Draft

Elochoman River Subbasin Summary

May 17, 2002

Prepared for the
Northwest Power Planning Council

Subbasin Team Leader
Ron Roler, WDFW

Contributors (in alphabetical order):
Jim Byrne, WDFW
Wolf Dammers, WDFW
Stacie Kelsey, WDFW
Mike Kohn, BPA, Cowlitz Falls Project
Charles Morrill, WDFW
John Serl, WDFW
Gary Wade, Lower Columbia Fish Recovery Board
John Weinheimer, WDFW

Elochoman Subbasin Summary

Table of Contents

List of Figures

List of Tables

Elochoman River Subbasin Summary

Subbasin Description

General Description

Subbasin Location

The headwaters of the Elochoman River lie in the Willapa Hills in southwest Lewis County and northeast Cowlitz County. The river flows southwesterly into Wahkiakum County to join the Columbia River at River Mile (RM) 38, just downstream from the town of Cathlamet, Washington, encompassing a drainage area of 73.3 square miles. (See Figure 1.)

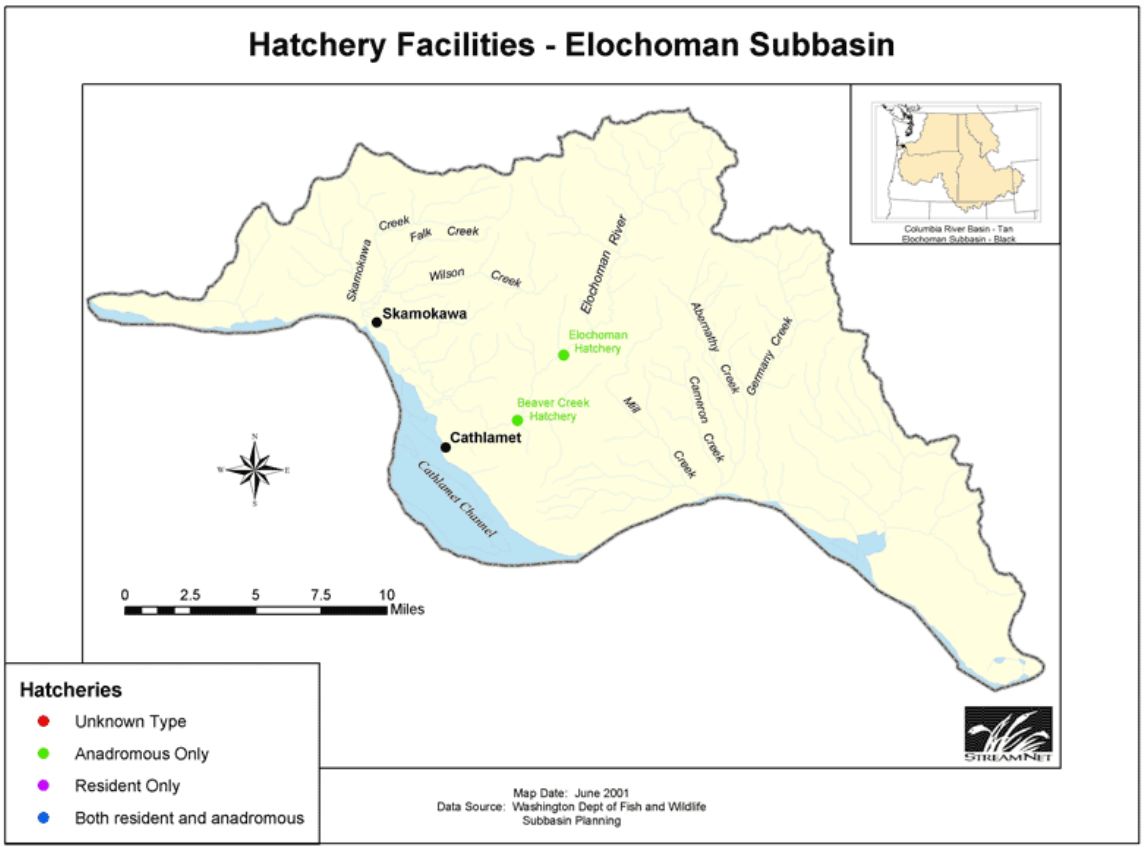

Figure 1. Elochoman River Subbasin.

Drainage Area

The headwaters of the Elochoman River lie in the Willapa Hills in southwest Lewis County and northeast Cowlitz County. The river flows southwesterly into Wahkiakum County to join the Columbia River at River Mile (RM) 38, just downstream from the town of Cathlamet, Washington, encompassing a drainage area of 73.3 square miles.

Climate

The climate in the basin is similar to much of western Washington. The marine air influence from the Pacific Ocean moderates the seasons, making the winters wet but mild and the summers cool but relatively dry. Rainfall averages between 80 inches to 100 inches a year, most of it falling in the rainy season between October and March.

Topography

The Elochoman River is characterized by the rugged area of the Willapa Hills, which occupy a major portion of the subbasin along with, the valley plains along the Columbia River.

Geology

Geology greatly influences the development of soils, slope stability, and dictates the competence of the rock that becomes the typical substrate for the streams within a watershed. The geology in the Elochoman River subbasin is a mix of sedimentary and volcanics.

Hydrology

The streamflow originates almost entirely from the rainfall in the region. Average streamflow over a 31-year period (1940-1971) was 375 cubic feet per second (cfs) with wide extremes between a maximum flow of 8,530 cfs in November 1962 to a minimum of 9.8 cfs in August 1967. (Gauge records after 1971 are not continuous and the U.S. Geological Survey gauge station was discontinued in 1977.). In 1977 measured flow ranged from 19 cfs to 1,060 cfs for the year.

