villosus	hairy woodpecker
Empidonax hammondii	hammond's flycatcher
Histrionicus histrionicus	harlequin duck
Zonotrichia querula	Harris' sparrow
Catharus guttatus	hermit thrush
Larus argentatus	herring gull
Lophodytes cucullatus	hooded merganser

Birds

Podiceps auritus	horned grebe
Eremophila alpestris	horned lark
Carpodacus mexicanus	house finch
Passer domesticus	house sparrow
Troglodytes aedon	house wren
Charadrius vociferus	killdeer
Chondestes grammacus	lark sparrow
Passerina amoena	lazuli bunting
Passerina amoena	lazuli bunting
Calidris minutilla	least sandpiper
Carduelis psaltria	lesser goldfinch
Aythya affinis	lesser scaup
Melospiza lincolnii	lincoln's sparrow
Lanius ludovicianus	loggerhead shrike
Numenius americanus	long-billed curlew
Limnodromus scolopaceus	long-billed dowitcher
Asio otus	long-eared owl
Oporornis tolmiei	macgillivray's warbler
Anas platyrhynchos	mallard
Limosa fedoa	marbled godwit
Cistothorus palustris	marsh wren
Falco columbarius	merlin
Larus canus	mew gull
Sialia currucoides	mountain bluebird
Parus gambeli	mountain chickadee
Parus gambeli	mountain chickadee
Oreortyx pictus	mountain quail
Zenaida macroura	mourning dove
Vermivora ruficapilla	nashville warbler
Colaptes auratus	northern flicker
Accipiter gentilis	northern goshawk
Circus cyaneus	northern harrier
Icterus galbula	northern oriole
Anas acuta	northern pintail
Glaucidium gnoma	northern pygmy-owl
Stelgidopteryx serripennis	northern rough-winged swallow
Aegolius acadicus	northern saw-whet owl
Anas clypeata	northern shoveler
Lanius excubitor	northern shrike
Clangula hyemalis	oldsquaw
Clangula hyemalis	oldsquaw
Contopus borealis	olive-sided flycatcher
Vermivora celata	orange-crowned warbler
Pandion haliaetus	osprey

Birds

Dendroica palmarum	palm warbler
Calidris melanotos	pectoral sandpiper
Falco peregrinus	peregrine falcon
Podilymbus podiceps	pied-billed grebe
Dryocopus pileatus	pileated woodpecker
Pinicola enucleator	pine grosbeak
Carduelis pinus	pine siskin
Falco mexicanus	prairie falcon
Sitta pygmaea	pygmy nuthatch
Loxia curvirostra	red crossbill
Sitta canadensis	red-breasted nuthatch
Vireo olivaceus	red-eyed vireo
Aythya americana	redhead
Sphyrapicus nuchalis	red-naped sapsucker
Podiceps grisegena	red-necked grebe
Phalaropus lobatus	red-necked phalarope
	red-shafted flicker
	red-tailed hawk
Agelaius phoeniceus	red-winged blackbird
Larus delawarensis	ring-billed gull
Aythya collaris	ring-necked duck
Phasianus colchicus	ring-necked pheasant
Columba livia	rock dove
Salpinctes obsoletus	rock wren
Chen rossii	ross' goose
Buteo lagopus	rough-legged hawk
Regulus calendula	ruby-crowned kinglet
Oxyura jamaicensis	ruddy duck
Bonasa umbellus	ruffed grouse
Selasphorus rufus	rufous hummingbird
Pipilio erythrophthalmus	rufous-sided towhee
Oreoscoptes montanus	sage thrasher
Passerculus sandwichensis	savannah sparrow
Sayornis saya	say's phoebe
Charadrius semipalmatus	semipalmated plover
Charadrius semipalmatus	semipalmated plover
Calidris pusilla	semipalmated sandpiper
Accipiter striatus	sharp-shinned hawk
Limnodromus griseus	short-billed dowitcher
Asio flammeus	short-eared owl
Plectrophenax nivalis	snow bunting
Chen caerulescens	snow goose
Tringa solitaria	solitary sandpiper
Vireo solitarius	solitary vireo

Birds

Melospiza melodia	song sparrow
Porzana carolina	sora
Actitis macularia	spotted sandpiper
Cyanocitta stelleri	Steller's jay
Buteo swainsoni	Swainson's hawk
Catharus ustulatus	Swainson's thrush
Picoides tridactylus	three-toed woodpecker
Myadestes townsendi	Townsend's solitaire
Dendroica townsendi	Townsend's warbler
Tachycineta bicolor	tree swallow
Agelaius tricolor	tricolored blackbird
Cygnus columbianus	tundra swan
Cathartes aura	turkey vulture
Bartramia longicauda	upland sandpiper
Ixoreus naevius	varied thrush
Chaetura vauxi	vaux's swift
Catharus fuscescens	veery
Pooecetes gramineus	vesper sparrow
Tachycineta thalassina	violet-green swallow
Rallus limicola	virginia rail
Vireo gilvus	warbling vireo
Sialia mexicana	western bluebird
Aechmophorus occidentalis	western grebe
Tyrannus verticalis	western kingbird
Sturnella neglecta	western meadowlark
Calidris mauri	western sandpiper
Otus kennicottii	western screech owl
	western scrub-jay
Piranga ludoviciana	western tanager
Contopus sordidulus	western wood-pewee
Sitta carolinensis	white-breasted nuthatch
Zonotrichia leucophrys	white-crowned sparrow
Picoides albolarvatus	white-headed woodpecker
Zonotrichia albicollis	white-throated sparrow
Loxia leucoptera	white-winged crossbill
Meleagris gallopavo	wild turkey
Catoptrophorus semipalmatus	willet
Sphyrapicus thyroideus	williamson's sapsucker
Empidonax traillii	willow flycatcher
Phalaropus tricolor	wilson's phalarope
Wilsonia pusilla	wilson's warbler
Troglodytes troglodytes	winter wren
Aix sponsa	wood duck
Dendroica petechia	yellow warbler

Birds	
Coccyzus americanus	yellow-billed cuckoo
Icteria virens	yellow-breasted chat
Xanthocephalus xanthocephalus	yellow-headed blackbird
Dendroica coronata	yellow-rumped warbler
Mammals	
Taxidea taxus	american badger
Martes americana	American marten
Castor canadensis	beaver
Spermophilus beldingi	belding's ground squirrel
Eptesicus fuscus	big brown bat
Ursus americanus	black bear
Lepus californicus	black-tailed jackrabbit
Lynx rufus	bobcat
Neotoma cinerea	bushy-tailed woodrat
Myotis californicus	california myotis
Scapanus orarius	coast mole
Spermophilus columbianus	columbian ground squirrel
Ondatra zibethicus	common muskrat
Erethizon dorsatum	common porcupine
Procyon lotor	common raccoon
Canis latrans	coyote
Peromyscus maniculatus	deer mouse
Sylvilagus floridanus	eastern cottontail
Mustela erminea	ermine
Myotis thysanodes	fringed myotis
Spermophilus lateralis	golden-mantled ground squirrel
Perognathus parvus	great basin pocket mouse
Phenacomys intermedius	heather vole
Lasiurus cinereus	hoary bat
Tamias minimus	least chipmunk
Myotis lucifugus	little brown myotis
Myotis evotis	long-eared myotis
Myotis volans	long-legged myotis
Microtus longicaudus	long-tailed vole
Mustela frenata	long-tailed weasel
Lynx lynx	lynx
Sorex merriami	merriam's shrew
Mustela vison	mink
Microtus montanus	montane vole
Sylvilagus nuttallii	mountain cottontail
Felis concolor	mountain lion
Odocoileus hemionus	mule deer
Glaucomys sabrinus	northern flying squirrel
Onychomys leucogaster	northern grasshopper mouse

Mammals

Thomomys talpoides	northern pocket gopher
Lutra canadensis	northern river otter
Lutra canadensis	northern river otter
Dipodomys ordii	ord's kangaroo rat
Plecotus townsendii pallescens	pale western big-eared bat
Antrozous pallidus	pallid bat
Sorex preblei	preble's shrew
Antilocapra americana	pronghorn
Vulpes vulpes	red fox
Tamiasciurus hudsonicus	red squirrel
Lemmiscus curtatus	sagebrush vole
Lasionycteris noctivagans	silver-haired bat
Lepus americanus	snowshoe hare
Clethrionomys gapperi	southern red-backed vole
Euderma maculatum	spotted bat
Mephitis mephitis	striped skunk
Spermophilus townsendii	townsend's ground squirrel
Sorex vagrans	vagrant shrew
Didelphis virginiana	virginia opossum
Spermophilus washingtoni	washington ground squirrel
Sorex palustris	water shrew
Microtus richardsoni	water vole
Reithrodontomys megalotis	western harvest mouse
Zapus princeps	western jumping mouse
Pipistrellus hesperus	western pipistrelle
Myotis ciliolabrum	western small-footed myotis
Spilogale gracilis	western spotted skunk
Odocoileus virginianus	white-tailed deer
Lepus townsendii	white-tailed jackrabbit
Lepus townsendii	white-tailed jackrabbit
Gulo gulo	wolverine
Marmota flaviventris	yellow-bellied marmot
Tamias amoenus	yellow-pine chipmunk
Myotis yumanensis	yuma myotis

Reptiles

Thamnophis sirtalis	common garter snake
Pituophis catenifer	gopher snake
Gambelia wislizenii	longnose leopard lizard
Hypsiglena torquata	night snake
Chrysemys picta belli	painted turtle
Coluber constrictor	racer
Charina bottae	rubber boa
Sceloporus graciosus graciosus	sagebrush lizard
Phrynosoma douglassii	short-horned lizard

Reptiles

Uta stansburiana	side-blotched lizard
Masticophis taeniatus	striped whipsnake
Sceloporus occidentalis	western fence lizard
Crotalus viridis	western rattlesnake
Eumeces skiltonianus	western skink
Thamnophis elegans	western terrestrial garter snake

Appendix D - Hatchery releases of summer steelhead in the Umatilla subbasin

Table __. Hatchery releases of summer steelhead in the Umatilla River

Year of Release	Hatchery	No. Released	No./lb.	Release Location	Stock
1967	Gnat Creek	109,805	75.0		Skamania
1967	Oak Springs	238,020	117.0		Idaho (Oxbow)
1967	Wallowa	142,240	240.0		Idaho (Oxbow)
1968	Gnat Creek	23,100	66.0		Skamania
1968	Gnat Creek	150,000	Eggs		Skamania
1969	Oak Springs	174,341	145.0		Skamania
1970	Carson	39,489	8.0-9.0		Skamania
1975	Wizard Falls	11,094	9.0		Umatilla River
1981	Oak Springs	17,558	6.0-9.0	Upper Umatilla	Umatilla River
1981	Oak Springs	9,400	145.0	Upper Umatilla	Umatilla River
1982	Oak Springs	59,494	7.0-8.0	Upper Umatilla	Umatilla River
1982	Oak Springs	67,940	124.0	Upper Umatilla	Umatilla River
1983	Oak Springs	60,500	11.0	Upper Umatilla	Umatilla River
1983	Oak Springs	52,700	62.0	Upper Umatilla	Umatilla River
1984	Oak Springs	57,939	6.5	Bonifer	Umatilla River
1984	Oak Springs	22,000	135.0	Bonifer	Umatilla River
1985	Oak Springs	53,850	7.0	Bonifer	Umatilla River
1985	Oak Springs	39,134	150.0	Bonifer	Umatilla River
1986	Oak Springs	54,137	8.4	Bonifer	Umatilla River
1987	Oak Springs	1,485	5.5	Meacham Cr. (RM	Umatilla River
1988	Oak Springs	95,290	6.5-10.3	Minthorn, Nr. Minthorn, Uma. RM	Umatilla River
1988	Oak Springs	10,033	57.5	Umatilla RM 89	Umatilla River
1988	Irrigon	24,618	3200.0	South Fork Umatilla	Umatilla River
1989	Oak Springs	81,712	5.5-6.6	Minthorn, Nr. Minthorn,	Umatilla River
1990	Oak Springs	89,193	5.5-7.7	Bonifer, Nr.	Umatilla River
1991	Oak Springs	71,935	6.2-8.7	Bonifer, Nr.	Umatilla River
1991	Oak Springs	3,998	12.5	Umatilla RM 3	Umatilla River
1992	Umatilla	19,977	5.8	Bonifer	Umatilla River
1992	Umatilla	47,458	5.8	Minthorn	Umatilla River
1992	Umatilla	64,550	5.0	Meacham Cr.	Umatilla River
1992	Umatilla	67,419	5.5	Meacham Cr.	Umatilla River
1992	Umatilla	5,443	5.8	Umatilla RM 3	Umatilla River
1993	Umatilla	44,824	4.5	Bonifer	Umatilla River
1993	Umatilla	47,979	5.6	Minthorn	Umatilla River
1993	Umatilla	65,465	6.1	Bonifer	Umatilla River
1994	Umatilla	51,403	4.9	Bonifer	Umatilla River
1994	Umatilla	49,598	5.1	Minthorn	Umatilla River
1994	Umatilla	52,097	5.2	Bonifer	Umatilla River
1994	Umatilla	1,732	5.7	Umatilla RM 27.3	Umatilla River
1995	Umatilla	48,539	5.6	Bonifer	Umatilla River
1995	Umatilla	49,983	4.7	Minthorn	Umatilla River
1995	Umatilla	47,941	5.5	Bonifer	Umatilla River
1996	Umatilla	47,543	5.1	Minthorn	Umatilla River
1996	Umatilla	49,377	5.3	Bonifer	Umatilla River
1996	Umatilla	49,783	5.1	Thornhollow	Umatilla River
1997	Umatilla	46,788	4.6	Minthorn	Umatilla River
1997	Umatilla	41,555	5.4	Bonifer	Umatilla River
1997	Umatilla	48,944	4.9	Bonifer	Umatilla River
1998	Umatilla	49,084	4.7	Minthorn	Umatilla River
1998	Umatilla	41,088	5.9	Bonifer	Umatilla River
1998	Umatilla	47,313	5.5	Bonifer	Umatilla River
1999	Umatilla	41,843	4.9	Minthorn	Umatilla River
1999	Umatilla	44,226	5.5	Bonifer	Umatilla River
1999	Umatilla	35,564	5.9	Bonifer	Umatilla River
1999	Umatilla	9,878	43.9	Umatilla RM 0.5	Umatilla River
2000	Umatilla	51,659	4.8	Minthorn	Umatilla River

Appendix E - Hatchery releases of coho in the Umatilla subbasin

Table __. Hatchery releases of spring chinook salmon in the Umatilla River

Year of Release	Hatchery	No. Released	No./lb.	Release Location	Stock	
1986	Carson	99,970	22.8	Bonifer	Carson	
1986	Irrigon	300,438	87.0	S.F. & N.F. Uma. R., Upper Uma. R., N.F. Mea. Cr.	Carson	
1986	Irrigon	75,000	15.0	Bonifer	Carson	
1987	Carson	99,897	10.4	Bonifer	Carson	
1987	Oxbow	169,100	199.0	N.F. Mea. Cr., N.F. Uma. R., Uma. RM 89	Carson	
1988	Bonneville	1,196	21.4	Bonifer	Carson	/a
1988	Carson	99,895	20.6	Umatilla RM 23	Carson	
1988	Bonneville	297,377	8.3-10.3	Upper Uma. R., N.F. Mea. Cr., Bonifer, Nr. Bonifer, Uma. RM 23	Carson	
1988	Bonneville	75,767	11.1	Umatilla RM 89	Carson	/a
1989	Bonneville	325,520	10.6-12.0	Bonifer, Nr. Bonifer	Carson	/a
1990	Carson	99,775	18.6	Umatilla RM 23	Carson	
1990	Bonneville	390,208	9.0-13.4	Bonifer, Nr. Bonifer	Carson	/a
1991	Carson	96,733	16.0-20.6	Umatilla RM 3 & 89	Carson	
1991	Bonneville	196,657	10.1-11.8	Bonifer, Nr. Bonifer	Carson	/a
1991	Bonneville	159,624	16.5-16.8	Bonifer, Nr. Bonifer	Carson	/b
1992	Carson	90,982	18.7	Umatilla RM 89	Carson	
1992	Carson	5,272	18.7	Umatilla RM 3	Carson	
1992	Bonneville	208,029	8.5-9.2	Bonifer, Nr. Bonifer	Carson	/a
1992	Umatilla	955,752	35.4	Umatilla RM 80	Carson	
1992	Irrigon	294,458	32.5	Umatilla RM 80	Carson	
1992	Bonneville	132,929	11.5	Umatilla RM 80	Carson	
1992	Umatilla	101,416	19.4	Umatilla RM 80	Carson	
1993	Bonneville	186,948	14.5	Umatilla RM 80	Carson	
1993	Umatilla	208,782	8.3	Umatilla RM 80	Carson	
1993	Carson	85,134	20.3	Umatilla RM 80	Carson	
1993	Carson	10,952	20.0-20.5	Umatilla RM 3 & 27.3	Carson	
1993	Umatilla	667,367	27.6	Umatilla RM 80	Carson	
1993	Umatilla	460,809	19.9	Umatilla RM 80	Carson	
1994	Umatilla	205,143	8.4	Umatilla RM 80	Carson	
1994	Bonneville	152,854	11.5	Umatilla RM 73.5	Carson	
1994	Bonneville	252,248	12.3	Umatilla RM 80	Carson	
1994	Umatilla	8,890	8.1-8.3	Umatilla RM 3 & 29.2	Carson	
1994	Umatilla	839,377	30.4	Imeques C-mem-ini-kem	Carson	
1994	Umatilla	378,225	8.7	Imeques C-mem-ini-kem	Carson	
1995	Bonneville	247,871	10.3	Imeques C-mem-ini-kem	Carson	
1995	Umatilla	275,804	7.9	Imeques C-mem-ini-kem	Carson	
1995	Bonneville	74,735	14.4	Imeques C-mem-ini-kem	Carson	
1995	Bonneville	74,921	11.4	Imeques C-mem-ini-kem	Carson	
1996	Umatilla	378,561	8.9	Imeques C-mem-ini-kem	Carson	/c
1997	Umatilla	225,883	9.1	Imeques C-mem-ini-kem	Carson	/d
1998	Umatilla	382,714	11.6	Imeques C-mem-ini-kem	Carson	/e
1998	Umatilla	114,370	18.1	Imeques C-mem-ini-kem	Carson	/f
1998	Little White Salmon	172,999	15.6	Imeques C-mem-ini-kem	Carson	/e
1998	Little White Salmon	172,258	11.6	Imeques C-mem-ini-kem	Carson	/e
1998	Carson	99,641	16.3	Imeques C-mem-ini-kem	Carson	
1999	Umatilla	253,831	13.7	Imeques C-mem-ini-kem	Carson	/f
1999	Little White Salmon	302,015	12-7-16.1	Imeques C-mem-ini-kem	Carson	/f
1999	Carson	103,761	13.2	Imeques C-mem-ini-kem	Carson	
2000	Umatilla	254,101	13.3	Imeques C-mem-ini-kem		
2000	Umatilla	103,621	12.2	Imeques C-mem-ini-kem		
2000	Little White Salmon	173,545	13.1	Imeques C-mem-ini-kem		
2000	Little White Salmon	185,069	11.1	Imeques C-mem-ini-kem		
2000	Carson	99,848	14.4	Imeques C-mem-ini-kem	Carson	

/a Carson via Lookingglass stock
/b Carson via Lookingglass, Umatilla River and Big Canyon stock
/c Carson via Lookingglass and Lyons Ferry
/d Carson via Lyons Ferry and Little White Salmon
/e Carson via Little White Salmon
/f Carson via Umatilla River
/a Bonneville, Little White Salmon and Umatilla River stock
/b Priest Rapids and Umatilla River stock

Appendix F - Hatchery releases of spring chinook salmon in the Umatilla subbasin

Table __. Hatchery releases of coho salmon in the Umatilla River Basin.

Year of Release	Hatchery	No. Released	No./lb.	Release Location	Stock
1966	Little White Salmon	500,000	1312.0		Little White Salmon
1967	Little White Salmon	200,000	1087.0		Little White Salmon
1967	Cascade	500,000	Eggs		Tanner Creek
1968	Little White Salmon	750,000	Eggs		Little White Salmon
1969	Carson	200,040	23.0		Little White Salmon
1987	Cascade	948,549	13.5-14.0	Minthorn & Umatilla RM 23	Tanner Creek
1988	Cascade	996,433	16.6	Umatilla RM 9 - 23	Tanner Creek
1989	Cascade	753,637	15.3-19.7	Umatilla RM 55 - 70	Tanner Creek
1989	Cascade	233,269	17.2-19.1	Minthorn, Nr. Minthorn	Tanner Creek
1990	Cascade	796,842	14.7	Umatilla RM 23- 70	Tanner Creek
1990	Cascade	192,086	11.2-13.5	Minthorn, Nr. Minthorn	Tanner Creek
1991	Cascade	152,974	15.4	Minthorn	Tanner Creek
1991	Cascade	228,293	16.5	Umatilla RM 56	Tanner Creek
1991	Cascade	221,385	16.6	Umatilla RM 60	Tanner Creek
1991	Cascade	143,054	16.4	Umatilla RM 63	Tanner Creek
1991	Cascade	209,923	17.1	Umatilla RM 70	Tanner Creek
1992	Cascade	489,165	15.7	Umatilla RM 60	Tanner Creek
1992	Cascade	472,221	15.5	Umatilla RM 56	Tanner Creek
1993	Cascade	437,884	17.5	Umatilla RM 42	Tanner Creek
1993	Cascade	454,794	17.6	Umatilla RM 60	Tanner Creek
1994	Cascade	465,883	17.1	Umatilla RM 60	Tanner Creek
1994	Cascade	418,222	18.1	Umatilla RM 42	Tanner Creek
1995	Cascade	502,105	14.7	Umatilla RM 42	Tanner Cr. & Umatilla R.
1995	Cascade	497,449	14.5	Umatilla RM 60	Tanner Cr. & Umatilla R.
1995	Sandy	191,854	13.9	Umatilla RM 60	Tanner Creek
1995	Lower Herman Cr.	322,858	20.3	Umatilla RM 42	Tanner Creek
1996	Lower Herman Cr.	465,769	17.9	Umatilla RM 42	Tanner Creek
1996	Cascade	500,005	18.0	Umatilla RM 60	Tanner Creek
1996	Cascade	511,609	18.6	Umatilla RM 42	Tanner Creek
1997	Klaskanine	81,445	18.1	Umatilla RM 42	Tanner Creek
1997	Gnat Creek	881,341	15.3	Umatilla RM 42	Tanner Creek
1997	Lower Herman Cr.	438,153	16.0	Umatilla RM 42	Umatilla River
1998	Cascade	1,078,436	16.8	Umatilla RM 52	Tanner Creek
1998	Lower Herman Cr.	528,350	16.3	Umatilla RM 52	Tanner Creek
1999	Cascade	1,010,608	17.9	Umatilla RM 52	Tanner Creek
1999	Lower Herman Cr.	465,314	15.8	Umatilla RM 52	Tanner Creek
2000	Cascade	249,792	16.8	Pendleton	Tanner Creek
2000	Cascade	798,210	15.2	Pendleton	Tanner Creek
2000	Lower Herman Cr.	513,288	16.8	Pendleton	Tanner Creek

Appendix G - Hatchery releases of fall chinook salmon in the Umatilla subbasin

Table __. Hatchery releases of fall chinook salmon in the Umatilla River Basin.

Year of Release	Hatchery	No. Released	No./lb.	Release Location	Stock
1982	Bonneville	3,807,171	79.0-92.0	Uma. RM 0.5 & 51.5	Tule
1983	Bonneville	100,564	5.9	Bonifer & Mea. Cr.	Bonneville URB
1984	Bonneville	228,412	8.6	Bonifer & Mea. Cr.	Bonneville URB
1984	Bonneville	966,250	85.1	Uma. RM 0.5 & Col. R.	Bonneville URB
1985	Bonneville	3,223,172	92.3	Umatilla RM 0.5	Bonneville URB
1985	Bonneville	198,162	7.8	Bonifer & Uma. RM 87	Bonneville URB
1985	Bonneville	51,000	16.2	Bonifer	Bonneville URB
1986	Irrigon	206,815	4.7-5.0	Bonifer & Minthorn	Bonneville URB
1986	Irrigon	2,029,602	86.0	Umatilla RM 0.5	Bonneville URB
1986	Irrigon	35,574	11.6	Minthorn	Bonneville URB
1987	Irrigon	1,476,830	60.4	Umatilla RM 0.5	Priest Rapids URB
1987	Bonneville	211,506	8.1-8.6	Bonifer & Minthorn	Bonneville URB
1987	Irrigon	2,000	20.0	Minthorn	Priest Rapids URB
1988	Irrigon	1,886,757	68.3	Umatilla RM 23	Priest Rapids URB
1988	Irrigon	1,429,250	93.1	Umatilla RM 9	Bonneville URB
1988	Irrigon	94,089	8.6-9.8	Minthorn & Nr. Minthorn	Priest Rapids URB
1988	Bonneville	200,341	8.8-10.2	Bonifer & Minthorn	Bonneville URB
1989	Bonneville	217,443	8.6	Umatilla RM 63 - 70	Bonneville URB
1989	Irrigon	2,393,710	66.6	Umatilla RM 23	Priest Rapids URB
1989	Irrigon	156,957	10.9-11.1	Minthorn & Nr. Minthorn	Priest Rapids URB
1990	Bonneville	255,614	8.2	Umatilla RM 70	Bonneville URB
1990	Irrigon	2,425,681	87.5	Umatilla RM 70 - 79	Bonneville URB
1990	Irrigon	629,800	82.4	Umatilla RM 70 - 79	Priest Rapids URB
1990	Irrigon	148,510	8.8-9.2	Minthorn & Nr. Minthorn	Bonneville URB
1991	Bonneville	194,847	7.8	Umatilla RM 56 - 79	Bonneville URB
1991	Irrigon	10,462	80.0-194.0	Umatilla RM 3	Bonneville URB
1991	Irrigon	3,245,751	80.5-86.0	Minthorn, Nr. Minthorn, Uma. RM 70 - 79	Bonneville URB
1992	Bonneville	220,440	7.6-7.7	Umatilla RM 56 - 70	Bonneville URB
1992	Umatilla	2,678,343	55.2-70.6	Umatilla RM 42	Bonneville URB
1992	Umatilla	2,670	112.0	Umatilla RM 3	Bonneville URB
1992	Irrigon	504,369	53.4	Umatilla RM 42	Umatilla River
1992	Irrigon	5,167	62.8	Umatilla RM 3	Umatilla River
1993	Bonneville	134,837	9.1	Umatilla RM 73.5	Bonneville URB
1993	Umatilla	2,629,917	62.7	Umatilla RM 73.5	Upriver Brights /a
1993	Umatilla	29,681	95.5-142.0	Umatilla RM 0.5 to 27.3	Upriver Brights /a
1994	Bonneville	283,453	8.5-10.4	Umatilla RM 73.5	Bonneville URB
1994	Umatilla	2,843,212	65.2	Umatilla RM 73.5	Upriver Brights /b
1994	Umatilla	22,174	85.0-171.0	Umatilla RM 27.3 to 32.5	Upriver Brights /b
1995	Bonneville	227,088	8.0	Thornhollow	Bonneville URB
1995	Umatilla	2,466,298	63.1-64.7	Imeques & Thornhollow	Priest Rapids URB
1996	Bonneville	421,316	7.0-7.1	Imeques & Thornhollow	Bonneville URB
1996	Umatilla	143,087	5.1	Imeques	Priest Rapids URB
1996	Umatilla	2,960,413	65.1-65.8	Imeques & Thornhollow	Priest Rapids URB
1997	Umatilla	258,953	7.6-8.1	Imeques & Thornhollow	Priest Rapids URB
1997	Little White Salmon	260,968	13.6	Thornhollow	Bonneville URB
1997	Umatilla	2,580,833	66.0-67.3	Imeques & Thornhollow	Upriver Brights /b
1998	Bonneville	256,910	10.8	Thornhollow	
1998	Willard	179,100	7.8	Thornhollow	Umatilla River
1998	Umatilla	2,777,442	64.9-67.7	Imeques & Thornhollow	Priest Rapids URB
1999	Bonneville	449,568	9.1-9.4	Thornhollow	Umatilla River
1999	Umatilla	1,842,666	55.9	Imeques	Priest Rapids URB
2000	Bonneville	235,246	10.9	Thornhollow	
2000	Bonneville	234,510	10.1	Thornhollow	
2000	Umatilla	975,871	49.0	Thornhollow	Priest Rapids URB
2000	Umatilla	2,044,648	48.3	Pendleton	Priest Rapids URB

Appendix H - Management Plan (HGMP)

DRAFT (2/16/2000)
SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of Program
Umatilla River Summer Steelhead Program

1.2) Population (or stock) and species
Endemic Umatilla River Summer Steelhead (*Oncorhynchus mykiss*)

1.3) Responsible organization and individual:
The Umatilla River Summer Steelhead Program is co-managed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Oregon Department of Fish and Wildlife (ODFW). This HGMP has been developed and submitted by CTUIR separately from ODFW.

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1.4) Location of hatchery and associated facilities:

- *Adult Collection:* Summer steelhead broodstock are collected at the **Three Mile Falls Dam** adult trapping facility located approximately 4 miles upstream from the mouth of the Umatilla River, near the town of Umatilla, in Umatilla County, Oregon. The regional mark processing center site code for Three Mile Falls Dam is 5F33427 H27 24.

- *Holding and Spawning:* Summer steelhead broodstock are transferred to **Minthorn Springs** (Minthorn) for holding and spawning. Minthorn is located approximately 4 miles east of Mission in Umatilla County, Oregon. The facility is located on Minthorn Springs Creek. The creek is approximately one mile long with the facility located near the mouth at approximately Umatilla RM 64. The regional mark processing center site code for this facility is 5F33414 H14 22.

- *Incubation and rearing (from green egg to smolt):* Green eggs are transferred to Umatilla Hatchery for incubation and rearing. Umatilla Hatchery is located along the Columbia River approximately two miles west of Irrigon in Morrow County, Oregon.

The regional mark processing center site code for Umatilla Hatchery is 5F33449 H49 21.

- *Acclimation to release:* Juvenile summer steelhead are transferred to Minthorn and Bonifer Pond (Bonifer) for acclimation and release. Minthorn is discussed under "Holding and Spawning". Bonifer is located approximately 20 miles east of Mission in Umatilla County, Oregon. The facility lies adjacent to Meacham Creek at approximately RM 2. The pond discharges into Boston Canyon Creek, which then flows approximately 20 yards before entering Meacham Creek. Meacham Creek flows into the Umatilla River at approximately RM 79. The regional mark processing center site code for Bonifer is 5F33440 H40 21.

1.5) Type of Program:

Integrated Recovery: The Umatilla River Summer Steelhead Program integrates recovery through supplementation with harvest objectives while maintaining the endemic genetic characteristics of the target populations.

1.6) Program goal:

The goals of the Umatilla River Summer Steelhead Program are threefold: 1) Enhance production through supplementation of naturally producing populations; 2) Provide sustainable tribal and non-tribal harvest opportunities; and 3) Maintain the genetic character of the natural population.

1.7) Specific performance objectives:

- Enhance production through supplementation of naturally producing populations: Adult return goals in the original master plan include 4,000 natural and 5,670 hatchery adult steelhead to Three Mile Falls Dam (CTUIR and ODFW, 1989). It was projected that these goals would be reached five years after the completion of Umatilla Hatchery. However, water and space limitations at the hatchery produced a poor quality smolt. This led to a reduction of hatchery smolt production from 210,000 to 150,000 in 1993 (1992 brood).

- Provide sustainable tribal and non-tribal harvest opportunities: Tribal and sport fisheries are monitored annually to determine the success of the harvest objective.

- Maintain the genetic character of the natural population: Only Umatilla stock adults are used for brood in order to maintain genetic similarity between the hatchery and wild populations. Currens and Schreck (1993 and 1995) collected and reported baseline genetic characteristics of Umatilla River summer steelhead. Additional samples will be collected approximately every five years to archive and monitor the genetic characteristics of the natural steelhead populations. Subsequent proposals to collect genetic samples have not been funded.

1.8) List of Performance Indicators designated by "benefits" and "risks"

Below is a generic list of performance indicators. Specific indicators will be developed as part of the Natural Production Plan (NPP) called for in the "Memorandum of Understanding regarding Implementation of Oregon State Law HB 3609" between ODFW, Confederated Tribes of the Warm Springs Reservation of Oregon, CTUIR and Nez Perce Tribe (HB3609 MOU).

Benefits:

- Increase total adults returning to the subbasin.
- Provide sustainable harvest opportunities for both tribal and non-tribal fisheries.
- Monitor and evaluate natural life histories and supplementation strategies.
- Enhance the natural spawning population while maintaining the genetic characteristics of the target population.

Risks:

- Does collection of wild fish for broodstock negatively affect the natural spawning population.
- Introduction of hatchery fish into natural environment could function as a vector for pathogens.
- Increased production beyond basin carrying capacity could detrimentally affect the existing natural population.
- First generation hatchery adults spawning in the wild may reduce spawning productivity.
- Hooking mortality associated with fisheries could reduce natural escapement.

1.9) Expected size of program

1.9.1 Expected Releases

Excluding 1971 through 1974 and 1976 through 1980, juvenile summer steelhead have been released into the Umatilla River basin since 1967 (Table 2). Release numbers from 1967 through 1992 were highly variable; however, numbers released from 1993 through 1999 have been between 122,000 and 158,000. The production goal for FY 2000 and subsequent years is 150,000 smolts.

1.9.2 Adult Fish Harvested

The number of hatchery fish harvested was originally expected to be about 500 fish annually. However, harvest rates have been lower than expected because of three factors: 1) Anglers are releasing hatchery steelhead, 2) Hatchery return rates are lower than expected, and 3) Angler success is lower than expected.

Non-tribal anglers are required to release wild steelhead. Tribal fishermen are encouraged to release wild fish but are only required to release wild fish below Three Mile Falls Dam. Tables 3, 4 and 5 detail the estimated harvest of Umatilla River steelhead since 1993.

1.9.3 Escapement Goals

The program goals for adult returns are 4,000 natural and 5,670 hatchery adult summer steelhead to Three Mile Falls Dam. The expected run size for 1999-00 is 1,741 (range = 1,563 – 1,918) (ODFW and CTUIR, 1999).

1.10) Date program started or is expected to start:

The current summer steelhead program (100% rearing at Umatilla Hatchery) began in 1991 with smolt releases in 1992. However, hatchery steelhead smolts have been released into the Umatilla River Basin since 1967 (Table 2).

1.11) Expected duration of program:

This is an on-going program.

1.12) Watersheds targeted by program:

The Umatilla Summer Steelhead Program targets hatchery releases in the mainstem of the Umatilla River (RM 0-80) and lower Meacham Creek (RM 2).

SECTION 2. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

2.1) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.

1) CTUIR. 1994. Wildlife Mitigation Plan (Draft) May 1996, Columbia Basin Salmon Policy. 1995 pg 9-10, and Water Assessment Report;
2) NMFS - Salmon & Steelhead Enhancement Plan for the Washington and Columbia River Conservation areas.Vol 1. chpt 4, 37pgs;
3) Reeve, R. 1988. Umatilla River Drainage Anadromous Fish Habitat Improvement Plan; 4)CTUIR/ODFW. 1990. Umatilla Hatchery Master Plan;
5) OWRD. 1988. Umatilla Basin Report;
6) BOR. 1988. Umatilla basin Project Planning Report,
7) Umatilla County - Comprehensive Plan. 1983, chpt 8;
8) USNF - Umatilla National Forest Land & Resource Management Plan. 1990, chpt 2, pg 13. and Final EIS. 1990, chpt III, pgs 59-62;
9) CTUIR/ODFW. 1990. Umatilla River Subbasin Salmon and Steelhead Production Plan;
10) Boyce, R. 1986. A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin; 11)USFWS & NMFS. 1982. Umatilla R. Planning Aid Report.

This HGMP is consistent with these plans and commitments.

2.2) Status of natural populations in target area.