Soils

The “Ocasta” soil association consists of soils along coastal bays in the area. These are very deep, poorly drained soils formed in alluvium deposited in Coastal Bays. Ditching, tiling, and pumping practices have altered soil drainage. The surface is covered with a mat of sedge and grass leaves. The surface layer is silty clay loam. The underlying material to a depth of 60 inches or more is silty clay and clay. This soil is used mainly for hay, pasture, and crops and as habitat for open land and wetland wildlife. It is poorly suited to home site development or as woodland. The main limitation is the high water table.

The Grehalem-Rennie soil association consists of soils along drainageways throughout the area. The well-drained Grehalem soil formed in alluvium derived dominantly from basic

igneous and sedimentary rock. The surface layer is silt loam. The underlying material to a depth of 60 inches or more is mainly silty clay loam. The poorly drained Rennie soils are in depression areas. They formed in alluvium derived dominantly from basic igneous and sedimentary rock. The surface layer is silty clay loam. The subsoil and substratum to a depth of 60 inches or more are silty clay and clay. These soils are used for hay, pasture, crops, wildlife habitat, woodland, and home sites. If the soils are used for home site development, the main limitations are the hazard of flooding and a seasonal high water table.

The Lytell-Astoria soil association consists of soils on broad low ridges and uneven side slopes. The deep Lytell soils are on slumps on uplands. They formed in colluvium derived dominantly from marine siltstone and fine-grained sandstone. Slope is 8-90 percent. The surface layer is silt loam. The subsoil is silty clay loam over siltstone, which is at a depth of about 50 inches. The very deep Asotria soils are on uplands. They formed in residuum derived dominantly from siltstone. Slope is 3-65 percent. The surface layer is silt loam. The subsoil is to a depth of 60 inches or more and is silty clay. These soils are used mainly as woodland, wildlife habitat, and recreation areas. It is also used for hay, pasture, and rural home sites. If this unit is used for home site development, the main limitations are steepness of slope and the hazard of sliding.

The Zenker-Elochoman soil association consists of soils on sharp ridges and long slopes. The Zenker soils formed in colluvium derived from marine sandstone. Slope is 8-90 percent. The surface layer is silt loam. The subsoil is dominantly loam to a depth of 60 inches or more. The Elochoman soils are on uplands. They formed in residuum derived from sandstone. The surface layer is silt loam. The subsoil is also silt loam to a depth of 60 inches or more. These soils are used mainly as woodland, wildlife habitat, and recreation areas. It is also used for rural home sites. If this unit is used for home site development, the main limitations are steepness of slope and the hazard of sliding.

The Raught-Germany soil association consists of soils on uplands. The Raught soils are on shoulders and back slopes on uplands. Slope is 5-90 percent. The Germany soils are on plateaus, shoulders, and back slopes on uplands. Slope is 1-65 percent. These soils form in residuum and colluvium derived mainly from basic igneous rocks. The surface layer is silt loam and the subsoil is silt loam to a depth of 60 inches or more. These soils are used mainly as woodland and wildlife habitat. It is also used for hay, pasture, and rural home sites. If this unit is used for home site development, the main limitation is steepness of slope.

The Bunker-Knappton soil association consists of soils on side slopes on uplands. Bunker soils have slopes of 5-90 percent. Knappton soils have slope of 8-90 percent. The soils formed in colluvium derived mainly from basic igneous rocks. The Bunker soils surface layer is silt loam and the subsoil is gravelly silt loam. Basalt is at a depth of about 50 inches. The Knappton soils surface layer is silt loam. The subsoil is gravelly silty clay loam. Basalt is at a depth of about 43 inches. This unit is used as woodland and wildlife habitat. It is well suited as woodland.

The Lates-Murnen soil association consists of soils on mountains. The moderately deep Lates soil formed in residuum derived mainly from basic igneous rocks. Slope is 8-90 percent. The surface layer is silt loam and the subsoil is gravelly loam. Basalt is at a depth of 35 inches. The very deep Murnen soil formed in residuum derived mainly from basic igneous rocks. Slope

is 5-65 percent. The soils are silt loam to a depth of 60 inches or more. This unit is used as woodland and wildlife habitat. It is well suited as woodland.

Land Uses

Fishery surveys earlier this century recorded the widespread disturbance to stream habitat and riparian areas from logging. Logging in the area was conducted without regard for riparian or instream habitat. As a result, considerable erosion and silting caused damage to salmonid spawning and rearing habitat. Today second-and third-growth stands of fir, alder, and maple have grown back and the watershed is recovering, however long-term impacts of early logging appear to persist. Forestry is still the major land use on both private and state owned lands. Major timber companies own more than 50 percent of the land in the subbasin, while the Washington Department of Natural Resources owns and manages about 30 percent of the land. The remaining land is privately owned smaller tracts, many of them small farms and residences located along the lower river floodplain.

Impoundments and Irrigation Projects

Streamflow in the Elochoman River is directly dependent on rainfall and since there are no lakes, reservoirs, or impoundments in the system, effects of precipitation are immediate.

Protected Areas

There are no protected areas in the Elochoman River subbasin.

Fish and Wildlife Resources

Fish and Wildlife Status

Threatened and Endangered Species

Table 1 provides a listing of fisheries listed as threatened or endangered for effecting, which includes the Elochoman River WRIA 25 (NMFS 2001).

Table 1.Threatened or Endangered listing status of anadromous fish

Species	Listing Status	Date of Listing
Chinook Salmon	Threatened	March 24, 1999
Chum Salmon	Threatened	March 25, 1999
Coastal Cutthroat Trout	Proposed-Threatened	April 5, 1999
Coho Salmon	Proposed –Threatened	July 25, 1995
Steelhead	Threatened	March 19, 1998

In addition to fisheries listing, several species of plants and wildlife are identified as threatened or endangered species. Some sources for information regarding threatened and endangered

plants and animals include the federally listed species maintained by the United States Fish and Wildlife Service, priority species and habitats listing maintained by the Washington Department of Fish and Wildlife, and the Heritage database maintained by the Department of Natural Resources.