2.2.1) Geographic and temporal spawning distribution of steelhead.

Steelhead spawning surveys conducted from 1989 through 1999 indicate that the majority of steelhead spawn from late February through May with the peak in early April (Contor et al. 1998). Steelhead redds have been observed in Birch Creek and in the mainstem and the major tributaries of the Umatilla River at and above Minthorn Springs at RM 64.5. A few steelhead redds are also found in some of the smaller tributaries such as Mission Creek, Moonshine Creek, Buckaroo Creek, Camp Creek and East Meacham Creek. All perennial stream reaches above RM 64 are considered suitable for summer steelhead spawning and rearing (Figure 2).

2.2.2) Annual spawning abundance for as many years as available.

From 1987 through 1998**,** the estimated number of adults available for spawning in the Umatilla River Basin has ranged from 857 in 1990-91 to 2,322 in 1991-92, with a mean of 1,695 (Table 1).

2.2.3) Progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for as many brood years as available.

Adult returns of naturally produced steelhead are the primary measurement of productivity used (see Table 1). Abundance of natural juvenile summer steelhead emigrating from the basin has ranged from approximately 54,000 in 1998 to 73,000 in 1996 (Knapp et al. 1996, 1998a 1998b, 2000 in preparation). Other measures of productivity (monitoring and enumeration of redd counts, and juvenile abundance estimates) have been examined without acceptable results.

2.2.4) Annual proportion of hatchery and natural fish on natural spawning grounds for as many years as possible.

The percent of adults available to spawn that were of hatchery origin has ranged from 6.9% of the total run in 1987-88 to a high of 58.9% in 1996-97 with a mean of 27.2% (1987-1998; Table 6).

2.2.5) Status of natural population relative to critical and viable population thresholds.

Analysis of Umatilla steelhead populations by ODFW (Chilcote 1997), states “there are no obvious signs that steelhead populations in the John Day and Umatilla are reproductively failing or at critically low population levels… their capacity to respond to environmental changes is still intact.”

2.3) Relationship to Harvest ObjectivesSteelhead harvest guidelines were developed by state and tribal co-managers as part of the Umatilla Hatchery Master Plan (CTUIR and ODFW, 1989). This plan identified hatchery broodstock, spawning escapement, and tag collection for evaluation as priorities, and specified numbers of fish allocated to these uses at varying run sizes. The plan was designed to allow harvest of fish returning in excess of these needs. However, the harvest guidelines are no longer current as a result of several adaptations in program management. Broodstock and evaluation needs are only about half what was originally projected, and non-tribal sport fishing regulations have changed to exclude the harvest of natural steelhead. No formal harvest plan has been drafted since then because the shift in fishing regulations was expected to adequately protect natural fish, while providing sport fisheries and additional spawners from hatchery fish. Reliable run prediction models have been developed for Umatilla River steelhead, and in the event of low projected returns, formal management processes are in place to modify collections and harvest prior to their entry into the Umatilla River.

Numbers of steelhead collected at Three Mile Falls Dam, harvested in fisheries, and available for spawning are given in Tables 1 and 3-7. Current collection rates for broodstock are 110 natural and 15 hatchery fish for broodstock and 105 hatchery fish for evaluation. Completed coded-wire-tag data from brood years 1991 through 1994 estimate average harvest on each hatchery brood was 55 in the tribal Columbia River net fishery, 73 in the Columbia River sport fishery (Table 1), 31 in tribal Umatilla River fishery, and 67 in the Umatilla River sport fishery. Tribal harvest of natural fish in the Columbia River net fishery is unknown, but is probably comparable to harvest rates on hatchery fish (55/year). Tribal harvest of natural steelhead in the Umatilla River fishery has averaged 3/year (Table 1). Numbers of hatchery and natural fish available for spawning from the time adults started returning from Umatilla Hatchery releases (run years 93-94 to 97-98) has averaged 684 and 899, respectively (Table 6). Information available on the incidental catch and harvest of juvenile steelhead during Umatilla River steelhead, spring Chinook, and trout fisheries is given in Table 7.

2.4) Relationship to habitat protection and recovery strategies.

The Umatilla Summer Steelhead Program is a part of an overall Umatilla Basin Salmon and Steelhead Restoration Program. In addition to on-going passage and hatchery operations, restoration efforts include on-going projects that enhance stream and riparian habitat as well as monitor and evaluate the hatchery and natural components of the restoration program.

Factors limiting the natural production of steelhead in the Umatilla River Basin include channelization, low or no summer flows, warm water temperatures, sediment, and poor habitat diversity caused by urban and rural development/land management practices. Ocean conditions and the mortalities and stress from the operation of hydropower projects on the mainstem Columbia River are important factors outside the basin. There continues to be degradation to fish habitat in these areas that hampers improvement efforts

2.5) Ecological interactions with salmonid and non-salmonid fishes or other species

2.5.1 <u>Interactions with species that could negatively impact program: a) bird predation</u> during peak smolt migration periods each spring; and b) northern Pikeminnow and smallmouth bass predation during smolt migration periods.

<u>2.5.2 Interactions with species that could be negatively impacted by program:</u> Hatchery steelhead smolts that residualize and become resident fish are much larger than wild juvenile steelhead, and compete with wild juvenile redband trout and

steelhead, bull trout, Pacific lamprey, coho and Chinook salmon, margined sculpin, mountain whitefish and other non-game fish for limited summer rearing habitat.

2.5.3 Interactions with species that could positively impact program: Carcasses from salmon and hatchery steelhead kelts or pre-spawn mortalities add to the Umatilla River subbasin's nutrient recharge cycle.

2.5.4 Interactions with species that could be positively impacted by program: Hatchery steelhead smolts could add to the food base for bull trout.

SECTION 3. WATER SOURCE

3.1) Umatilla Hatchery

The water source for Umatilla Hatchery is the Columbia River via a Ranney well system. The system was initially designed and constructed to produce a maximum of 15,000 gpm of water. However, several wells have been subject to failure (Jack Hurst, ODFW, Umatilla Hatchery, personal communication, 1999) and water capacity has been reduced to 5,500 gpm. Water from the well system is a constant 12.2^{o}C (54 F). Water quality exceeds BPA requirements (BPA 1987) for all hatchery uses (Table 8).

3.2) Three Mile Falls Dam

Water for the Three Mile Falls Dam adult facility is pumped directly from the Umatilla River. The Denil steeppass utilizes 2,900 gpm and the holding pond uses 1,450 gpm. Both the steeppass and holding pond pumps run continuously. The fish lock system uses 630 gpm, but is used only during handling operations (approximately two hours per day). The water source is the same as used by the natural population.

Water temperatures at Three Mile Falls Dam range from approximately 0^{o}C (32^{o} F) in winter to over 21^{o}C (70^{o} F) during the summer. Sediment loads vary dramatically during the return season (late August through early June). High sediment loads are experienced annually during high flow conditions.

3.3) Minthorn Juvenile Acclimation and Adult Holding Facility

Minthorn receives its water from Minthorn Springs Creek, which is formed from the inflow of several springs located immediately south of the Umatilla River. Water through the brood holding area is supplied by gravity and ranges from approximately 500 to 2,100 gpm. The water supply to the raceways is pumped from the creek with a single-pass pass water-pumping rate of approximately 800 gpm per each of two raceways. During the summer steelhead adult holding period (September to May), average monthly water temperatures range from approximately 7.0 to 13.0^{o} C. During the juvenile acclimation period (mid-March to early May), temperatures range from 8.0 to 11.0^{o} C.

3.4) Bonifer Pond

Bonifer Pond is fed by gravity from three nearby springs. Flows range from approximately 750 to 1,850 gpm. During the juvenile acclimation period (mid-March to early May), average monthly temperatures range from approximately 7.5 to 11.0^{o} C.

3.5) Natural Production

Natural spawners use the water available in the streams of the Umatilla River Basin. Water quality is relatively high in the headwater streams where steelhead spawn and rear. The spawning streams contrast greatly to the lower Umatilla River and lower tributaries where sediment loads are high in the spring and summer water temperatures are often lethal to salmonids (Contor et al. 1998). Water quality in this desert basin contrasts to the hatchery, as there are often large daily fluctuations in water temperature. During the winter and spring, rain-on-snow events interspersed with cold periods often produce large fluctuations in stream flow. During spawning and incubation, the streams are often high and turbid.

SECTION 4. FACILITIES

4.1) Brood stock collection

Broodstock collection is conducted solely at the Three Mile Falls Dam east bank adult trapping facility. The facility consists of a vertical slot fish ladder, Denil steeppass, adult holding pond (raceway), and fish handling and sorting complex. The construction and operation of the facility has no effect on the critical habitat for summer steelhead.

The dimensions of the holding pond are 14' wide by 36' long by 3.5' deep (approximately 1,800 cubic feet). The holding pond has a jump screen located at the upper end and jumpout panels located at both upper corners to prevent adults from jumping out of the pond. The holding pond is located above the 100 year flood level.

The water supply for the holding pond is pumped directly from the Umatilla River at a rate of 1,450 gpm. A low water discharge alarm is located on the pond supply line to signal any loss of flow to the holding pond. No backup pumps or emergency generator system are located at the site. In case of water loss to the pond, two options are available to on-site personnel. During power outages or other short term losses of flow, the outlet gate from the pond can be closed to maintain water depth. For pump failures or other long term losses of water supply, adults can be dipnetted out of the pond and returned to the river.

4.2) Spawning

Since 1988, all summer steelhead spawning has occurred at Minthorn. The facility includes a concrete channel that functions as a fish ladder/trap, inlet/outlet water control structure, and summer steelhead broodstock holding area. The brood holding area is approximately 25 feet long by 8 feet wide. Water through the pond is supplied by gravity from Minthorn Springs Creek. Depth is controlled by dam boards and is usually held at 4 feet. The pond has vertical bar screens with 1 ½ inch spacing at both the influent and effluent ends and is surrounded by a chain link fence topped with barbed wire. The fence provides security and prevents fish from jumping out or escaping due to flood events.

Floating covers are placed over approximately one third of the pond to help alleviate disturbances to the fish and to help prevent fish from jumping. The top of the concrete walls and bottom of the chain link fence are overlapped with rubber matting so that if the fish do jump, injuries will be minimized. The fence has three gates for accessing the pond for unloading adults and spawning. Adjacent to the pond is a concrete slab used during the spawning operation. The entire facility is covered with a roof to provide protection for fish, eggs and personnel. In an extreme emergency, the fish can be released into Minthorn Springs Creek by pulling the effluent screen and dam boards and letting the fish swim out volitionally.

Beginning in early February, the fish are treated two days per week with formalin to help control prespawning losses due to fungus. During the spawning period (April - May), treatments are increased to three times per week. A one-hour flow through treatment at approximately 167 ppm is used. ODFW pathology personnel are available to address disease concerns.

The location of the facility blocks approximately one mile of habitat that might be utilized for spawning and rearing. This habitat is limited, however, as flows are as low as 500 gpm and temperatures often exceed 20^{o} C during the period from June to September.

4.3) Incubation

Fertilized eggs are transported from Minthorn to Umatilla Hatchery in five-gallon buckets with chilled water. Umatilla hatchery incubation equipment consists of four separate units of Marisource incubators (Heath tray type). Water can be pumped directly from the well or mixed with chilled water. Three units can be supplied with well water at 12.2^{o}C (54^{o}F) or mixed with chilled water 7.2^{o}C (45^{o} F) for any combination of temperatures from 7.2-12.2^{o}C (45-54^{o} F) provided that 300 gpm of chilled water is not exceeded. The fourth unit can be mixed with water chilled to 3.3^{o}C (38^{o} F) to achieve any combination of temperatures from 3.3-12.2^{o}C (38–54^{o} F) provided that 60 gpm of chilled water is not exceeded. Numerous systems continually monitor temperature, mechanical systems, electrical systems, and flow. Alarms sound if any system fails or is out of criteria. Continual monitoring of systems and preventative maintenance is used to prevent system failure. An emergency gas powered pump installed in the aeration tower structure supplies water for incubation in the event of aeration lift pump failure. In the event of total system failure resulting in total loss of water, eggs may be transported to Irrigon hatchery (if they are still operational and have necessary space).

Pathogen free water is used for incubation at Umatilla Hatchery for the summer steelhead program. This is a direct preventive measure at minimizing the risk of introducing pathogens into the hatchery program, thus minimizing the risks to fish in the natural environment after these fish are released. Sanitary measures are taken at Umatilla Hatchery to prevent transmission of pathogens from one stock to another by disinfecting equipment in Iodophor.

4.4) Rearing

Umatilla Hatchery has three different types of rearing units. There are eight 21' Canadian style early rearing tanks located in the main building adjacent to incubation. Water is pumped to an aeration tower and then is gravity fed to the tanks. Steelhead are started in these tanks in early July. The fish are moved outside to Oregon ponds when densities reach approximately 80 pounds in each tank. Umatilla Hatchery has 10 Oregon ponds. Rearing dimensions are 91'X18.75'X3.67'. These ponds are designed for serial reuse in-groups of two ponds, upper and lower. If necessary, they can also be individually supplied with fresh water. Steelhead are reared in these ponds until grading occurs in late October. They are then moved to Michigan style ponds. Umatilla Hatchery has 24 Michigan style ponds, with rearing dimensions of 91'X9'X2.75'. Water is supplied to these ponds in reuse groups of three ponds each. Each pond has a submersible pump that supplies 950 gpm of water to oxygen contact columns, located at the head of each pond. Oxygen is introduced and unwanted saturated gas is removed from incoming water at this point. Each pond has its own oxygen supply line. Supplemental oxygen is either delivered from oxygen generators, (pressure swing absorption units) or from an on-site bulk liquid oxygen tank. Steelhead are reared at enhanced densities to evaluate the effectiveness of these ponds. Steelhead are transferred in the spring to Bonifer and Minthorn for acclimation and release. All ponds have a high-low water level alarm, and for Michigan ponds, pump failure and oxygen flow alarms. In the event of total system failure, fish could be moved to nearby Irrigon Hatchery if pond space were available and all logistics were in place prior to the time of failure. Monitoring and maintenance of the water supply system, and forecasting for contingencies, are the best means for dealing with the possibility of rearing pond system failure.

Pathogen free water is used for rearing the fish at the Umatilla Hatchery for the summer steelhead program. This is a direct preventive measure at minimizing the risk of introducing pathogens into the hatchery program, thus minimizing the risks to fish in the natural environment after these fish are released. Sanitary measures are taken at Umatilla Hatchery to prevent transmission of pathogens from one stock to another by disinfecting equipment in Iodophor. In addition, a fish health program is in place to monitor and evaluate the health status of summer steelhead juveniles reared at Umatilla Hatchery.

4.5) Acclimation/release

The Minthorn acclimation/release facilities include two-10 hp pumps, standby generator, two raceways (each 120 x 12 x 4 feet), and outlet pipe for releasing fish. The pumps and generator are located in the upper level of an enclosed pump house well above the 100-year flood levels. Water is pumped from the creek to each of the raceways. The outlets of the ponds have both vertical bar screens with one-quarter inch spacing and woven wire screens with one quarter inch openings to keep fish from escaping. Beginning in FY 2000, the ponds will be covered with netting to prevent bird predation. In case of power failure, a standby generator provides emergency power to the pump(s). In addition, there is a backup pump and both ponds are equipped with high-level and low-level float alarms. In the event of a power or pump failure or pond level alarm, an audio message is sent to a security company who then notifies specified individuals of an alarm condition at the facility. Fish are released from the facility by pulling the dam boards, lowering the pond and crowding out the fish. The fish then exit the pond through an underground pipe to Minthorn Springs Creek. In an extreme emergency, the fish can be released in this way. The ponds are thoroughly cleaned and disinfected prior to fish being placed into them, and ODFW pathology personnel are available to address disease concerns.

The location of the Minthorn facility blocks approximately one mile of habitat that might be utilized for spawning and rearing. This habitat is limited, however, as flows are as low as 500 gpm and temperatures often exceed 20^{o} C during the period June to September.

Bonifer consists of a 1.75-acre earthen pond that holds approximately 4.5 acre-feet of water, and concrete water control outlet structure that also functions as a fish release channel and ladder/trap if desirable. Bonifer is fed by gravity from three nearby springs. The outlet structure has horizontal bar screens with one quarter inch spacing to prevent fish from escaping and dam boards for controlling pond water depth. Additional channel guides allow for installation of a ladder and V-trap. Two of the three springs are screened to keep fish out. The third spring has no screen. It is extremely small and overgrown with vegetation and fish do not enter it. The springs and pond are bordered by a solar powered electric fence to keep domestic cattle and other large animals away. Juveniles are unloaded into the pond via a permanently installed pipe, and fish are released from the facility by pulling the dam boards in the outlet structure and lowering the pond. The fish then exit the pond volitionally through the outlet structure. In an extreme emergency, the fish can be released in this way. Because Bonifer is a natural pond that can not be completely drained, it is not disinfected prior to fish being placed into it. ODFW pathology personnel are available to address disease concerns.

The facility blocks approximately 5/8 total miles of habitat in the three springs that might be utilized for spawning and rearing as well as the pond area itself. This habitat is extremely limited for spawning as the springs and pond are laden with silt and vegetation and very little gravel exists. In addition, juvenile rearing is limited as temperatures often exceed 20^{o} C during the summer and flows are low as 750 gpm.

SECTION 5. ORIGIN AND IDENTITY OF BROODSTOCK

5.1) Broodstock source

Summer steelhead releases of Skamania and Oxbow stocks were made in the Umatilla River basin from 1967 through 1970 (Table 2). In 1975, one release of Umatilla stock steelhead occurred and fish releases every year since 1981 have been from endemic Umatilla stock.

5.2) Supporting information for broodstock program

5.2.1) History

Summer steelhead releases of Skamania and Oxbow stocks were made in the Umatilla River basin from 1967 through 1970 (Table 2). In 1975, one release of Umatilla stock steelhead occurred and fish releases every year since 1981 have been from endemic Umatilla stock.

Since 1982-83, all broodstock for the program have been trapped at Three Mile Falls Dam. Brood were collected at the west bank ladder from 1982-83 to 1986-87 and at the east bank ladder from 1987-88 to the present.

5.2.2) Annual number of broodstock collected

The number of summer steelhead broodstock collected for holding/spawning since 1982-83 has varied from 52 during the 1983-84 run year to 225 during the 1991-92 run year (Table 9). Historically, the ratio of males to females has varied. The collection goal for the 1999-00 run year is 125 adults (55 unmarked females, 55 unmarked males, and 15 additional coded-wire tagged hatchery males). The collection goal in following years is anticipated to be similar.

5.2.3) Past and proposed level of natural fish in brood stock.

From 1982 to 1990, only unmarked summer steelhead were collected for broodstock (Table 9). Beginning in 1990, first generation hatchery fish were also collected to ensure meeting broodstock goals. The proportion of hatchery fish collected has ranged from 2.3% of the total number collected in 1992-93 to 51.0% in 1990-91. The collection goal for the 1999-00 run year is 125 adults (55 unmarked females, 55 unmarked males, and 15 additional coded-wire tagged hatchery males). The collection goal in following years is anticipated to be similar.

5.2.4) Genetic or ecological differences

The broodstock for this program is collected entirely from the Umatilla River. Broodstock is consists of both natural steelhead captured in the Umatilla River (55 males and 55 females), and 15 (male) hatchery steelhead verified to be of Umatilla River origin (see sections 6.2.4 and 10.2).

5.2.5) Reasons for choosing existing stock

The endemic stock was selected because of their sufficient abundance and based on the tenet that they would have the best local adaptations and highest likelihood of natural production success in the Umatilla Basin. Umatilla Basin natural steelhead survived more than 100 years of human impact in a desert system including dams, dewatering of migration corridors, roads, logging, grazing, and urban agricultural development.

5.3) Unknowns

The number of unmarked strays used for broodstock is unknown.

SECTION 6. BROOD STOCK COLLECTION

6.1) Prioritized goals

The goal of the program is to concurrently enhance production through supplementation of naturally producing populations and provide sustainable tribal and non-tribal harvest opportunities while maintaining the genetic character of the natural population.

6.2) Supporting information

6.2.1) Proposed number of each sex

The broodstock goal is to collect 55 males and 55 females of natural origin. In addition, 15 males of hatchery origin are also collected.

6.2.2) Life-history stage to be collected

All fish collected for broodstock are adults.

6.2.3) Collection or sampling design

Over the last decade, all adults that returned to the Umatilla River have been trapped at Three Mile Falls Dam. All brood have been collected at the east bank adult facility and are collected from September through early May. Beginning in December 1999, adults returning to Three Mile Dam will be trapped one week and allowed to volitionally migrate one week. Brood are collected by selecting 10% of the unmarked return by week in order to collect a representative cross-section of the total run as brood. When adults are trapped on alternate weeks, the 10% rate will still be followed. The percent of one salt and two salt adult returns is monitored continuously throughout the season and a similar proportion of one salt and two salt adults are selected for brood. Determinations of one salt and two salt adults are based on a fork length of less than or greater than 26 inches. The male:female ratio in the brood is not representative of the ratio in the total return. Fifty percent of the unmarked brood are of each sex, whereas females have comprised an average of 68.7% of the total run since 1988.

Adults returning to Three Mile Dam ascend a vertical slot fishway ladder, but are precluded from swimming upstream by use of a barrier gate at the top of the ladder. Adults then ascend a Denil steeppass and fall into an adult holding pond where they are trapped. Disposition of the fish trapped generally occurs daily in order to minimize upstream passage delays. During periods when few adults are being trapped, adults may be held up to 72 hours. During handling operations, all adults are anesthetized with CO_2 to minimize stress. Mortality of listed steelhead can occur during the holding and handling operations at Three Mile Dam. Over the last eight years, average annual mortality at the facility has been 0.22% with a range of 0.00%-0.62%.

6.2.4) Identity

There is one population of summer steelhead in the Umatilla Basin above Three Mile Dam with a high degree of diversity (Currens and Schreck, 1993 and 1995). All unmarked adults that enter the trap at Three Mile Falls Dam are assumed to be of Umatilla origin (but could include unmarked strays), and may be selected for broodstock. Fifteen CWT hatchery males are also selected for broodstock. Coded wire tags are read prior to spawning in order to preclude the use of any stray hatchery males.

6.2.5) Holding

Since 1988, all summer steelhead holding/spawning has occurred at Minthorn. Adults are held in a concrete pond with a total volume of 800 cubic feet (see section 4.2 for more details). Historically, holding densities have ranged from approximately 3.6 to 7.3 cubic feet per adult and flows have varied from approximately 2.2 to 19.0 gpm per adult. The broodstock goal for FY2000 is 125 adults, which will result in a maximum density of approximately 6.6 cubic feet per adult and a flow of 4.1 to 17.3 gpm per adult. The variation is a result of lower flows in Minthorn Springs Creek in the fall and late spring and because 1,600 gpm is diverted into the acclimation ponds during the period mid-March to early May when juveniles are being acclimated.

From September to early February, the fish are left undisturbed. Beginning in early February, the fish are treated two days per week with formalin to help control fungus. During the spawning period (April - May), treatments are increased to three times per week. A one-hour flow through treatment at approximately 167 ppm is used.

Total mortality of fish held at Minthorn has ranged from 8.6 to 34.4% and has averaged 18.8%. Mortality of unmarked fish has ranged from 7.6 to 34.4% and has averaged 18.4%. In some years, however, a portion of the males were live spawned and held through the end of the spawning season. Had these fish been killed at the time of spawning, mortality numbers would have been lower. Prespawn mortalities are built into the broodstock collection goals. At the end of the spawning season all remaining hatchery fish are sacrificed for coded wire tag recovery and all unmarked fish are released back into the Umatilla River.

6.2.6) Disposition of carcasses

All summer steelhead broodstock carcasses are buried in the regional landfill.

SECTION 7. MATING

7.1) Selection method

From early April to late May, broodstock are sorted weekly for maturation. Fish are anesthetized with MS-222 and ripe fish are held in live totes until all fish have been sorted. All ripe females (all unmarked) are spawned on any given spawn day. Unmarked males, at a proposed rate of one male for every ripe female, are selected randomly throughout the broodstock population. To ensure having sufficient numbers of mature males on spawn days, extra marked males are also selected randomly for use. The goal is to spawn only unmarked males. However, if a sufficient number of naturally produced males are not available on spawn days, hatchery males are also used.

7.2) Males

The goal is not to re-use males, but historically, this has sometimes been unavoidable. Obtaining adequate quantity and quality of milt from the males is often difficult, and in a limited number of instances, re-use of mature males has been necessary. Before any hatchery males are spawned, coded wire tags are recovered and read on the spot to ensure the fish is of Umatilla River origin. If it is not from Umatilla Hatchery, the fish is discarded and another fish is selected. Backup males have not been used, primarily because matrix schemes are utilized (see section 7.3 for details).

7.3) Fertilization

A 3 x 3 spawning matrix is utilized whenever possible and matings are random. Hatchery males are used only when there are insufficient numbers of mature unmarked males available on a given spawn day. When only two females are available, a 2 x 2 matrix is used and when only one female is available, the eggs have been fertilized with the milt from a single male. Beginning in FY2000, single females will be fertilized with the milt from two males. Each 1 x 1(2), 2 x 2 or 3 x 3 cross is considered a single-family group.

Females are killed and bled by severing the caudal peduncle. The undersides of the fish are cleansed with a solution of Argentyne and are then wiped with a clean towel. The eggs from each female are stripped into a colander to remove excess ovarian fluid. When a 3 x 3 matrix is used, the eggs from each female are mixed and divided equally into three cups. If a 2 x 2 matrix is used, the eggs are mixed and divided equally into two cups. Males are generally killed for spawning, cleansed with Argentyne, and the milt is stripped into individual cups. If males are live spawned, they are marked with an opercle punch for identification and placed back into the holding pond. They are not used again unless absolutely necessary. When a 3 x 3 matrix is used, the milt from a single male is used to fertilize one third of the eggs from each female. If a 2 x 2 matrix is used, the milt from each male is used to fertilize one half the eggs from each female. After the milt is added, well water from Umatilla Hatchery is added and the eggs and sperm are mixed and allowed to stand for approximately one minute or longer. The fertilized eggs from each cup (one family group) are then poured into a colander and combined. The eggs are then poured into a bucket with Umatilla Hatchery well water, rinsed, poured back into the colander, and then are placed into a solution of Argentyne and allowed to water harden for one hour. At the end of the hour, the eggs are again poured into a colander and then into a bucket of fresh well water with a watertight lid for transport to Umatilla Hatchery. Colanders, spawning knives and other equipment are disinfected with Argentyne between each family group.

At the time the males and females are stripped, milt and ovarian fluid samples are taken to test for replicating viral agents. After spawning, pyloric caeca, kidney and spleen samples are also taken to test for bacterial kidney disease and other culturable pathogens. Samples of the lower intestine are examined for *Ceratomyxa shasta*.

Fish health procedures used for disease prevention include: 1) Draining ovarian fluid from eggs by use of colander; 2) Water hardening in Iodophor @ 75ppm for one hour and then for 15 minutes at the hatchery upon arrival to the facility; and 3) Annual fish health monitoring of Umatilla summer steelhead brood stock to detect any virus or replicating agents or bacterial pathogens that could place the listed fish at risk. For results from this monitoring see BPA annual reports 1992-1997 (Fish Health Monitoring & Evaluation, Keefe, Hayes, Focher & Groberg, et al.)

7.4) Cryopreserved gametes

Cryopreserved gametes are not collected on Umatilla River broodstock.

SECTION 8. REARING AND INCUBATION

INCUBATION:

8.1) Number of eggs taken and survival objective to ponding

Historically, the number of eggs taken since 1983 has varied from a low of 100,000 eggs in 1984 to a high of 476,000 in 1992 (Table 10). During those years, smolt production goals for the Umatilla River varied significantly. Since 1993, eggs takes have been between 210,000 to 255,000 eggs. The production goal for FY2000 is 227,000 green eggs, which will produce 150,000 smolts. The survival objective from green egg to ponding is 82.8%.

8.2) Loading density

Umatilla hatchery incubation consists of four isolated units of Marisource (Heath tray type) incubators as described in section 4.4. Loading densities are initially 8100 green eggs/tray and do not exceed 10,000 individuals/tray from green egg stage to ponding.

8.3) Influent and effluent gas concentration

Oxygen saturation levels average 10 ppm influent and 9 ppm effluent.

8.4) Ponding

Steelhead are ponded into Canadian style troughs the first week of July at approximately 950 temperature units and 3,500 fish per pound.

8.5) Fish Health monitoring

There have been no unusual disease related egg stage problems or yolk sack malformation in the Umatilla Summer Steelhead Program. Mortality rates have been normal. Formalin at 1:600 concentration for 1hr/day is applied to eggs daily from the green to pre-emergence stages (see Sections 8.12, 10.6.1 2, and Appendix D-1 for additional details).

REARING:

8.6) Number of fish ponded and survival objective to release

The fry to smolt survival objective is 80%. A total of 188,000 fry are ponded to produce 150,000 smolts. The 80% survival includes 10% graded pre-smolts not included in the 150,000 smolt goal.

8.7) Density and loading.

Swim-up fry are transferred from heath incubators to Canadian troughs in July at approximately 3,500/lb. They are ponded in one Oregon raceway in August at approximately 450 fish/lb. In September or October, they are graded into three sizes and are split into a three pass Michigan pond system with the smallest fish being put into the first pass. Density and loading for Michigan and Oregon raceways (1991-97 brood years) is presented in Table 12.

8.8) Influent and effluent gas concentrations

The maximum and minimum dissolved oxygen concentrations observed in Michigan and Oregon raceway's influent and effluent were 14.5 and 5.7, and 10.6 and 5.7 PPM, respectively (Table 8).

8.9) Length, weight, and condition factor.

Length, weight, and condition factor are evaluated during monthly, pre-release, and release monitoring. (Table 17).

8.10) Growth rate, energy reserves

No energy reserve parameters are monitored or evaluated. Growth rates were determined from monthly length-weight monitoring. Mean growth rates for recent broods (1995-98 broods) were 0.70 mm/d (SD=0.06) for length and 0.51 g/d (SD=0.08) for weight.

8.11) Food type and amount fed, and estimates of feed conversion efficiency.

Bio-Oregon moist diet is fed exclusively. Approximately 38,000 pounds are fed annually, with a conversion rate of 1.39.

8.12) Health and disease monitoring.

Personnel from the La Grande Fish Pathology Laboratory conduct monthly monitoring and pre-liberation monitoring of summer steelhead reared at Umatilla Hatchery. All raceways are monitored for specific fish pathogens and parasites. A pre-liberation examination is conducted within four weeks prior to release of fish at Umatilla Hatchery. Epidemiological, statistical and diagnostic methods are used when fish health problems occur. Information is used to determine how rearing strategies or fish culture methods might be modified to improve fish health.

8.13) Smolt development indices

Visual estimates of smoltification (parr, intermediate smolt, smolt) in combination with condition factor (see Section 8.9) are used to evaluate smoltification. Descaling and smoltification observations are presented in Table 13.

8.14) Use of "natural" rearing methods.

Bonifer is a "natural" earthen pond. One group of 50,000 smolts is released from Bonifer after being acclimated for four weeks.

SECTION 9. RELEASE

9.1) Life history stage, size, and age at release.

From 1967 to 1988, summer steelhead were released into the Umatilla River basin as subyearlings and yearlings and sizes ranged from 5.5 to 240/lb (Table 2). In addition, eggs were outplanted in 1968 and unfed fry were released in 1988. Since 1989, all releases have been with yearlings and fish have ranged in size from 4.5 to 8.7/lb., other than a small number of fish released at 12.5/lb. in 1991 as part of an ODFW passage evaluation study. The release size goal since 1989 has been 5.0/lb and it is anticipated this will continue to be the goal for future releases.

9.2) Life history stage, size and age of natural fish of same species in release area at time of release.

At the time of hatchery smolt releases, naturally produced steelhead rear near and migrate past the acclimation and release facilities. Juvenile natural steelhead at ages 0+ to 1+ rear in the area with the majority ranging from 60-130 mm FL. The majority of natural smolts migrating out of the Umatilla River are age 2+ (110-200 mm FL), but age 1+, 3+ and 4+ smolts have also been documented (Table 14). Resident redband trout also rear and spawn naturally near the acclimation facilities in the winter and early spring. Naturally produced adult steelhead also migrate, hold and spawn near the acclimation facilities at the time of release. Figure 3 and Table 15 summarize life histories and distributions of natural steelhead in the Umatilla River Basin.

9.3) Dates of release and release protocols.

Historically, fish releases have occurred both in the spring and fall (Table 2). Since 1984, however, all releases have been in the spring (March to early June), other than a small release of subyearlings in December, 1988. From 1967 to 1983, all releases were made directly into the Umatilla River. From 1984 to 1992, twelve groups of fish were acclimated prior to release, while all other groups were released directly into the Umatilla River. All of the acclimated groups were force released. Since 1993, all steelhead have been acclimated prior to release, other than a small group of fish released directly into the Umatilla River in 1994 as part of another ODFW passage evaluation study. Acclimated fish were force released from 1993 to 1996, while all releases since 1997 have been volitional beginning the last week of holding. After one week of volitional release, the remaining fish are forced out. It is anticipated that future releases will also be volitional.

9.4) Locations of releases.

All summer steelhead releases made from 1967 to 1983 were made directly into the upper Umatilla River at undetermined locations (Table 2). Beginning in 1984, releases were made in the lower Umatilla River (RM 3 to 27.3) as well as in the upper river (RM 64 to 89). In addition, releases were made in the South Fork of the Umatilla River (above Umatilla RM 89), at acclimation facilities (RM 64 to RM 2 of Meacham Creek), and in Meacham Creek (RM 0.5 to 11). Since 1993, all releases have been from Bonifer (RM 2 of Meacham Creek) and Minthorn (RM 64), other than a small number of fish released in the lower Umatilla River (RM 27.3) in 1994 and one group of fish released at Thornhollow (RM 73.5) in 1996. It is anticipated that future releases will also be from Bonifer and Minthorn.

9.5) Acclimation procedures.

Juvenile summer steelhead are transported to Bonifer and Minthorn using 3,000 and 5,000 gallon fish transport trucks. Historically, the proposed acclimation period has been four weeks. Beginning in FY2000, however, one group of fish will be acclimated for four weeks while two groups will be acclimated for approximately three weeks. The fish are fed Biomoist Feed twice each day at rate of approximately 0.5 to 1.0% BWD. Mortalities are removed daily and ODFW pathology personnel are available to address specific disease concerns. Temperature and dissolved oxygen measurements are taken daily during acclimation, and on the day of release, ODFW personnel sample the fish for descaling, weight and fork length.

Beginning in 1997, summer steelhead have been allowed to release volitionally for the final week of holding before the remaining fish are forced out. At Minthorn, one of three effluent screens in each of the two ponds is removed and the fish are allowed to swim over a V-notched dam board and through an underground pipe directly into Minthorn Springs Creek. One to two days before the remaining fish are released, they are taken off feed to reduce stress. The ponds are lowered and the fish are slowly crowded out. The fish are released over a two day period (one pond /day) and late in the day.

At Bonifer, the effluent screens are pulled and the fish are allowed to swim over a V-notched dam board and down the outlet channel directly into Boston Canyon Creek. The fish are taken off feed one to two days prior to the remaining fish being released. The effluent dam boards are removed and the pond is slowly lowered. The fish are allowed to go out on their own volition.

9.6) Number of fish released.

Excluding 1971 through 1974 and 1976 through 1980, juvenile summer steelhead have been released into the Umatilla River basin since 1967 (Table 2). Release numbers from 1967 through 1992 were highly variable; however, numbers released from 1993 through 1999 have been between 122,000 and 158,000 (Table 19). The production goal for FY 2000 and subsequent years is 150,000 smolts.

9.7) Marks used to identify hatchery adults.

All hatchery steelhead released into the Umatilla River basin are adipose fin clipped. All coded-wire tagged fish are also given a left ventral fin clip. It is anticipated that all future releases will be marked the same.