Fish

Fall chinook

The size of historical fall chinook runs in the Elochoman River is difficult to determine. At the time the first fisheries surveys were conducted in the 1940s, the natural stream habitat had been seriously damaged by logging practices. Records of initial surveys done for the Columbia River Fisheries Development Program in 1948 and 1949 document serious logjams, splash dams forming complete blockages, and logging-related landslides, siltation, and erosion. These impacts, coupled with harvest, limited natural production in this period.

In 1950, estimated annual escapement of fall chinook in the Elochoman River was 2,000 fish (WDF 1951). Today, the most heavily spawned area is in the main river above tidewater. A weir just above tidewater is used to collect fall chinook for the hatchery. When the hatchery has reached its egg-take goal, the remaining fish are allowed to proceed into the watershed and spawn naturally. On favorable flows they could go as high as the dam at the hatchery at RM 9.2.

Entry of adults into the subbasin occurs from early September to November. Natural escapement estimates for the Elochoman River has averaged 636 fish during 1987 through 2000 (Table 2). Spawning occurs from late September to mid-November with a peak usually in mid-October. Mark sampling on the spawning grounds indicates natural spawners are largely hatchery origin.

Table 2. Subbasin run size, catch and escapement for Elochoman River fall chinook, 1987-2000.

	Sport Catch		Natural Escapement		Hatchery Escapement		Total Return	
Year	Jacks	Adults	Jacks	Adults	Jacks	Adults	Jacks	Adults
1987	5	76	66	2,392	19	3,932	90	6,400
1988	172	281	14	1,356	42	4,705	228	6,342
1989	50	86	2	120	9	3,677	61	3,883
1990	27	32	38	136	13	1,500	78	1,668
1991	156	37	18	178	18	1,561	192	1,776
1992	5	45	0	190	22	947	27	1,182
1993	32	31	14	274	25	662	71	967
1994	0	0	18	688	29	1,566	47	2,254
1995	0	0	12	144	63	3,108	75	3,252
1996	9	189	25	508	12	4,825	46	5,522
1997	0	316	0	1,875	0	3,397	0	5,588
1998	0	0	8	220	0	1,440	8	1,660
1999	30	198	12	706	0	3,041	42	3,945
2000	5	120	75	121	9	1,763	89	2,004

Hatchery releases of tule fall chinook began in 1950 when 70,000 fingerlings were released. This supplementation continued until the Elochoman River Salmon Hatchery was constructed under the Lower Columbia River Fishery Development Program. Brood stock for these hatcheries was obtained from local stock or from transfers from other hatcheries. Spring Creek Hatchery fall chinook (Bonneville Pool Hatchery stock) have been the primary fall chinook stock transferred to lower river hatcheries. Straying of lower river hatchery (LRH) fall chinook from a number of Oregon and Washington hatcheries is not unusual, and contributes to natural production. The overall result of straying and transfers of fall chinook at lower Columbia River hatcheries is the development of a widely distributed, blended hatchery stock. Returns of adults to the hatchery have averaged 2,580 fish from 1987 through 2000 (Table 2). Juvenile releases in this same period are presented in Table 3

Columbia River fall chinook production (predominately from hatcheries) is a major contributor to the catches in Washington and Oregon ocean fisheries. Significant commercial net catch and recreational fishing occurs in the mainstem as well and minor catches are recorded in individual tributary streams. The overall approach to fall chinook production advanced in this subbasin plan works within the context of existing harvest management regimes utilizing both hatchery and natural production opportunities.

Table 3 Hatchery production of fall chinook at the Elochoman River hatchery, 1986-1999 brood years.

Brood Year	Number Released		
	Fry	Fingerling	Smolt
1986			3,486,600
1987		833,000	4,105,200
1988	2,182,000		4,371,000
1989			4,712,719
1990			4,386,500
1991			3,976,000
1992			4,605,200
1993			1,176,000
1994			4,452,800
1995			2,834,700
1996			3,241,061
1997			2,256,077
1998			1,206,100
1999		1,105,000	108,028

Coho

U.S. Fish and Wildlife Service surveys in 1936 and 1937 indicated coho were present in all accessible tributaries of the Elochoman River, but no population estimates were made. At this time portions of the watershed were being logged and splash dams, log and debris jams, and

logging through the streams was detrimental to fish production. Under the Columbia River Fisheries Development Program some of these problems were addressed on an ad hoc basis. Production was further expanded by removing natural and man-made barriers to migration. The precise distribution of coho in the watershed is unknown. Anecdotal information suggests coho spawn in most accessible tributaries. Escapement figures are not known since no directed surveys are done. The hatchery dam on the main river shunts all coho into the hatchery holding pond until the egg-take requirements are met, after which the ladder is opened to the river and fish are allowed to proceed upstream.

Early descriptions of coho runs in Columbia River tributaries suggest that time of return and spawning spanned a broad seasonal period in the same watershed, Today, hatchery stocks are generally referred to as early (Type S) and late (Type N). Type-S coho are distributed in a more southerly ocean area, and contribute to coastal Oregon fisheries more heavily than their more northerly distributed Type-N cohorts. It is possible that the timing of the stocks may be more an artifact of hatchery selection than a stock specific trait since early records from the Toutle River indicate a wide spawning timing for Type-S coho. Both stocks are probably represented on the spawning grounds in the Elochoman River today.