SECTION 10. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

10.1) Marking

<u>10.1.1 Fin Clips</u>

All hatchery steelhead released into the Umatilla River basin are adipose fin clipped. All coded-wire tagged fish are also given a left ventral fin clip. It is anticipated that for the near future, releases will be marked the same.

<u>10.1.2 Coded wire tags</u>

Program goals are evaluated by annually tagging 40 percent of each release group with coded- wire tags (20,000 fish in each of three groups of 50,000). It is anticipated that for the near future, a similar percentage will be coded-wire tagged.

10.1.3 PIT tags

Beginning in 1997, hatchery smolts have been PIT tagged annually. PIT tags allow for the assessment of outmigration timing and survival. 1,200 hatchery fish are PIT tagged for routine monitoring of production groups. Multiple year studies involve the annual PIT tagging of 2,700 fish for reach survival tests, and 1,200 for release timing evaluations. In addition, hatchery and natural juvenile summer steelhead are PIT tagged at the trap at Three Mile Falls Dam to determine trap collection efficiencies. These efficiencies are used to estimate total migrant abundance. ISO tags will be used in FY 2000 and beyond. In 1999, approximately 1,500 hatchery and 1,500 natural steelhead were PIT tagged with 400 kHz tags at Three Mile Falls Dam (primarily in April and May). During 1999, 2,047 natural juvenile steelhead were PIT tagged in the headwaters of the Umatilla River to assess migration timing and survival of natural steelhead. Evaluation of hatchery and natural steelhead with PIT tags will continue in the near future.

10.2) Genetic data

Currens and Schreck (1993 and 1995) reported on the genetic characteristics of juvenile steelhead from 14 different locations and from hatchery reared steelhead of endemic stock. This data established a genetic baseline for the Umatilla River summer steelhead stock.

During April and May 1996, 86 natural summer steelhead were collected for genetics analysis at Three Mile Falls Dam by the NMFS lab in Seattle. These samples were used to augment the regional GSI database. Fish were thought to be primarily two-year old migrating smolts. The samples were screened for variability at approximately 70 gene loci. Nei's genetic distance values were computed between all pairs of samples (polymorphic gene loci). Statistically significant differences were found among the allele frequencies ($p<0.01$; G-test) indicating variability among the temporal samples. Further analysis indicated the Umatilla samples cluster with the Snake River populations. This new genetic data may affect the configuration of boundaries for the inland steelhead Evolutionary Significant Units (letter from Robin Waples on 2/4/99, NMFS, Seattle).

10.3) Survival and fecundity

10.3.1) Average fecundity

Since 1990, summer steelhead fecundity has averaged 5,493 (Table 10).

10.3.2) Survival

a) Survival from collection to spawning

In 1982-83, broodstock were held in temporary holding ponds at McNary Dam and prespawn mortality was 51.6% (Table 16). Since 1984, spawning has occurred at either Bonifer or Minthorn and total prespawn mortality has ranged from 7.7 to 34.4% and has averaged 18.6%. Mortality of unmarked fish only has ranged from 7.6 to 34.4% and has averaged 18.2%. Since 1988, all spawning has occurred at Minthorn and total prespawn mortality has ranged from 8.6 to 34.4% and has averaged 18.8%. Mortality of unmarked fish has ranged from 7.6 to 34.4% and has averaged 18.4%. In some years, however, a portion of the males were live spawned and held through the end of the spawning season. Had these fish been killed at the time of spawning, mortality numbers would have been lower.

b) Survival from green egg to eyed egg

Green to eyed egg survival has averaged 82.8% from 1990 through 1999.

c) Survival from green egg to release

Green egg to smolt survival at Umatilla Hatchery has averaged 70 % from 1995-97 (Table 11).

d) Survival from release to adult

Smolt-to-adult survival of hatchery steelhead is based on coded wire tag recoveries and mean smolt-to-adult survival for the 1991-95 broods has ranged from 0.08-0.91% (Table 18). The estimated number of hatchery reared steelhead harvested each year in the Umatilla River Basin has ranged from 26 to 146 (Table 3). The hatchery steelhead harvested outside of the Umatilla River Basin has ranged from 6 to 210 (Table 5). The number of hatchery reared adults annually taken for brood stock has ranged from 0 to 103, (Table 1). The number of hatchery steelhead released upstream to spawn naturally has ranged from 102 to 1,301 (Table 1).

Smolt survival from release in the headwaters to Three Mile Falls Dam was estimated in 1996, 1998, and 1999 at 93.7%, 49.9%, and 62.8%, respectively. Survival was overestimated in 1995 (154%) and not determined in 1997. Abundance of natural juvenile summer steelhead emigrating from the basin has ranged from approximately 54,000 in 1998 to 73,000 in 1996 (Knapp et al. 1996, 1998a 1998b, 2000 in preparation).

10.4) Monitoring of performance indicators in Section 1.8

10.4.1 Proportions of hatchery spawners in natural populations in target area (list all populations or spawning areas that are monitored).

The proportion and number of hatchery steelhead available for spawning in the Umatilla River above Three Mile Falls Dam has ranged from 6.9% (160) to 58.9% (1,301) from 1988 to 1999 (Table 6). Because of high turbid flows, it is not possible to reliably estimate the number of hatchery steelhead that successfully spawn. However, a number of hatchery steelhead have been observed throughout the years that created redds that appeared normal and successful (Contor et al. 1995, 1996, 1997, 1998).

10.4.2 Ecological interactions

Natural and hatchery juvenile salmonids have similar migration timing out of the Umatilla basin. Both peak in their migration in the lower river in early to mid-May, although natural steelhead begin to migrate in late winter and early spring. Hatchery steelhead releases in April coincide with increasing movement of natural steelhead; hatchery releases in May coincide with the peak period.

Large numbers of hatchery releases tend to attract bird predators that indirectly affect steelhead migrants. As river flow declines and water clarity improves, juvenile migrants are more vulnerable to avian predation. When large numbers of salmon are released into the Umatilla basin, gulls become extremely numerous in key locations along the river. An increase in bird marks on hatchery and natural summer steelhead migrating out of the basin has been observed in June. Large-sized summer steelhead have also been occasionally observed to prey on smaller-sized fish when they are in the trap livewell (Knapp et al. 1996, 1998a 1998b, 2000 in preparation).

10.4.3 Disease control in the hatchery, and potential effects on natural populations

Minimizing transfer of pathogens from hatchery fish to the natural environment is currently achieved by preventing and controlling disease in the hatchery. All raceways at Umatilla Hatchery are monitored monthly for specific fish pathogens and parasites. A pre-liberation examination is conducted within four weeks prior to transfer of fish from Umatilla Hatchery to the acclimation facilities. Epidemiological, statistical and diagnostic methods are applied when fish health problems occur, and are used to determine how rearing strategies or fish culture methods might be modified to improve fish health. In addition, broodstock are monitored for specific pathogens.

Mortalities of natural summer steelhead collected in the lower river are examined by ODFW pathology. Fish are examined for whirling disease (Myxobolus cerebralis), systemic bacteria, and presence of the Rs antigen (bacterial kidney disease). A number of fish have been positive for the Rs antigen through ELISA testing; some at clinical levels. However, these ELISA values may or may not indicate the presence of the Rs antigen for the true kidney disease bacterium (BKD). Apparently, natural summer steelhead commonly show positive ELISA values, but the implications are unknown. The presence of several mortalities of natural summer steelhead could be related to a number of factors in addition to hatchery related pathogens including: 1) Poor water quality; 2) Physical injuries obtained at hydropower and irrigation bypass facilities; 3) Lethal but unsuccessful attempts of predators, and 4) Catch and release by anglers.

10.4.4 Behavior of program fish.

a) Juveniles

Hatchery juvenile steelhead are released as large-grade fish in April and small-grade fish in May at approximately 5 fish/pound. Monitoring in the lower river indicates that small-grade summer steelhead released in May do not move out of the basin as well as the earlier-released fish. It is believed that a portion of these small-grade fish remain in the river as residuals; to a lessor degree the same probably holds true for the large-grade releases. Recent radio-tracking studies in 1999 indicated that only 3 of 20 small-grade steelhead tagged were known to have migrated out of the basin. Snorkeling surveys at the release site a month after release revealed the continuing presence of hatchery steelhead. It is unknown whether this behavior is due to the genetic nature of small-grade fish, the release site location, or river flows at time of release. Reach-specific survival studies in 1998 and 1999 with PIT tagged juvenile summer steelhead (both large-grade and small-grade) suggested that there may have been a survival advantage for fish released lower in the basin (Knapp et al. 1996, 1998a 1998b, 2000 in preparation). Two PIT-tagged steelhead released at Bonifer in 1998 during reach survival tests were detected more than 1 year later at Three Mile Falls Dam.

Migration of the April-released, large-grade, steelhead takes three or more weeks before observed numbers peak at Three Mile Falls Dam. Peak catch of all hatchery steelhead smolts occurs in early to mid-May. Migration duration extends into July, but 95% capture occurs by late May. Diel movement in river is primarily at night (64%), although movement through passage facilities tends to be more toward day (between 11:00 and 14:00 hours) (Knapp et al. 1996, 1998a 1998b, 2000 in preparation).

River flow appears to influence steelhead movement. In general, when flows increase, steelhead movement also increases. Release of water from McKay reservoir in June for flow enhancement usually results in a small increase in catch of migrant steelhead at Three Mile Falls Dam (Knapp et al. 1996, 1998a 1998b, 2000 in preparation).

b) Adults

Adult life history characteristics of hatchery reared steelhead appear similar to naturally produced fish. Assessments suggest similar run timing to Three Mile Falls Dam. Moreover, age- and size-at-return characteristics are comparable. Umatilla summer steelhead are in the mainstem Columbia River (Zone 6) from early August through late October. In general, summer steelhead do not stray. Adult returns of CWT fish have showed that less than 5% are recovered in other subbasins. Those that migrate above McNary Dam generally fall back and ascend the Umatilla River. Fall entry of summer steelhead in the Umatilla River is determined by flow and temperature. Tributary migration is slow with low temperatures (< 6°C), high flows (> 2,000 cfs), and early entry. Entry timing generally extends from September to May. Later entry fish generally move faster and more constant. Radio tagged fish have taken 3 to 120 days (25 mean) on average to travel the first 30 miles of river depending on conditions. Migrational delays have been documented at Feed Canal Dam (RM 29). Approximately half of the steelhead used the fish ladders above Three Mile Falls Dam, except Stanfield Dam (RM 32) where only 15% use the ladder. During extremely low flow conditions, summer steelhead are transported from Three Mile Falls Dam to mid-river sections. Steelhead that are transported migrate positively upstream after release and migration rates are similar to those exhibited by non-transported fish (6 miles/day) (Knapp 1996, Contor et al. 1997).

10.4.5 Homing or straying rates for program fish.

Coded-wire tag recoveries (1993-99) indicate an average of 96.6% of all Umatilla Hatchery adults have been recovered in the Umatilla River or from Columbia River fisheries. A small number of strays have been observed in the John Day, Walla Walla, and Snake Rivers (Table 20).

10.4.6 Gene flow from program fish into natural populations.

Hatchery releases have increased the numbers of potential spawners. An average of seven hatchery adults have returned to the Umatilla River and escaped the in-river fishery for each fish spawned from brood years 1991-94 (eg. progeny:parent - escapement ratio = 7:1). The net effect of the hatchery program on escapement has been an average of 647 additional adults per year. Hatchery steelhead have been observed spawning: however, high turbid flows prevent a comprehensive evaluation of the success of hatchery spawners (see section 10.4.1).

10.5) Unknowns or uncertainties

Uncertainties regarding the short and long term viability and success of Umatilla steelhead include:

1) Benefits of rearing juvenile steelhead in Oregon ponds instead of the Michigan ponds (higher densities and oxygen supplementation).
2) Benefits of the small, late-released group of hatchery steelhead with poor survival rates. Poorer survival of this group relative to the early-released groups represents a potential genetic risk (residualization impacts on wild juvenile steelhead and resident fish). Adaptive management will be implemented with the objective of increasing survival of the late-released group.
3) Benefits of "natures" rearing practices.
4) Relative success of hatchery reared endemic steelhead reproducing naturally. It is currently assumed that hatchery reared endemic steelhead reproduce successfully and enhance natural production. The benefits of hatchery adults reproducing are assumed to outweigh the affect of mining natural adults for broodstock.
5) Hatchery supplementation using endemic steelhead will not reduce or depreciate the genetic characteristics of the natural steelhead populations.
6) Persistence of high mortalities of smolts as a direct and indirect result of mainstem Columbia River Dams and hydropower projects, and the continued decline of ocean and estuary health and related consequences of environmental degradation by humans.

Details of each uncertainty are listed in Appendix C.

10.6) Other relevant monitoring projects (list an overview of all M&E work here)

10.6.1 Introduce the M&E projects

An array of monitoring projects are currently underway or have been completed in the Umatilla Basin and include:

1) *Umatilla Hatchery Monitoring and Evaluation Project.* Goals of this project are to provide information and recommendations for culture and release of hatchery fish, harvest regulations, and natural escapement that will lead to the accomplishment of long-term natural and hatchery production goals in the Umatilla River basin in a manner consistent

with provisions of the Council's Fish and Wildlife Program. Additional goals are to assess the success of achieving the management objectives in the Umatilla River basin that are presented in the Master Plan and the Comprehensive Rehabilitation Plan. A substantial proportion of the production at Umatilla Hatchery is produced in the "Michigan Type" oxygen supplementation system. Project objectives are directed at evaluating the effects of this new rearing system on smolt-to-adult survival for Chinook salmon and steelhead.

2) *Fish Health Monitoring and Evaluation Project:* Goals of this project are to monitor and evaluate the health status of spring and fall Chinook salmon and summer steelhead juveniles reared at Umatilla Hatchery, and adult broodstock held and spawned at satellite facilities. A systematic fish health monitoring program is used to assess the effects that different rearing environments and strategies may have on fish propagated for the Umatilla Hatchery evaluation project. The fish health monitoring program currently emphasizes specific diseases and conditions thought to be critical for the Umatilla Hatchery program.

3) *Umatilla Hatchery Satellite Facilities Operation and Maintenance:* Goals of this project are to operate and maintain the satellite facilities used to implement hatchery operations in the Umatilla Basin and include: 1) Increase adult salmon and steelhead survival and homing to the Umatilla River basin by acclimating juveniles prior to release, 2) Provide summer steelhead as well as chinook eggs to Umatilla and other hatcheries for incubation, rearing, and later releases back into the Umatilla River basin, and 3) Participate in planning and review process for new satellite facilities.

4) *Evaluate Juvenile Fish Bypass and Adult Fish Passage Facilities at Water Diversions on the Umatilla River:* Passage evaluation studies from 1991 – 1995 followed construction of new bypass and screening facilities at irrigation canals and new adult fish ladders at dams on the Umatilla River. Mark-release-recapture studies with juvenile fish evaluated injury and travel time through the facilities, and leakage at canal screens. Measurements of velocity at canal screens assessed whether NMFS/ODFW screening entrainment criteria was met for safe juvenile passage. Studies with adult salmonids evaluated upstream migration and homing needs of these fish in the basin. Radio telemetry was later used to determine the ability of adult salmonids to successfully negotiate the major diversions on the river. This work was a cooperative effort between ODFW (juvenile passage) and CTUIR (adult passage).

5) *Lower Umatilla River Outmigration and Survival Evaluation Project:* The goals of this project are to evaluate outmigration, estimate survival, and investigate factors affecting survival of juvenile salmonids in the lower Umatilla River basin. Project objectives developed out of the need to enlarge the scope of evaluating the success of juvenile salmonid passage at passage facilities to the basin as a whole. Information on migration success and performance of different rearing and release strategies for salmonid species within the Umatilla River supplements the evaluation of specific hatchery practices at Umatilla Hatchery. Effects of mid-summer transport of juvenile fish have also been evaluated. Lower River monitoring augments our understanding of life history patterns of natural fish and the impacts of river operations on fish migrations.

6) *Umatilla River Basin Passage Operations:* The current Umatilla Passage Operations program was implemented to assist fish passage during periods of low river flow. The program goal is to maximize survival of adult and juvenile salmonids through the lower 30 miles of the Umatilla River. To meet this goal, primary responsibilities of the program include monitoring basin flow and passage conditions, daily operation and refinement of operating criteria for passage and trapping facilities, and oversight and coordination of flow enhancement.

7) *Natural Production M&E:* This project evaluates the natural production of salmon and steelhead in the Umatilla River Basin (Contor et al. 1996, 1997, and 1998). Natural production monitoring began in the Umatilla Basin during the fall of 1992, ten years after the hatchery program started with the construction of two juvenile acclimation facilities in 1982 and releases of hatchery fall Chinook in 1983. CTUIR and ODFW developed the Umatilla Hatchery Master Plan to restore salmon to the basin (CTUIR 1984 and ODFW 1986). The plan was completed in 1990 and included monitoring and evaluation including this project which evaluates the implementation of the Umatilla River Basin Fisheries Restoration Plans with respect to natural production and tribal harvest.

10.6.2 Objectives of M&E projects

See Appendix D

SECTION 11. RESEARCH

Research activities in this basin are conducted and managed within the monitoring and evaluation projects listed above.

SECTION 12. ATTACHMENTS AND CITATIONS

APPENDIX A: Literature Cited

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APPENDIX B: Tables and Figures

Table 1. Disposition and Spawning Ground Data of Natural and Hatchery Summer Steelhead (STS) Returning to the Umatilla River above Three Mile Falls Dam, 1988-1999.