Type-S coho enter the Columbia River by mid-August and begin entering tributary streams in early September. Spawning activity peaks between October 20 and November 1. The only data collected on natural escapement has been incidental to directed fall chinook surveys and no estimates of annual escapements are available. Type-N coho pass through the lower Columbia in mid-October, entering tributary streams in November and spawning into late November and December. For purposes of this report and when natural run sizes were required for modeling, natura1 escapement has been assumed to be 10 percent of the hatchery return. Returns to the Elochoman Salmon Hatchery of both stocks are presented in Table 4 and Table 5.

Table 4. Return of early stock coho to the Elochoman River Hatchery, 1987-2000.

Year	Jacks	Adults
1987	0	0
1988	764	3,754
1989	586	0
1990	0	0
1991	56	7,313
1992	172	208
1993	59	1102
1994	38	2,914
1995	179	1,086
1996	0	1,253
1997	0	601
1998	969	19
1999	231	2,131
2000	1,798	6,851

Table 5. Returns of late stock coho to the Elochoman River Hatchery, 1987-2000.

Year	Jacks	Adults
1987	3,477	1,267
1988	2,127	2,766
1989	3,974	6,203
1990	2,413	7,963
1991	10	9,700
1992	105	1,589
1993	22	1,100
1994	38	829
1995	19	939
1996	0	0
1997	0	0
1998	860	567
1999	1,133	2,693
2000	1822	4,526

Both Type-S and Type-N stocks are reared at the Elochoman Salmon Hatchery. Biological data collected at the hatchery is assumed to be applicable to naturally produced fish since the magnitude of hatchery production, high regional harvest rates,
and the weirs have affected the status of natural production. Approximately 75 percent to 80 percent of the run returns as 3-year-olds for the Type-N and Type-S stocks, respectively. Fecundity of the Type-S stock (2,830 eggs per female) is slightly higher than the Type-N stock (2,670 eggs per female). Coho releases for both stocks are presented in Table 6and Table 7.

Table 6. Hatchery production of Elochoman River Type-S coho, 1986-1999 brood years.

Brood	**Number Released**		
Year	**Fry**	**Fingerling**	**Smolt**
1986			1,720,600
1987			
1988			475,700
1989			505,100
1990			630,600
1991		103,000	635,502
1992			593,300
1993			534,500
1994			468,300
1995			259,889
1996			476,836
1997			414,003
1998			263,500
1999			360,525

Table 7. Hatchery production of Elochoman River Type-N coho, 1986-1999 brood years.

Brood Year	Number Released Fry	Fingerling	Smolt
1986		1350,000	
1987			1,814,200
1988			1,144,481
1989		416,282	1,271,200
1990			737,400
1991			1,294,700
1992			1,540,400
1993			1,235,900
1994			1,320,200
1995			250,818
1996			964,095
1997			356,287
1998			1,091,525
1999			

The juvenile life history for subbasin coho is similar to that of other stocks in the region with a spring emergence, followed by a full year of freshwater residence prior to ocean migration the following spring. Subbasin natural production potential was estimated to be 43,393 smolts using the Smolt Density Model.

Elochoman River Hatchery is located on the Elochoman River, seven miles northwest of Cathlamet, Washington, on State Highway 407. The hatchery was built in 1954 with funds from the Columbia River Fishery Development Program and currently administered through the National Marine Fisheries Service.

The hatchery has 20 concrete raceways, two large rearing ponds (one asphalt and one dirt bottom), and a large dirt bottom adult holding pond that doubles as a juvenile rearing pond. Incubation facilities consist of concrete deep troughs, vertical incubators, and a few concrete shallow troughs. Water is supplied by gravity flow from two intakes on the Elochoman River -- one located upstream of the hatchery and one at the barrier dam. Additional incubation water is supplied by gravity flow from an intake on Clear Creek. Also, the large dirt bottom pond receives water from a small creek (Hatchery Creek) on the hatchery grounds. Adults are spawned without selectivity at a l:l ratio. In years where large returns of coho are present, the ratio can be l-to-3. These practices are consistent with the Salmon Culture Spawning Guidelines and the Salmon Culture Genetics Policy.

Chum

Chum salmon are native to the Elochoman River. Although natural production is much reduced over historic levels, a small remnant run still returns to spawn. Washington Department of Fisheries reports for the Lower Columbia River Fishery Development Program in 1951 estimated chum escapement in the Elochoman River to be about 1,000 fish, spawning mainly in the lower reaches of the main river above tidal influence. This was in the period when Columbia River

chum stocks declined precipitously. In 1973, the Washington Department of Fisheries reported a small run to the river.

Directed spawning ground surveys are not conducted in the Elochoman River for chum and no estimates are available on current run size or biological characteristics of the stock. Similar data for Grays River chum should be applicable. Adults migrate into the river from mid-October through November with peak spawner abundance occurring in late November. Scale analysis indicates 3- and 4-year-old fish are the dominant age classes. A few fish return as 5-year-olds, but none as 2-year-old jacks. Males predominate in the 5-year-old class.

Recent stream enhancement work by the Washington Department of Fisheries in the Grays River watershed at Gorley Springs has been relatively successful and may increase basin chum production by providing a stable incubation environment. The same kind of project could support rebuilding the Elochoman River chum stock. It is expected that suitable sites are available for such projects.

Occasional releases of chum fry have been made in the basin. Egg-box programs in 1978, 1979 and 1980 released 50,000, 376,000 and 475,000 fry (Hood Canal stock), respectively. The present low numbers of chum in the Columbia River made it necessary to use stock from outside the area. No spawning ground surveys were conducted in subsequent years to determine the success of these releases.

The Elochoman River Salmon Hatchery does not raise chum and planners anticipate that any future supplementation of the run would be through the use of portable egg incubators and direct release of emergent fry or short-term rearing (up to one month) in portable raceways and on-site release of the fed fry.