RUN YEAR (Fall/Spring)	1987 1988	1988 1989	1989 1990	1990 1991	1991 1992	1992 1993	1993 1994	1994 1995	1995 1996	1996 1997	1997 1998	1998 1999
Natural STS Enumerated at TMD	2315	2104	1422	724	2247	1298	945	875	1299	1014	862	1134
Hatchery STS Enumerated at TMD	165	370	245	387	522	616	345	656	782	1463	903	740
Natural and Hatchery STS Enumerated at TMD	2480	2474	1667	1111	2769	1914	1290	1531	2081	2477	1765	1874
Natural STS Sacrificed or Mortalities at TMD	20	12	40	2	3	4	0	0	8	5	2	1
Hatchery STS Sacrificed or Mortalities at TMD	5	17	143	50	112	69	51	33	73	95	70	74
Natural STS Taken for Brood Stock	151	158	92	99	237	129	93	86	107	100	86	110
Natural STS Spawned	31F	42F	25F	78	172	95	79	59	63	75	68	76
Hatchery STS Taken for Brood Stock	0	0	0	103	95	91	42	68	26	10	30	15
Hatchery STS Spawned	0	0	0	49	0	3	17	22	21	3	21	4
Natural Females Released above TMD	1436	1232			1193	875	642	602	863	689	550	716
Natural Males Released above TMD	708	702			814	290	210	187	321	220	224	308
Natural STS Released above TMD	2144	1934	1290	623	2007	1165	852	789	1184	909	774	1024
Hatchery Females Released above TMD	114	216			161	266	186	274	371	666	476	425
Hatchery Males Released above TMD	46	137			154	190	66	281	312	692	327	236
Hatchery STS Released above TMD	160	353	102	234	315	456	252	555	683	1358	803	661
Natural STS Harvested above TMD-CTUIR						5	5	5	0	0	5	5
Hatchery STS Harvested above TMD-CTUIR						25	20	20	39	33	33	39
Natural STS Harvested above TMD-ODFW								0	0	0	0	0
Hatchery STS Harvested above TMD-ODFW						22	5	21	25	24	12	47
Natural Female STS Available to Spawn	1436	1232			1193	872	639	599	863	689	548	713
Natural Male STS Available to Spawn	708	702			814	288	208	185	321	220	221	306
Natural STS Available to Spawn	2144	1934	1290	623	2007	1160	847	784	1184	909	769	1019
Hatchery Female STS Available to Spawn	114	216			161	242	173	253	339	637	454	382
Hatchery Male STS Available to Spawn	46	137			154	167	54	261	280	664	305	193
Hatchery STS Available to Spawn	160	353	102	234	315	409	227	514	619	1301	759	575
Total STS Available for Spawning	2304	2287	1392	857	2322	1569	1074	1298	1803	2210	1528	1594
Total Female STS Available to Spawn	1550	1448			1354	1114	812	852	1202	1326	1002	1095
STS Redds Observed in Index Reaches	138	77	HW	HW	135	HW	64	74	119	138	126	218
Total STS Redds Observed	275	128	HW	HW	300	HW	224	126	150	149	217	270
Index Reaches Miles Surveyed	18.5	20	HW	HW	21.4	HW	21.4	21.4	21.4	21.4	21.4	21.4
Redds Per Mile in Index Reaches	7.5	3.9	HW	HW	6.3	HW	3.0	3.5	5.6	6.4	5.9	10.2
Total Miles Surveyed in Umatilla River	61.0	50.2	HW	HW	67.2	HW	65.8	35.0	34.4	24.6	38.0	35.0
Redds Per Mile in all Areas	4.5	2.5	HW	HW	4.5	HW	3.4	3.6	4.4	6.1	5.7	7.7

Harvest not determined and not subtracted from estimates of spawners, 1988-1982. H. W. = high water.
Assumes that harvest steelhead were 50% females and 50% males. No adjustments made for hook and release mortality.
Index reaches are in Squaw, NF Meacham, Buckaroo, Camp, and Boston Canyon Creeks and the SF Umatilla River.

Table 2. Hatchery releases of summer steelhead in the Umatilla River Basin.

Year of Release	Hatchery	Number Released	Age at Release	Location	Date of Release	Type of Release	No/lb.	Stock
1967	Gnat Creek	109,805				Direct	75.0	Skamania
1967	Oak Springs	238,020				Direct	117.0	Idaho (Oxbow)
1967	Wallowa	142,240				Direct	240.0	Idaho (Oxbow)
1968	Gnat Creek	23,100				Direct	66.0	Skamania
1968	Gnat Creek	150,000	Eggs			Direct	Eggs	Skamania
1969	Oak Springs	174,341				Direct	145.0	Skamania
1970	Carson	39,489				Direct	8.0-9.0	Skamania
1975	Wizard Falls	11,094				Direct	9.0	Umatilla River
1981	Oak Springs	17,558	Yearling	Upper Umat. R.		Direct	6.0-9.0	Umatilla River
1981	Oak Springs	9,400		Upper Umat. R.		Direct	145.0	Umatilla River
1982	Oak Springs	59,494	Yearling	Upper Umat. R.		Direct	7.0-8.0	Umatilla River
1982	Oak Springs	67,940		Upper Umat. R.		Direct	124.0	Umatilla River
1983	Oak Springs	60,500	Yearling	Upper Umat. R.		Direct	11.0	Umatilla River
1983	Oak Springs	52,700		Upper Umat. R.		Direct	62.0	Umatilla River
1984	Oak Springs	57,939	Yearling	Bonifer	May	Forced	6.5	Umatilla River
1985	Oak Springs	22,000	Yearling /b	Bonifer	March	Forced	135.0	Umatilla River
1985	Oak Springs	53,850	Yearling	Bonifer	May	Forced	7.0	Umatilla River
1986	Oak Springs	39,134	Yearling /b	Bonifer	Spring	Forced	150.0	Umatilla River
1986	Oak Springs	54,137	Yearling	Bonifer	May	Forced	8.4	Umatilla River
1987	Oak Springs	1,485	Yearling	Meacham Cr.(RM 11)	May	Direct	5.5	Umatilla River
1988	Oak Springs	30,549	Yearling	Minthorn	April	Forced	6.5-7.4	Umatilla River
1988	Oak Springs	30,757	Yearling	Near Minthorn	April	Direct	6.5	Umatilla River
1988	Oak Springs	33,984	Yearling	Umatilla RM 23	May	Direct	10.3	Umatilla River
1988	Oak Springs	10,033	Subyearling	Umatilla RM 89	December	Direct	57.5	Umatilla River
1988	Irrigon	24,618	Unfed fry	S. F. Umat. R.	June	Direct	3200.0	Umatilla River
1989	Oak Springs	29,852	Yearling	Minthorn	May	Forced	6.6	Umatilla River
1989	Oak Springs	29,586	Yearling	Near. Minthorn	May	Direct	5.6	Umatilla River
1989	Oak Springs	22,274	Yearling	Bonifer	April/May	Forced	5.5	Umatilla River
1990	Oak Springs	59,747	Yearling	Bonifer	May	Forced	5.9-7.7	Umatilla River
1990	Oak Springs	29,446	Yearling	Near Bonifer	May	Direct	5.5	Umatilla River
1991	Oak Springs	42,610	Yearling	Bonifer	May	Forced	6.2-7.5	Umatilla River
1991	Oak Springs	29,325	Yearling	Near Bonifer	May	Direct	8.7	Umatilla River
1991	Oak Springs	3,998	Yearling	Umatilla RM 3	April	Direct	12.5	Umatilla River
1992	Umatilla	19,977	Yearling	Bonifer	March	Forced	5.8	Umatilla River

Year of Release	Hatchery	Number Released	Age at Release	Location	Date of Release	Type of Release	No/lb.	Stock
1992	Umatilla	47,458	Yearling	Minthorn	March	Forced	5.8	Umatilla River
1992	Umatilla	64,550	Yearling	Meacham Cr.(RM 0.5)	April	Direct	5.0	Umatilla River
1992	Umatilla	67,419	Yearling	Meacham Cr.(RM 0.5)	April/May	Direct	5.5	Umatilla River
1992	Umatilla	5,443	Yearling	Umatilla RM 3	April	Direct	5.8	Umatilla River
1993	Umatilla	44,824	Yearling	Bonifer	April	Forced	4.5	Umatilla River
1993	Umatilla	47,979	Yearling	Minthorn	April	Forced	5.6	Umatilla River
1993	Umatilla	65,465	Yearling	Bonifer	May	Forced	6.1	Umatilla River
1994	Umatilla	51,403	Yearling	Minthorn	April	Forced	4.9	Umatilla River
1994	Umatilla	49,598	Yearling	Bonifer	April	Forced	5.1	Umatilla River
1994	Umatilla	52,097	Yearling	Bonifer	May	Forced	5.2	Umatilla River
1994	Umatilla	1,732	Yearling	Umatilla RM 27.3	April	Direct	5.7	Umatilla River
1995	Umatilla	48,539	Yearling	Bonifer	April	Forced	5.6	Umatilla River
1995	Umatilla	49,983	Yearling	Minthorn	April	Forced	4.7	Umatilla River
1995	Umatilla	47,941	Yearling	Bonifer	May	Forced	5.5	Umatilla River
1996	Umatilla	47,543	Yearling	Minthorn	April	Forced	5.1	Umatilla River
1996	Umatilla	49,377	Yearling	Bonifer	April	Forced	5.3	Umatilla River
1996	Umatilla	49,783	Yearling	Thornhollow	May	Forced	5.1	Umatilla River
1997	Umatilla	46,788	Yearling	Minthorn	April	Volitional	4.6	Umatilla River
1997	Umatilla	41,555	Yearling	Bonifer	April	Volitional	5.4	Umatilla River
1997	Umatilla	48,944	Yearling	Bonifer	May	Volitional	4.9	Umatilla River
1998	Umatilla	49,084	Yearling	Minthorn	April	Volitional	4.7	Umatilla River
1998	Umatilla	41,088	Yearling	Bonifer	April	Volitional	5.9	Umatilla River
1998	Umatilla	47,313	Yearling	Bonifer	May	Volitional	5.5	Umatilla River
1999	Umatilla	41,843	Yearling	Minthorn	April	Volitional	4.9	Umatilla River
1999	Umatilla	44,226	Yearling	Bonifer	April	Volitional	5.5	Umatilla River
1999	Umatilla	35,564	Yearling	Bonifer	April/May	Volitional	5.9	Umatilla River

/b These fish were transferred to Bonifer in November as subyearlings and were released the following spring as yearlings

Table 3. Descriptive statistics for the steelhead fishery in the Umatilla River, run years 1993-94 through 1998-99. Catch statistics were based on creel surveys conducted in the lower river (Umatilla mouth to Three Mile Falls Dam) and upper river (Barnhart Bluffs to lower boundary of the CTUIR).

Statistic[a]	**Fish origin**[b] **or creel area**	**Run year** 93-94	94-95	95-96	96-97	97-98	98-99	**Mean**
Run size	WSTS	945	875	1296	1014	862	1133	1021
	HSTS	359	696	819	1529	994	739	856
Run composition (%)	WSTS	72	56	61	40	46	61	56
	HSTS	28	44	39	60	54	39	44
Catch composition (%)	WSTS	59	67	70	59	62	65	64
	HSTS	41	33	30	41	38	35	36
Number caught	WSTS	37	172	161	168	239	250	171
	HSTS	26	85	69	115	146	132	96
Percent of run caught	WSTS	3.9	19.6	12.4	16.6	27.7	22.1	17.1
	HSTS	7.2	12.2	8.4	7.5	14.7	17.9	11.3
Percent of run harvested	HSTS	5.3	8.7	7.3	5.9	10.4	13.7	8.6
Composition of lower river catch (%)	WSTS	49	67	64	59	49	50	56
	HSTS	51	33	36	41	51	50	44
Composition of upper river catch (%)	WSTS	71	66	75	60	78	75	71
	HSTS	29	34	25	40	22	25	29
Location of WSTS catch (%)	Lower Rr.	46	70	44	71	44	30	51
	Upper Rr.	54	30	56	29	56	70	49
Location of HSTS catch (%)	Lower Rr.	69	68	56	72	74	56	66
	Upper Rr.	31	32	44	28	26	44	34
Percent of WSTS run caught	Lower Rr.	1.8	13.7	5.4	11.9	12.2	6.6	8.6
	Upper Rr.	2.1	5.9	7.0	4.7	15.5	15.4	8.4
Percent of HSTS run caught	Lower Rr.	5.0	8.3	4.7	5.4	10.9	10.0	7.4
	Upper Rr.	2.2	3.9	3.7	2.1	3.8	7.8	3.9
Percent of HSTS run harvested	Lower Rr.	3.9	5.7	4.2	4.3	9.2	7.3	5.8
	Upper Rr.	1.4	3.0	3.1	1.6	1.2	6.4	2.8

[a] *Hatchery steelhead run = number counted at Three Mile Falls Dam plus harvest below Three Mile Falls Dam; Wild steelhead run = number counted at Three Mile Falls Dam.*
[b] *WSTS = wild steelhead; HSTS = hatchery steelhead; Lower Rr. = lower river creel area; Upper Rr. = upper river creel area.*

Table 4. Summary of Estimated Tribal of Summer Steelhead from 1993 through 1988.

Year	**Summer Steelhead Caught by Tribal Anglers**
1993-94	30 (5)*
1994-95	25 (5)
1995-96	25 (5)
1996-97	39
1997-98	33
1998-99	39 (5)*
Total	191 (20)*

* Wild Fish in parentheses, estimated for 1993 and 1999.

Table 5. Summary of Estimated Harvest Outside of the Umatilla River Basin for Hatchery Summer Steelhead Adults Returning from Releases in the Umatilla River (based on coded wire tag recoveries).

Year of Release	**Estimated Summer Steelhead Harvested Out of Basin**		
	Canada and Idaho Catch	**Columbia River Catch (Nets)**	**Columbia River Sport Catch**
1988	3	88	15
1989	0	0	6
1990	0	136	74
1991	0	119	63
1992	0	48	4
1993	2	30	56
1994	0	42	157
1995	0	100	75
1996	0	17	11
Total	7	580	461

Table 6. The Number and Percent of Steelhead (STS) Available to Spawn Naturally that were of Hatchery Origin; Umatilla River, 1988-1999.

RUN YEAR (Fall/Spring)	1987 1988	1988 1989	1989 1990	1990 1991	1991 1992	1992 1993	1993 1994	1994 1995	1995 1996	1996 1997	1997 1998	1997 1998
Natural Female STS Available to Spawn	1436	1232			1193	872	639	599	863	689	548	713
Natural Male STS Available to Spawn	708	702			814	288	208	185	321	220	221	306
Natural STS Available to Spawn	2144	1934	1290	623	2007	1160	847	784	1184	909	769	1019
Hatchery Female STS Available to Spawn	114	216			161	242	173	253	339	637	454	382
Hatchery Male STS Available to Spawn	46	137			154	167	54	261	280	664	305	193
Hatchery STS Available to Spawn	160	353	102	234	315	409	227	514	619	1301	759	575
Total Female STS Available to Spawn	1550	1448			1354	1114	812	852	1202	1326	1002	1095
Percent Spawners of Hatchery Origin	6.9	15.4	7.3	27.3	13.6	26.1	21.1	39.6	34.3	58.9	49.7	36.1
Percent Females Spawners of Hatchery Origin	7.4	14.9			11.9	21.7	21.3	29.7	28.2	48.0	45.3	34.9

Harvest not estimated 1988-1992. 1993-1999, Harvest estimate subtracted from total, assumes harvest of 50% females and 50% males
No adjustments made for catch and release mortality.

Table 7. Catch and harvest of fin-clipped “trout” (juvenile hatchery steelhead) and unclipped “trout” (rainbow trout and juvenile native steelhead) during steelhead and spring chinook salmon fisheries in the upper Umatilla River, 1999.

Steelhead Fishery (Barnhart Bluffs to CTUIR West Boundary)
January 1 – April 15, 1999

Fish Caught	Estimated catch	Estimated harvest	Hrs / fish	
Clipped “trout” *Unclipped “trout”	114 340	0 0	77.2 25.9	Estimated hours of steelhead angling 8,805
*Unclipped:Clipped “Trout” Catch Ratio = 3:1				

Spring Chinook Fishery (Three Mile Falls Dam to CTUIR West Boundary)
May 29 – June 20, 1999

Fish Caught	Estimated catch	Estimated harvest	Hrs / fish	
SALMON ANGLERS Clipped “trout” *Unclipped “trout”	 40 85	 22 47	 37.5 17.6	Estimated hours of salmon angling 1,483
TROUT ANGLERS Clipped “trout” *Unclipped “trout”	 162 868	 85 451	 9.0 1.7	Estimated hours of trout angling 1,466
TOTAL Clipped “trout” *Unclipped “trout”	 202 953	 107 498	 -- --	
*Unclipped:Clipped “Trout” Catch Ratio = 5:1				

*Unclipped “trout” includes hatchery trout released for the put-and-take fishery through Pendleton

Table 8. Water quality parameters for steelhead in Michigan raceways, Umatilla Hatchery, 1992-98.