Summer Steelhead

No historical records of natural production exist for this stock in the Elochoman River. Prior to 1983, summer steelhead in the Elochoman River were hatchery strays. Hatchery releases of summer steelhead began in the Elochoman in 1982. An average of 21,000 fish have been planted annually (Table 8).

Table 8. Releases of hatchery summer steelhead in the Elochoman River, 1990-1998.

Release Year	Number Released
1990	9,881
1991	22,474
1992	24,000
1993	23,760
1994	14,315
1995	0
1996	0
1997	0
1998	24,314
1999	28,139

Winter Steelhead

Historic winter steelhead distribution occurred throughout the mainstem above tidal areas and in accessible tributary streams. The river has good spawning areas above the first five kilometers and in the lower parts of most tributaries. Logging-related habitat problems reduced productivity of the watershed.

Howell et al. (1985) reported that the wild stock enters the river from January to May, with the peak occurring in March. Heavy fishing pressure directed at hatchery origin adults, which return in December and January may have eliminated the earlier returning segment of the wild run.

Estimates for total run size are somewhat lacking, however, Watson (1964) provided estimates for the area above the weir for run year 1962-1963 and to the mouth of the river for run year 1963-1964 based on creel and trapping operations -- 2,947 fish and 2,537 fish, respectively. For run year 1963-1964, Watson calculated the run size above the weir to be 2,259 fish, slightly lower than the previous year's estimate. Lavier (1970) cites total returns of 3,410 and 3,588 fish for the same run years as Watson. A rough estimate of average total run size (7,850 fish) was made for 1963 through 1967 based on an average spawning escapement estimate for those years (5,200 fish) and an average harvest for those years (2,650 fish). These numbers include both hatchery and wild fish.

Adult winter steelhead spawn between February and June, peaking in April and May. Wild steelhead spawn throughout the mainstem Elochoman, the East, North, and West forks, and in the lower reaches of Beaver Creek between March and-June (Howell et al. 1985). The majority of wild smolts migrate in April and May, peaking in early May at an age of 2 years and a size of 160 mm (Howell et al. 1985). The Beaver Creek juvenile trap began operation in 1961 and has operated on an annual basis since. Trapping data suggests that fish are emigrating throughout the year, but that the majority move out beginning in March, peaking during April and May. Lucas (pers. commun.) indicates return rates of hatchery smolts planted since 1979 have averaged 2.8 percent return rate to the creel.

Two hatcheries are located within the Elochoman Subbasin -- the Beaver Creek Hatchery (steelhead and cutthroat) and the Elochoman Salmon Hatchery (coho and fall chinook). Beaver Creek Hatchery is located on-Beaver Creek several hundred yards upstream from its confluence with the mainstem Elochoman River.

The winter steelhead stock used at Beaver Creek Hatchery was originally from Chambers Creek. The stock was developed during the 1940s from predominantly native Chambers Creek steelhead. The adult return timing of this stock is from mid-November through February, with a strong peak in December and early January. Fecundity of the average size female that has spent two years in the ocean is 4,060 eggs per female (Randolph 1986). Hatchery releases of winter steelhead into the Elochoman River are presented in Table 9.

Table 9. Releases of hatchery winter steelhead smolts in the Elochoman River, 1990-2001.

Release Year	Number Released
1990	91,394
1991	114,919
1992	101,745
1993	97,200
1994	112,955
1995	0
1996	7,100
1997	0
1998	0
1999	81,409
2000	114,215
2001	82,450

Wildlife

A great number of bird species are associated with or require riparian habitats along the Columbia River and its tributaries. As a subset of this guild, the neotropical migrants (e.g., willow flycatcher, yellow warbler, yellow-breasted chat, red-eyed vireo, Vaux's swift) continually exhibit declining population trends in this region. Lewis' woodpeckers are closely associated with large cottonwoods stands. Historically, they were common in cottonwood habitats of the Columbia River but declines were noted after 1965 and they are now considered absent from Columbia River riparian habitat. The yellow-billed cuckoo is a riparian obligate species that was once found along the Columbia River but has not been confirmed breeding in Washington for more than twenty years. Other species that are marsh obligates include the Virginia rail, sora rail and marsh wren. Loss of riparian-marsh habitat for these birds resulted from the inundation and alteration of habitats in the Columbia River mainstem and tributaries. (Dobler, 2001, personal communication).

Riparian habitats cover a relatively small area yet support approximately 90 percent of Washington's fish and wildlife species. Riparian areas in Washington provide essential food, cover, and water, as well as essential breeding habitat during all times of the year. Riparian areas have moist and mild microclimates that moderate seasonal temperature extremes. Riparian areas provide critical habitat for unique and obligate species, and provide physical features that enhance nearby upland habitats for wildlife. Riparian habitats are essential to healthy, productive aquatic systems and to native fish that inhabit them. Unlike most habitat types, intact riparian habitat can offer natural habitat connections and movement corridors, enabling wildlife to persist in fragmented landscapes.

Riparian habitats support abundant and diverse fish and wildlife populations, offer habitat connectivity across the landscape, and play a vital role in maintaining aquatic systems. To

sustain the long-term productivity of fish and wildlife resources, riparian habitats in good condition must be preserved and those in degraded condition must be restored to a healthy productive state. Protection efforts for riparian habitat--compared to other habitats--may yield the greatest gains for fish and wildlife

Overwhelming evidence exists to support the retention and restricted use of riparian habitat in order to maintain healthy, productive fish and wildlife habitat (DNR-FEIS, 1996). Desired future conditions (DFC's) for riparian habitat widths in the Elochoman River watershed are found within WDFW's "Management Recommendations for Washington's Priority Habitats: Riparian (WDFW 1997)". These recommendations are based on an extensive survey and synthesis of the scientific literature (over 400 citations), and present the minimum standards generally needed to retain riparian habitat, protect associated wildlife, buffer streams for fish and other aquatic life, and retain hydrological functions.

Habitat Areas and Quality

Prior to any active state or federal regulation of forest practices, significant damage was done to the Elochoman's fisheries resources. Indiscriminate logging through streams, the use of splash dams to transport logs, and poor road construction and associated siltation problems reduced or eliminated anadromous fish from many streams. Other kinds of problems, more typically destruction of riparian vegetation, land reclamation and non-point source pollution was caused by agriculture development. Today, numerous laws limit many major impacts, but the cumulative loss of habitat continues.

Current land-use patterns are very similar to historical ones. The floodplain or the main river was developed for agriculture with associated single-family residential. The timbered slopes continue to be logged and used for sustained forest production.

Watershed Assessment

In 1990, the Columbia Basin System Planning Salmon and Steelhead Production Plan was developed to identify options and strategies for increasing steelhead and salmon production in the Columbia River basin (WDFW 1990). The Elochoman River subbasin plan was one of 31 developed under the Columbia Basin Fish and Wildlife Authority. This plan documented the existing and potential production for winter and summer steelhead, spring and fall chinook, and coho salmon, summarized current management goals and objectives, documented existing management efforts, identified problems and opportunities associated with increasing steelhead and salmon production, and presented preferred and alternative management strategies.

The Washington Conservation Commission is working on completing a watershed assessment of the salmon and steelhead habitat limiting factors in WRIA 25, which includes the Elochoman River subbasin (Wade 2001). Channel conditions, passage, water quality, and water quantity were evaluated and projects were ranked based on WCC criteria. The purpose of the report is to provide a habitat impediment inventory in a form and manner that assists local citizen groups in developing functional habitat protection and restoration projects.

Limiting Factors

Section 10 of Engrossed Substitute House Bill 2496 (Salmon Recovery Act of 1998), directs the Washington State Conservation Commission, in consultation with local government and treaty tribes to invite private, federal, state, tribal, and local government personnel with appropriate expertise to convene as a Technical Advisory Group (TAG). The purpose of the TAG is to identify habitat- limiting factors for salmonids. Limiting factors are defined as "conditions that limit the ability of habitat to fully sustain populations of salmon, including all species of the family Salmonidae." The bill further clarifies the definition by stating "These factors are primarily fish passage barriers and degraded estuarine areas, riparian corridors, stream channels, and wetlands." It is important to note that the responsibilities given to the Conservation Commission in ESHB 2496 do not constitute a full limiting factors analysis.

These limiting-factors reports are based on a combination of existing watershed studies and knowledge of the TAG participants. WRIA 25 is located in Southwest Washington within portions of Lewis, Cowlitz, and Pacific counties. This area encompasses numerous tributaries to the Columbia River including the Elochoman River.

The major habitat limiting factors common to most streams within the Elochoman River subbasin included:

Access: Fish passage improvement projects continue to be implemented in the subbasin. Several locations were identified that need further assessment including natural barriers and limitations that they may pose to natural fish distribution and habitat utilization.

- Floodplain Connectivity: Floodplain connectivity and access to off channel habitat and floodplain habitat has been affected by management practices including diking, channel hardening and the historic practice of splash damming.
- Side Channel Availability: Similar practices that have affected floodplain connectivity have affected the availability of side channels. A combination of limiting factors has resulted in an overall reduction in channel complexity. Most of the streams in the subbasin can be characterized as having a single thread channel.

Bank Erosion / Stability: Stream surveys identified several areas of active bank erosion considered a concern. These areas are typically associated with alluvial soil with little or no riparian vegetation. Although data was not readily available to assess bank stability, TAG members identified several areas within the Elochoman River subbasin where bank stability is a concern.

- Riparian conditions: Riparian conditions are considered poor within the subbasin. Loss of riparian function affects water quality, erosion rates, streambank stability, and instream habitat conditions.
- Large Woody Debris: Almost throughout the Elochoman River subbasin, LWD abundance was below habitat standards. Adequate large woody debris in streams, particularly larger key pieces, is critical to developing pools, collecting spawning gravels, and providing habitat diversity and cover for salmonids.
- Pool Frequency: Although isolated areas were identified where pool frequency rated "Fair" to Good", pool frequency was below habitat standards almost throughout the subbasin.

- Water quality: Elevated stream temperatures are a concern for rearing salmonids and resident fisheries during summer months. With the onset of fall freshets, water temperatures appear to quickly return to levels satisfying spawning water quality criteria.
- Water quantity was also identified as a limiting factor in several of the watersheds in the subbasin, according to evaluation criteria.

First limiting factor

Access

Several culvert sites were identified that require further assessment to determine the degree of fish passage impairment. Wahkiakum Conservation District is in the process of collecting information on public culverts in the subbasin. Forest industry representatives indicated that they are in the process of evaluating road and culvert condition to satisfy forest practices requirements. Low flow was identified as a concern for the Elochoman River between the Beaver Creek hatchery upstream to the West Fork Elochoman.

Second limiting factor

Floodplain Connectivity / Side Channel Availability

Most of the streams within the subbasin have been divorced from their floodplains and development of side channel habitats discouraged by several management practices particularly in the lower reaches of the watersheds. Practices include flood control measures, bank hardening, and channelization and draining to improve agriculture and splash damming. Surveys conducted by the Conservation District indicate that the side channel habitat available is typically short lengths that are highly transient in nature.

Third limiting factor

Bank Erosion / Bank Stability

Bank erosion concerns are closely tied to areas characterized as alluvial deposits with little or no woody vegetation. Bank stability is a concern in the West Fork Elochoman and North Fork Elochoman due to mass wasting.