Parameter	Pass	Number	Average	Minimum	Maximum
Temperature In (°C)	A	112	12.4	10.4	15.2
	B	93	12.5	10.6	15.0
	C	87	12.5	10.2	14.9
Temperature Out (°C)	A	112	12.3	10.4	15.1
	B	93	12.5	10.6	15.0
	C	86	12.5	10.3	15.2
pH In	A	107	7.78	6.83	8.63
	B	88	7.71	7.08	8.30
	C	82	7.64	6.85	8.24
pH Out	A	107	7.68	6.79	8.30
	B	88	7.62	6.73	8.18
	C	81	7.60	6.73	8.14
Oxygen In (ppm)	A	110	12.11	8.7	17.9
	B	90	12.72	8.7	19.5
	C	83	13.04	9.3	17.6
Oxygen Out (ppm)	A	110	9.13	5.7	11.9
	B	90	9.51	6.2	12.9
	C	83	9.79	7.2	14.5
Un-ionized Ammonia (µg/L)	A	88	0.56	0.03	2.56
	B	70	1.12	0.12	7.48
	C	65	1.49	0.23	11.75

Table 9. Umatilla River summer steelhead broodstock collection

Run Year	Number Collected								
	Marked			Unmarked			Total		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
82-83	0	0	0	unk	unk	161	unk	unk	161
83-84	0	0	0	20	32	52	20	32	52
84-85	0	0	0	25	79	104	25	79	104
85-86	0	0	0	11	58	69	11	58	69
86-87	0	0	0	57	91	148	57	91	148
87-88	0	0	0	73	78	151	73	78	151
88-89	0	0	0	72	88	160	72	88	160
89-90	0	0	0	49	57	106	49	57	106
90-91	47	56	103	46	53	99	93	109	202
91-92	49	46	95	109	116	225	109	116	225
92-93	1	2	3	64	61	125	65	63	128
93-94	18	25	43	47	45	92	65	70	135
94-95	35	33	68	38	48	86	73	81	154
95-96	16	12	28	56	49	105	72	61	133
96-97	12	1	13	48	49	97	60	50	110
97-98	19	11	30	42	44	86	61	55	116
98-99	17	0	17	52	59	111	69	59	128

Table 10. Umatilla River summer steelhead broodstock spawning

Run Year	Number Spawned									Eggs Taken	Mean Fecundity
	Marked			Unmarked			Total				
	Males	Female	Total	Males	Female	Total	Males	Female	Total		
82-83	0	0	0	unk	33	unk	unk	33	unk	132,000	4,000
83-84	0	0	0	unk	21	unk	unk	21	unk	100,000	4,762
84-85	0	0	0	unk	33	unk	unk	33	unk	150,000	4,545
85-86	0	0	0	unk	30	unk	unk	30	unk	166,000	5,533
86-87	0	0	0	30	37	67	30	37	67	239,760	6,480
87-88	0	0	0	31	31	62	31	31	62	121,980	5,545
88-89	0	0	0	42	42	84	42	42	84	214,712	5,803
89-90	0	0	0	28	25	53	28	25	53	130,274	5,922
90-91	11	31	42	52	33	85	63	64	127	410,356	6,412
91-92	0	0	0	86	86	172	86	86	172	476,871	5,545
92-93	1	2	3	48	47	95	49	49	98	255,441	5,213
93-94	0	17	17	48	31	79	48	48	96	234,432	4,884
94-95	9	13	22	31	28	59	40	41	81	223,525	5,452
95-96	13	8	21	31	32	63	44	40	84	215,408	5,385
96-97	2	1	3	37	38	75	39	39	78	209,639	5,375
97-98	13	8	21	30	38	68	43	46	89	228,622	5,080
98-99	4	0	4	35	41	76	39	41	80	224,716	5,481

Table 11. Egg take and survival of summer steelhead (brood years 1992-1998) reared at Umatilla Hatchery, 1992-98 broods.

Brood year	Number of eggs taken or received	Egg-to-fry survival[ab](%)	Egg-to-smolt survival[bc] (%)
1991	340,674	78.4	77.9
1992	476,871	81.4	72.8
1993	255,441	74.1	73.1
1994	234,436	82.4	81.9
1995	223,525	86.8	75.4
1996	215,408	81.6	69.9
1997	209,639	82.4	76.0
1998	228,642	77.7	65.5

[a] *Egg-to-fry survival estimate was adjusted to include eggs lost when delivery of water to the incubation trays failed and adjusts for fry that were destroyed because of a reduction in program goals.*
[b] *Survival estimate are based on green egg-to-fry or smolt stage. Fry numbers are from the monthly hatchery report, smolt numbers are from the coded-wire tag report.*
[c] *Survival estimate includes fish that were destroyed because of a reduction in program goals.*

Table 12. Rearing conditions immediately before transfer for summer steelhead in Michigan raceways at Umatilla Hatchery and in Oregon raceways at Irrigon Hatchery during 1991-98.

Brood year	**System**	**Maximum density ($lb./ft^3$)**	**Maximum loading (lb./gal/min)**
1991	Michigan	5.4-6.7	11.8-14.6
1991	Oregon	1.3	6.6
1992	Michigan	4.0-4.5	8.9-9.9
1992	Oregon	1.3	6.6
1993	Michigan	3.8-4.6	8.4-10.1
1993	Oregon	1.4-1.5	6.7-7.4
1994	Michigan	4.0-4.2	9.7-10.2
1994	Oregon	1.3-1.4	7.3-10.4
1995	Michigan	4.1-4.3	9.8-10.4
1995	Oregon	1.2-1.4	5.9-6.9
1996	Michigan	3.4-3.9	8.1-9.3
1996	Oregon	1.3-1.5	7.1-8.0
1997	Michigan	3.7-3.8	8.7-9.1
1997	Oregon	1.3-1.5	7.1-8.0

Table 13. Mean proportion of descaled, partially descaled, and undamaged summer steelhead reared in Michigan passes at Umatilla Hatchery, brood years 1991 - 1997.

Brood Year	Smolts Pass	(%)	Partially Descaled[a]	Descaled[b]	Undamaged[c]
1991	A		0.01	0.43	0.56
1991	B		0.05	0.39	0.61
1991[d]	C				
1992	A		0.08	0.30	0.62
1992	B		0.03	0.56	0.41
1992	C		0.02	0.58	0.40
1993	A	66.0	0.05	0.13	0.82
1993	B	29.0	0.01	0.50	0.49
1993	C	66.0	0.11	0.33	0.56
1994	A	23.0	0.13	0.39	0.48
1994	B	45.0	0.00	0.21	0.79
1994	C	61.0	0.09	0.42	0.50
1995	A	8.0	0.03	0.70	0.28
1995	B	8.0	0.01	0.31	0.69
1995[e]	C	8.0			
1996	A	45.9	0.12	0.48	0.41
1996	B	4.4	0.02	0.35	0.63
1996	C	1.5	0.32	0.57	0.11
1997	A	9.3	0.00	0.04	0.96
1997	B	1.5	0.04	0.32	0.64
1997	C	2.8	0.05	0.34	0.61
1998	A	0.0	0.12	0.03	0.85
1998	B	0.0	0.06	0.00	0.94
1998	C	0.9	0.15	0.01	0.84

[a] *More than 0.20 descaling on either side of the fish.*
[b] *Descaling = 0.03 to 0.20 on either side of the fish.*
[c] *Less than 0.03 descaling on either side of the fish.*
[d] *Data not available.*
[e] *The 1995 brood steelhead from pond M8C escaped from the acclimation pond prior to sampling.*

Table 14. Age summary of natural summer steelhead from the Umatilla River.

Return Year		**Age 1.1**	**Age 1.2**	**Age 2.1**	**Age 2.2**	**Age 2.3**	**Age 3.1**	**Age 3.2**	**Age 4.1**	**Total**
1994	n=	0	2	24	26	0	5	6	0	63
	%=	0	3.2	38.1	41.3	0	7.9	9.5	0	100
1995	n=	0	0	19	17	0	9	11	0	56
	%	0	0	33.9	30.4	0	16.1	19.6	0	100
1996	n=	0	0	28	8	0	7	1	0	44
	%	0	0	63.6	18.2	0	15.9	2.3	0	100
1997	n=	0	0	19	17	0	5	10	0	51
	%	0	0	37.3	33.3	0	9.8	19.6	0	100
1998	n=	1	1	33	11	1	4	0	1	52
	%	1.9	1.9	63.5	21.2	1.9	7.7	0	1.9	100

Juvenile years of freshwater growth from scales of adult steelhead returning to the Umatilla River.

Return Year		**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Total**
1994	n=	2	50	11	0	63
	%=	3.2	79.4	17.4	0	100
1995	n=	0	36	20	0	56
	%	0	64.3	35.7	0	100
1996	n=	0	36	8	0	44
	%	0	81.8	18.2	0	100
1997	n=	0	37	15	0	51
	%	0	70.6	29.4	0	100
1998	n=	2	45	4	1	52
	%	3.8	86.5	7.7	1.9	99.9

Table 15. Life History table of steelhead

Mouth of the Umatilla to the mouth of McKay Creek (RM 0-50.5)

Life History Stage	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Adult Migration	x	x	x	x	x	x	x	x				
Prespawning Holding												
Spawning												
Incubation												
Rearing	x	x	x	x	x	x	x	x	x	x	x	x
Juvenile Migration	x	x	x	x	x	x	x	x	x			

Mouth of McKay Creek to the mouth of Meacham Creek (RM 50.5-79) and mid-basin streams

Life History Stage	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Adult Migration	x	x	x	x	x	x	x	x				
Prespawning Holding					x	x	x	x				
Spawning						x	x	x				
Incubation						x	x	x	x			
Rearing	x	x	x	x	x	x	x	x	x	x	x	x
Juvenile Migration	x	x	x	x	x	x	x	x	x			

Mouth of Meacham Creek to the forks (RM 79-89 and headwater streams)

Life History Stage	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
Adult Migration	x	x	x	x	x	x	x	x				
Prespawning Holding					x	x	x	x				
Spawning						x	x	x				
Incubation						x	x	x	x			
Rearing	x	x	x	x	x	x	x	x	x	x	x	x
Juvenile Migration	x	x	x	x	x	x	x	x	x			

Table 16. Umatilla River summer steelhead broodstock mortality

Run Year	Marked			Unmarked			Total		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
82-83	0	0	0	unknown	unknown	83	unknown	unknown	83
83-84	0	0	0	1	3	4	1	3	4
84-85	0	0	0	1	9	10	1	9	10
85-86	0	0	0	9	8	17	9	8	17
86-87	0	0	0	unknown	unknown	35	unknown	unknown	35
87-88	0	0	0	18	34	52	18	34	52
88-89	0	0	0	15	15	30	15	15	30
89-90	0	0	0	11	25	36	11	25	36
90-91	4	2	6	13	2	15	17	4	21
91-92	1	3	4	11	6	17	12	9	21
92-93	0	0	0	8	3	11	8	3	11
93-94	7	2	9	10	4	14	17	6	23
94-95	10	7	17	12	17	29	22	24	46
95-96	3	4	7	8	9	17	11	13	24
96-97	10	0	10	4	4	8	14	4	18
97-98	2	2	4	10	3	13	12	5	17
98-99	6	0	6	14	9	23	20	9	29

Table 17. Mean length, weight, and condition factor at release for summer steelhead reared in first, second, and third pass Michigan raceways at Umatilla Hatchery, 1991-1997 broods (standard error in parentheses).

Brood Year	Pass	Length (mm)	Weight (g)	Condition factor
1991	A	194.3(1.4)	91.0(3.2)	1.13(0.01)
	B	200.0(1.1)	90.2(2.4)	1.09(0.01)
	C	186.9(1.0)	76.7(2.1)	1.12(0.01)
1992	A	199.6(1.1)	74.8(2.1)	0.93(0.01)
	B	198.2(1.2)	80.9(2.7)	1.01(0.01)
	C	220.1(1.0)	102.4(2.5	0.93(0.01)
1993	A	205.9(1.2)	86.7(2.5)	0.97(0.01)
	B	198.3(1.2)	88.7(2.4)	1.05(0.01)
	C	214.2(1.1)	93.3(2.3)	0.94(0.01)
1994	A	206.3(1.1)	82.6(2.2)	0.90(0.01)
	B	209.7(1.0)	96.2(2.7)	1.00(0.01)
	C	205.9(0.8)	81.4(1.8)	0.90(0.01)
1995	A	207.9(1.1)	87.3(2.4)	0.99(0.01)
	B	206.8(1.3)	89.9(2.9)	0.98(0.01)
	C[a]			
1996	A	208.3(1.0)	93.3(2.3)	1.00(0.01)
	B	208.1(0.9)	99.5(1.5)	1.08(0.00)
	C	203.5(1.1)	84.8(1.7)	0.95(0.00)
1997	A	187.0(1.7)	71.9(2.9)	1.04(0.01)
	B	209.3(1.7)	95.5(3.1)	1.01(0.01)
	C	202.3(1.3)	77.0(1.7)	0.94(0.00)
1998	A	194.7(1.1)	76.4(2.6)	0.98(0.01)
	B	207.3(1.1)	91.9(2.9)	1.04(0.01)
	C	207.7(1.1)	83.1(2.5)	0.96(0.01)

[a] *The 1995 brood steelhead from pond M8C escaped from the acclimation pond prior to sampling*

Table 18. Total catch, escapement and survival of steelhead that were coded-wire-tagged and released in the Umatilla River, 1991-95 broods. Recoveries are complete for 1991-94 broods years. Estimates of number of adults recovered are based on total production in each raceway.

Brood year	Raceway	N[a]	Total exploitation rate (%)	Return rate (% of release)	Umatilla survival rate (% of release)	Total number of adults recovered
1991						
	M5A	3	0.0	0.01	0.01	7
	M5B	6	67.0	0.00	0.02	9
	M5C	63	31.5	0.16	0.20	135
Total/Average		72	33.3	0.05	0.08	151
1992						
	M5A	28	0.0	0.08	0.08	50
	M5B	171	6.0	0.60	0.59	281
	M5C	185	15.6	0.52	0.63	282
Total/Average		384	7.2	0.40	0.43	613
1993						
	M5A	6	6.7	0.02	0.04	18
	M5B	98	30.4	0.31	0.50	246
	M5C	129	16.9	0.43	0.64	329
Total/Average		233	19.1	0.26	0.39	593
1994						
	M5A	49	0.0	0.26	0.25	120
	M5B	255	20.6	0.53	1.36	680
	M5C	217	13.4	1.04	1.12	544
Total/Average		520	12.6	0.61	0.91	1,344
1995						
	M5A	5	0.0	0.03	0.03	15
	M5B	70	4.9	0.39	0.35	166
	M5C	34	14.6	0.16	0.18	79
Total/Average		108	6.5	0.14	0.19	270

[a] Expanded CWT recovery

Table 19. Release data for summer steelhead reared at Umatilla Hatchery and released in the Umatilla River (RM= river mile; acclimation facilities: BS - Bonifer Springs acclimation facility; MC - Meacham Creek; MI - Minthorn Springs acclimation facility, RM=63.8; TH - Thornhollow acclimation facility, RM=73.5)

Brood year, CWT code	Release date	Race-way	Number released[a]	Number CWT	Number with brand/ paint mark/ PIT-tags	Fish per pound	Release location
1991							
075840	050192	M5A	22,288	10,105		5.5	MC
075838	050192	M5A	22,469	10,562		5.5	MC
075839	050192	M5A	22,662	10,275		5.5	MC
075841	043092	M5B	22,262	10,108		5.0	MC
075842	043092	M5B	21,365	9,498		5.0	MC
075843	043092	M5B	20,923	9,747		5.0	MC
074127	032992	M5C	22,059	10,203		5.8	BS & MI
073862	032992	M5C	22,902	10,594		5.8	BS & MI
073759	032992	M5C	22,474	10,394		5.8	BS & MI
			199,404	91,486		5.4	
1992							
076052	051393	M5A	65,465	13,117	9,055	6.1	BS
076053	051393	M5A		11,410		6.1	BS
076054	051393	M5A		9,907		6.1	BS
076055	041693	M5B	47,979	10,031	9,641	5.6	MI
076056	041693	M5B		9,418		5.6	MI
076057	041693	M5B		9,643		5.6	MI
076058	041893	M5C	44,824	10,194	8,863	4.5	BS
076059	041893	M5C		9,792		4.5	BS
076060	041893	M5C		9,440		4.5	BS
			158,268	92,952	27,559	5.5	
1993							
070139	051294	M5A	26,411	8,595	7,700	5.2	BS
070140	051294	M5A	25,686	8,400		5.2	BS
070141	041494	M5B	24,692	9,952	7,827	5.1	MI
070142	041494	M5B	24,906	9,965		5.1	MI
070143	041194	M5C	26,481	10,470	7,718	4.9	BS
070144	041194	M5C	24,922	9,651		4.9	BS
			153,098	57,033	23,346	5.1	
1994							
070655	051295	M8A	47,941	19,782	8,908	5.5	BS
070656	041395	M8B	49,983	18,812	8,134	4.7	MI
070657	041195	M8C	48,539	19,290	7,771	5.6	BS
			146,463	57,884	24,813	5.3	
1995							
071034	050996	M8A	49,783	20,633	8,896	5.1	TH
071035	041296	M8B	47,543	19,742	8,615	5.1	MI
071036	042496	M8C	49,377	21,205	8,827	5.3	BS
			146,703	61,580	26,338	5.1	

Table 19 (Continued)

Brood year, CWT code	Release date	Race-way	Number released[a]	Number CWT	Number with brand/ paint mark/ PIT-tags	Fish per pound	Release location
1996							
091837[b]	051597	M8A	48,944	20,065	8,655	4.9	BS
091836	041197	M8B	46,788	19,103		4.6	MI
091835[c]	041097	M8C	41,555	19,531		5.4	BS
			137,287	58,699	8,655	4.9	
1997[d]							
092339	050498	M8A	47,313	19,468	242	5.5	BS
092340	041798	M8B	49,084	20,646	244	4.7	MI
092341	041698	M8C	41,088	20,800	250	5.9	BS
			137,485	60,914	736	5.4	
1998[d]							
092527	050499	M8A	35,564	19,088	288	5.9	BS
092526	041499	M8B	41,843	20,787	211	4.9	MI
092525	041399	M8C	44,226	20,450	198	5.5	BS
			121,633	60,325	697	5.4	

[a]*All fish were adipose clipped and all CWT fish were also left ventral fin clipped*
[b]*Fish were paint marked with orange (1,511), mustard yellow (5,003), and red (2,141) on the anal fin.*
[c]*Approximatlely 5,000 fish were released on 051597.*
[d]*Fish marked with PIT tags.*

Table 20. Location of adult coded-wire tag recoveries from juveniles reared at Umatilla Hatchery and released in the Umatilla River, 1993-99.