Fourth limiting factor

Fine Sediment

Department of Natural Resources North Elochoman Watershed Analysis identified shallow rapid landslides associated with forest practices and roads as concerns for delivery of fine sediment to the stream system.

Fifth limiting factor

Riparian Condition

Although isolated areas considered as “Fair” or “Good” conditions exist, riparian condition is considered “Poor” throughout the subbasin.

Sixth limiting factor

Large Woody Debris

Although isolated areas considered as "Fair" or "Good" conditions exist, the presence or large woody debris is considered "Poor" throughout the subbasin.

Seventh limiting factor

Pool Frequency

Although isolated areas considered as "Fair" or "Good" conditions exist, pool frequency is considered "Poor" throughout the subbasin. In general, areas of Fair or Good rating for LWD tend to correspond with areas of Fair or Good pool frequency in the upper watershed and tributary streams.

Eighth limiting factor

Water Quality

Stream temperature is a concern for rearing juveniles and resident fish. Elevated stream temperature may also affect migrating fish in the early fall. Fall freshets tend to rapidly cool stream temperature to current guidelines for spawning salmonids.

Ninth limiting factor

Water Quantity

Low flows were identified as a concern in the section of the Elochoman River from the Beaver Creek hatchery upstream to the West Fork Elochoman River. Hydrologic maturity of forest cover is a surrogate measure for whether peak flows have been potentially impaired in a watershed. Analysis of conditions in the subbasin indicates that a majority of the subbasin has been impaired hydrologically. Conditions in the North Fork Elochoman River warranted a "likely impaired" designation.

Existing and Past Efforts

Summary of Past Efforts

Management activities on the Elochoman River system have occurred over many years. Recent major emphasis has focused on the Salmon and Steelhead Initiative, SAFE program, Limiting Factors Analysis, and the Steelhead Habitat Inventory Assessment Program (SSHIAP) which document barriers to fish passage.

Bonneville Power has funded a series of projects in this basin in the past. They are presented in Table 10.

Table 10. Previous projects funded by Bonneville Power Administration.

Project	Program Category	Project Focus 1	Project Focus 2	Primary Agency
CODED-WIRE TAG RECOVERY	(A)	Monitoring / Baseline	Adult Mainstem Passage	PACIFIC STATES MARINE FISH COM
SURVEY OF ARTIFICIAL SALMON PRODUCTION FACILITIES	(A)	Monitoring / Baseline	Baseline / Feasibility Efforts	US SMALL BUSINESS ADMIN.
ANADROMOUS FISH HEALTH MONITORING IN WASHINGTON	(A)	Research / Evaluation	Fish Health	WASHINGTON DEPT. of WILDLIFE
ANADROMOUS FISH HEALTH MONITORING (WDF)	(A)	Research / Evaluation	Fish Health	WASHINGTON DEPT of FISHERIES
ANN CD WIRE TAG PROG-MISSING PROD WASHINGTON HATCH	(A)	Monitoring / Baseline	Program Outcome / Impacts	WASHINGTON DEPT of FISHERIES
FISH PASSAGE EVALUATIONS - LOWER COLUMBIA RIVER	(A)	Research / Evaluation	Adult Mainstem Passage	COE (PORTLAND DISTRICT)
AUDIT COLUMBIA BASIN ANADROMOUS HATCHERIES	(A)	Monitoring / Baseline	Facility Design / Construction	MONTGOMERY WATSON

Present Subbasin Management

Existing Management

A number of state, federal and local laws address the protection of fish and wildlife habitats in the Elochoman River Watershed. These include the Forest Practices Act, Endangered Species Act, the Shoreline Management Act, State Hydraulic Code, the Growth Management Act, and various Wahkiakum County ordinances.

Federal Government

First agency

National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) administers the Endangered Species Act (ESA) for anadromous fish. NMFS reviews and comments on activities that affect fishery resources and

develop recovery plans for listed species in the Subbasin. Under the ESA's 4(d)rule, "take" of listed species is prohibited and permits are required for handling. Biological Opinions, recovery plans, and habitat conservation plans for federally listed fish and aquatic species help target and identify appropriate watershed protection and restoration measures.

Federal Caucus All-H Paper (2000). This document provides a framework for basin-wide salmon recovery and identifies strategies for harvest management, hatchery reform, habitat restoration, and hydropower system operations.

FCRPS BiOp (2000). This is a biological opinion written by NMFS and the Fish and Wildlife Service regarding the operation of the federal hydropower system on the Columbia River, and fulfills consultation requirements with the US Army Corps of Engineers, the Bureau of Reclamation, and the Bonneville Power Administration under Section 7 of the ESA. This recent BiOp also concluded that off-site mitigation in tributaries is necessary to continue to operate the hydropower system.

United States Fish and Wildlife Service

Coastal cutthroat are proposed for a "threatened" listing, and since these are considered as non-anadromous fish they are in the process of being evaluated by the United States Fish and Wildlife Service.

Bonneville Power Authority

The Bonneville Power Authority wholesales hydroelectric power throughout the West. It also provides funding to deal with impacts of the Columbia River Hydrosystem on fish and wildlife.

Tribes

Cowlitz Indian Nation

The Cowlitz tribe has recently been granted tribal status from the Federal Government.

State

Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife manages fish and wildlife resources in the subbasin. Fall chinook salmon, chum salmon, and steelhead are listed as "threatened" and coho salmon are listed as a candidate species under the ESA. WDFW management attempts to protect these fish and provide harvest opportunity on hatchery fish through the Fish Management and Evaluation Plan.