	Recovery year							
Recovery location	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**Total**
Umatilla River	11	160	209	310	249	178	43	1,160
Columbia River fisheries	6	28	70	42	43	18	0	207
Strays	0	10	29	6	3	0	0	48
Total	17	198	308	358	295	196	43	1,415

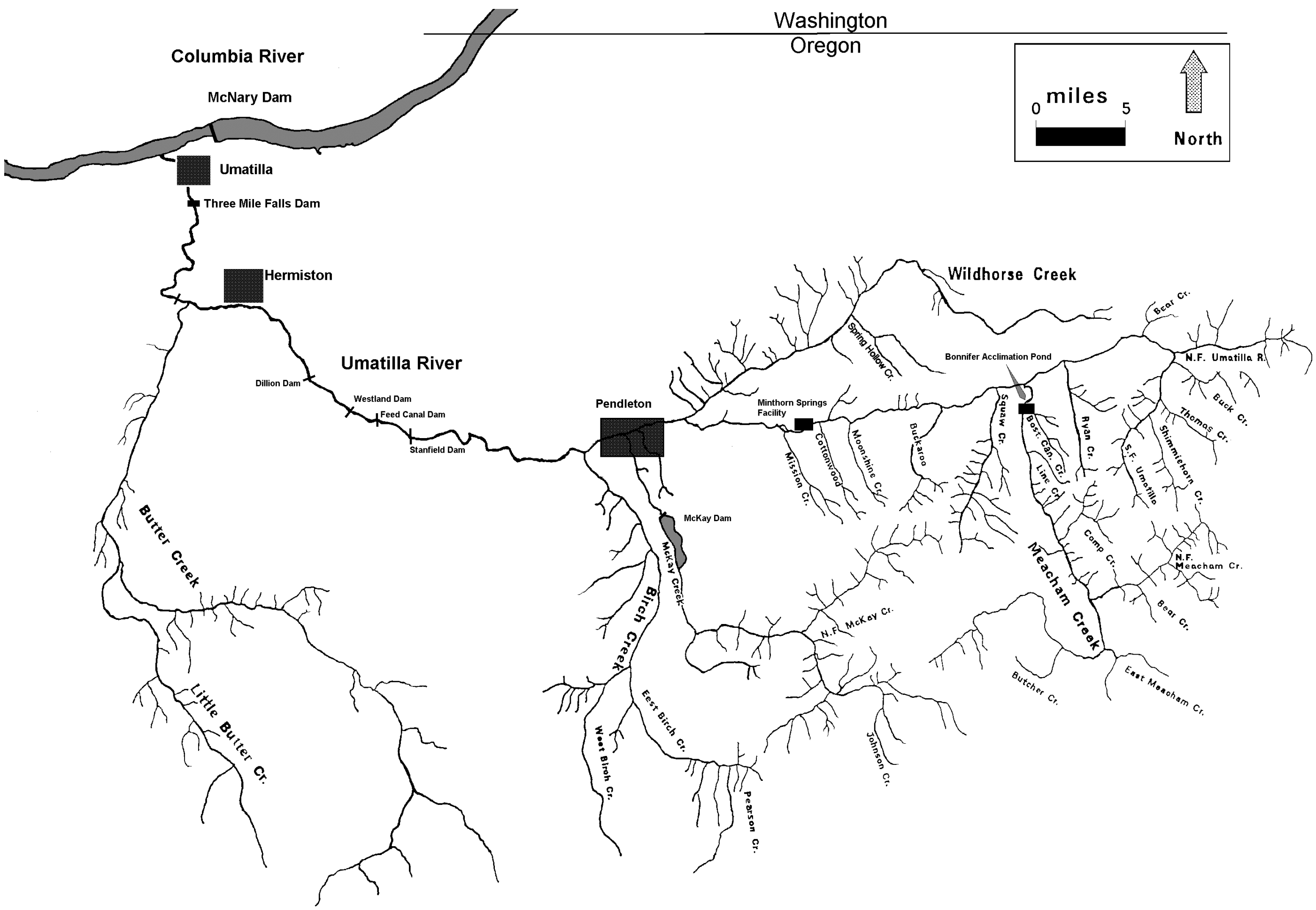

Figure 1. Map of Umatilla River Basin and related features

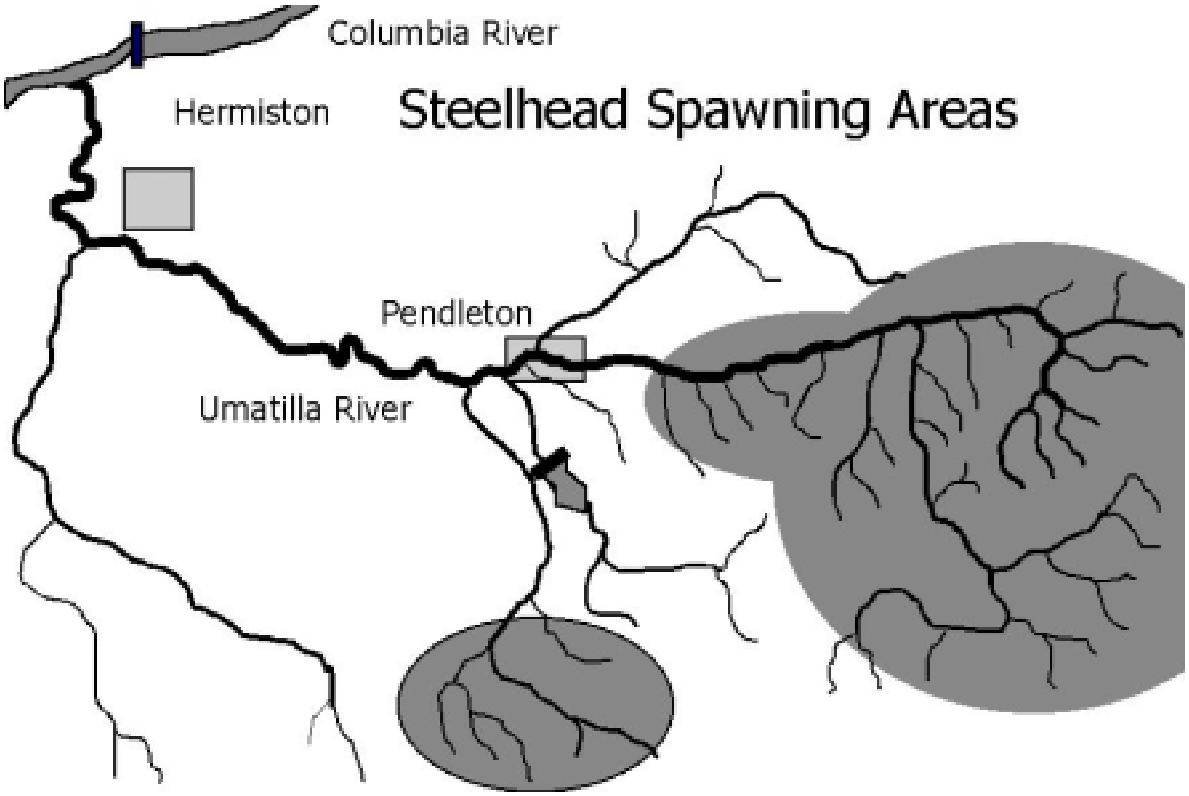

Figure 2. Map of Umatilla River Basin and natural steelhead spawning areas.

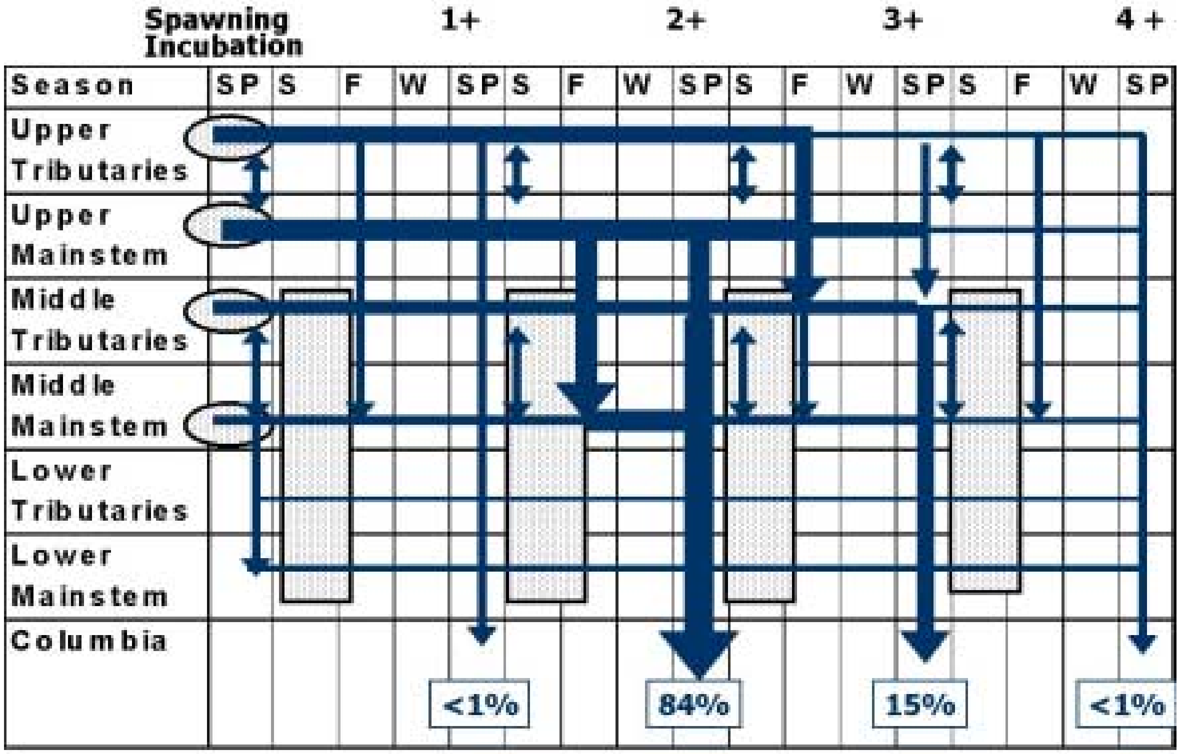

Figure 3. Life history schematic for steelhead in the Umatilla River. Ovals represent risk to redds from high sediment and/or scour. Shaded rectangles represent risk due to high water temperatures and low flows.

APPENDIX C: Umatilla Summer Steelhead Program Uncertainties

Uncertainty #1. The comparison of Oregon and Michigan rearing methods was identified as a high priority for study in the Hatchery Master Plan. Effects of rearing steelhead in Michigan raceways on survival, behavior, and life history are unknown. Water shortages have prevented the proposed side-by-side evaluation of Oregon versus Michigan rearing methods. However, reorganization of future production at the Irrigon-Umatilla Hatchery complex may allow this study to be conducted in the near future. A proposal to initiate this evaluation as soon as water supplies allow is being reviewed by managers. Funding is requested from BPA on an annual basis. Staff and logistical support are presently available to conduct this evaluation.

Uncertainty #2. Smolt-to-adult survival from the first four broods of Umatilla steelhead indicate survival of the late-released group from Bonifer was only 16% of the survival achieved by the early released groups. It is unclear if the costs of this program return a net benefit. Hatchery steelhead smolts that residualize and become resident fish are much larger than wild juvenile steelhead of the same age, and compete with wild juvenile redband trout and steelhead, other resident and anadromous salmonids, and non-game fish for limited summer rearing habitat. Managers are implementing an earlier release time at Minthorn next spring (FY 2000) for the late release group to improve survival and reduce residualism. Preliminary information gathering will be initiated with PIT-tag studies. Funding is requested from BPA on an annual basis. Staff and logistical support are presently available to conduct this evaluation.

Uncertainty #3. Natures rearing techniques are currently being explored at several hatcheries in the Pacific Northwest. If the results of current studies show significant increases in smolt to adult survival rates, "natures" rearing may be examined in detail in the Umatilla program.

Uncertainty #4. It is assumed that hatchery reared endemic steelhead released upstream to spawn naturally provide a substantial contribution to natural production. This assumption has never been tested. Proposals to examine this question in detail have not been developed sufficiently to obtain support by managers or funding by BPA.

Uncertainty #5. It is assumed that the hatchery supplementation program will not adversely change the natural progression of genetic variation and maintenance of genetic characteristics of the Umatilla Basin steelhead population. This assumption has never been examined. Proposals to examine this question in detail have not been developed sufficiently to obtain support by managers or funding by BPA.

Uncertainty #6. It remains uncertain if the negative impacts of human development in the Columbia River Basin will be addressed by society to the extent that natural salmonids will persist. Currently, political and corporate influences often prevent public agencies from properly addressing clear and blatant factors jeopardizing Columbia Basin salmonid

APPENDIX D: Objectives of Monitoring and Evaluation Projects

1. **Hatchery Monitoring and Evaluation (BPA Project 90-005, including Fish Health Monitoring and Evaluation)**

   Objective 1. Determine and compare smolt-to-adult survival, life history characteristics, and cost effectiveness of subyearling fall Chinook salmon reared in Michigan and Oregon raceways.

Objective 2. Determine and compare rearing performance, smolt condition, juvenile migration performance, smolt-to-adult survival, life history characteristics, and cost effectiveness of subyearling fall Chinook salmon reared at three densities in Michigan raceways.

Objective 3. Determine and compare effects of release size on smolt condition and juvenile migration performance of subyearling fall Chinook salmon.

Objective 4. Determine and compare rearing performance, smolt condition, juvenile migration performance, smolt-to-adult survival, life history characteristics, and cost effectiveness of yearling fall Chinook salmon reared in Michigan and Oregon raceways at Umatilla, Bonneville, and Little White Salmon hatcheries.

Objective 5. Determine and compare straying of fall Chinook salmon into the Snake and upper Columbia rivers for all groups.

Objective 6. Determine and compare smolt-to-adult survival, life history characteristics, and cost effectiveness of spring Chinook salmon reared in Michigan and Oregon raceways and released in the fall. Compare survival of spring Chinook salmon reared at Umatilla and Bonneville hatcheries and released in the fall.

Objective 7. Determine and compare rearing performance, smolt condition, juvenile migration performance, smolt-to-adult survival, life history characteristics, and cost effectiveness of yearling spring Chinook salmon reared in Michigan and Oregon raceways at Umatilla Hatchery.

Objective 8 . Determine and compare smolt condition, smolt migration performance, smolt-to-adult survival, and life history characteristics between spring Chinook salmon reared as yearling smolts at Umatilla, Bonneville, Carson and Little White Salmon hatcheries.

Objective 9. Monitor rearing performance, smolt condition, juvenile migration performance, smolt-to-adult survival, life history characteristics, and cost effectiveness of summer steelhead reared in Michigan raceways.

Objective 10. Monitor water quality in an index series of Michigan and Oregon raceways.

Objective 11 . Coordinate in the development of a water quality sampling and monitoring program in the Umatilla basin.

Objective 12. Determine annual recreational fishery for Chinook salmon and steelhead in the Umatilla River including estimates of catch by tag code. Maximize coded-wire tag recovery by monitoring catch from local fisheries.

Objective 13. Participate in planning and coordination activities associated with anadromous fish production and monitoring and evaluation in the Umatilla basin.
Fish Health Monitoring and Evaluation

Objective 14. Complete an annual report of progress that summarizes results of work conducted.

2. Fish Health Monitoring and Evaluation Project (BPA Project 90-005)

Objective 1. Monitor and evaluate the health and disease status of spring and fall Chinook salmon and summer steelhead juveniles reared at Umatilla Hatchery, of adult broodstocks providing gametes for the Umatilla program, and, as possible, of marked adults with coded-wire tags and reared as juveniles at Umatilla or other hatcheries providing fish for the Umatilla basin.

Objective 2. Complete an annual report of progress that summarizes results of work conducted.

3. Umatilla Hatchery Satellite Facilities Operation and Maintenance (BPA Project 83-435)

Objective 1. Hold groups of juvenile salmonids at Minthorn, Bonifer, Thornhollow and Imeques C-mem-ini-kem acclimation facilities prior to release into the Umatilla River Basin.

Objective 2. Determine general trends in juvenile outmigration timing.

Objective 3. Provide summer steelhead, spring and fall Chinook and coho salmon eggs to the Oregon Department of Fish and Wildlife for rearing and later release in the Umatilla River Basin.

Objective 4. Determine survival, contribution to ocean and Columbia River fisheries and escapement to the Umatilla River and other terminal areas of all coded-wire tagged groups released in the Umatilla River Basin.

Objective 5. Maintain the facilities in good working order.

Objective 6. Participate in planning process for new Umatilla Hatchery satellite facilities.

Objective 7. Disseminate information associated with the completion of above tasks.

4. The Evaluation of Juvenile Fish Bypass and Adult Fish Passage Facilities at Water Diversions on the Umatilla River (Past BPA Project # 89-024-01)

Objective 1. Determine facility-caused injury to juvenile fish at passage facilities.

Objective 2. Determine rate of travel and recapture of juvenile salmonids at passage facilities.

Objective 3. Determine screen efficiency (leakage) and impingement (rollover).

Objective 4. Measure water velocities at screening locations.

Objective 5. Evaluate adult passage past major diversion dams on the Umatilla River.

Objective 6. Evaluate effectiveness of west-bank passage facility operations at Three Mile Falls Dam.

Objective 7. Determine migrational timing and required flows for homing to the Umatilla River.

5. Lower Umatilla River Outmigration and Survival Evaluation Project (BPA Project #89-024-01)

Objective 1. Use PIT-tag technology to monitor tagged juvenile salmonids from the basin; conduct trap efficiency tests with tagged fish.

Objective 2. Determine migration performance and pattern, migrant abundance, and survival of PIT-tagged hatchery fish.

Objective 3. Conduct reach-specific survival studies with tagged hatchery salmonids; determine survival of transported tagged fish.

Objective 4. Determine migration patterns, life history characteristics, migrant abundance, and survival of PIT-tagged natural fish.

Objective 5. Determine species composition condition, and total count of collected fish at Westland Canal.

Objective 6. Investigate relationships between river flow, temperature, turbidity, and canal diversion with migration parameters of hatchery and natural fish.

Objective 7. Assist with Pacific lamprey monitoring and research.

Objective 8. Participate in planning and coordination activities in the basin.

6. The Umatilla River Passage Operations Program (BPA Project #88-022)

Objective 1. To increase the survival of migrating juvenile and adult salmon and steelhead in the Umatilla River.

7. The Umatilla Basin Natural Production Monitoring and Evaluation (BPA Project #90-005-01)

Objective 1. Estimate abundance and densities of juvenile salmonids in index sites and selected stream reaches of the Umatilla River Basin.

Objective 2. Collect and PIT tag natural juvenile Chinook and steelhead in the Umatilla River Basin for detection at John Day Dam. Estimate minimum survival and timing of outmigrants from the upper Umatilla River to John Day Dam.

Objective 3. Determine natural spawning success, spawning habitat utilization, prespawning mortality, and redds per adult spring Chinook salmon passed above Three Mile Falls Dam. Determine, if possible, spawning distribution, success and timing of steelhead, fall Chinook salmon and coho salmon.

Objective 4. Estimate tribal harvest of adult salmon and steelhead returning to the Umatilla River Basin.

Objective 5. Monitor stream temperatures in coordination with other projects and agencies in the Umatilla River Basin.

Objective 6. Determine age and growth characteristics of natural anadromous salmonids in the Umatilla River Basin.