The objectives of the Washington Department of Fish and Wildlife's (WDFW) Fish Management and Evaluation Plans (FMEP) are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus

production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997a). In addition, fisheries will be managed to insure adult size, timing, distribution of the migration and spawning populations, and age at maturity are the same between fished and unfished populations. By following this policy, fisheries' impacts to listed steelhead, chinook salmon, and chum salmon in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species and not at rates that jeopardize their survival or recovery. The full text of the Fish Management and Evaluation Plan appears in Appendix C.

The Washington Department of Fish and Wildlife also administers the Washington State Hydraulic Code (RCW 75). This law requires that anyone wishing to use, divert, obstruct, or change the natural flow or bed of any waters of the state to first secure a Hydraulic Project Approval (HPA) from WDFW, so that potential harm to fish and fish habitat can be avoided or corrected.

WDFW is presently conducting or has conducted habitat inventories within the subbasin. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP) which document barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Washington SRF Board

The Salmon Recovery Funding Board's mission is to support salmon recovery by funding habitat protection and restoration projects, and related programs and activities that produce sustainable and measurable benefit for the fish and their habitat.

Joint Natural Resources Cabinet

In May 1997, Governor Gary Locke and thirteen agency heads signed a memorandum of agreement to establish a forum to serve as the ". . . formal and ongoing institutional framework to promote interagency communication, coordination, and policy direction on environmental and natural resource issues. This forum was named the Joint Natural Resources Cabinet (JNRC or Joint Cabinet) and is chaired by Curt Smitch, the Governor's Special Assistant for Natural Resources.

Government Council on Natural Resources

As a way to bring together a wider forum to assist with the review and development of the three-part effort to recover salmon, which includes the Statewide Salmon Recovery Strategy, state and federal budget proposals, and a comprehensive legislative package, the Government Council on Natural Resources (GCNR or Government Council) was developed. This group includes representation from JNRC, the Legislature, tribes, cities, counties, federal government, and ports.

Governors Salmon Recovery Office

To assist the Joint Cabinet and Government Council in accomplishing their mission, the Governor's Salmon Recovery Office was established by the Legislature through the Salmon Recovery Planning Act (Engrossed Substitute House Bill 2496). The Salmon office's role is to coordinate and produce a statewide salmon strategy, assist in the development of regional salmon recovery plans, and submit the strategy and plans to the federal government. The office will also provide the Biennial State of the Salmon report to the Legislature.

Washington Department of Natural Resources

DNR through the Forest Practice Board has developed a Forestry Module. The results are presented in the forest and Fish Rule. The Board has established the following Forestry Module goals: To provide compliance with the Endangered Species Act for aquatic and riparian-dependent species on state and private lands; To restore and maintain riparian habitat on state and private forest lands to support a harvestable supply of fish; To meet the requirements of the Clean Water Act for water quality on state and private forest lands; and To keep the timber industry economically viable in the state of Washington.

Washington Department of Ecology

The Department of Ecology impacts habitat in the subbasin in a variety of ways. Most importantly is the review and/or permitting of projects under the State Environmental Policy Act (SEPA) and the Shoreline Management Act. DOE also participates in the development of county comprehensive plans for growth management and the development of DNR's Forestry Module. DOE also issues municipal and industrial wastewater and storm water permits. It is involved in setting water allocations and instream flow.

Local Government

First local government agency

Wahkiakum County

Wahkiakum County encompasses most of the Elochoman River watershed. Under the Growth Management Act the each of these counties must identify and protect critical lands, which include streams, wetlands and critical fish and wildlife habitat conservation areas.

Lower Columbia Fish Recovery Board

Established in 1998 by state law, the Lower Columbia Fish Recovery Board encompasses five counties in the Southwest Washington Region. The Board's mission is to recover steelhead and other species listed under the Endangered Species Act through the development and implementation of a comprehensive recovery plan. The 15-member board is responsible for implementing the habitat portion of an approved state and federal recovery plan. To accomplish this, the Board is authorized to establish habitat project criteria, prioritize and approve projects, acquire and distribute funds for projects, enter into contracts on behalf of project sponsor, and

assess and monitor project outcomes. The Board holds regular monthly meetings on the first Friday of each month at different locations across the region.

Existing Goals, Objectives, and Strategies

Fish

In the State of Washington's Statewide Salmon Strategy, its goal is to "restore salmon, steelhead, and trout populations to healthy harvestable levels and improve the habitat on which fish rely on." The Washington Department of Fish and Wildlife has a mission statement of "Sound stewardship of fish and wildlife". The WDFW Wild Salmonid Policy goal is to "Protect, restore, and enhance the productivity, production, and diversity of wild salmonids and their ecosystems to sustain ceremonial, subsistence, commercial, and recreational fisheries; non-consumptive fish benefits; and other related cultural and ecological values." (WDFW 1997).

Objective 1: The Draft Endangered Species Act Implementation Plan for the Federal Columbia River Power System has a section on research monitoring and evaluation. It states, "The primary objectives of the RM&E component of this Plan are: Track the status of fish populations and their environment relative to required performance standards; identify the physical and biological responses to management actions: and resolve critical uncertainties in the methods and data required for the evaluation of future population performance and needed survival improvements."

Strategy 1. Monitor effects of HGMPs (Appendix B.) It is imperative to be able to monitor the freshwater production of naturally spawning salmon, cutthroat and steelhead in the subbasin in order to understand the potential effects of hatchery stocking. Spawning and rearing areas should be identified and protected. Smolt production should be determined through the use of downstream migrant traps on major tributaries. Wild escapement should be documented through the use of redd surveys and carcass counts.

Strategy 2. Hatchery and wild interactions on spawning grounds need to be monitored. Spatial and temporal differences between hatchery and wild fish of the same species need to be documented. Spawning ground surveys should provide this information. Snorkel surveys could document interactions of hatchery residuals and wild juvenile fry.

Objective 2: Monitor the effect of Fish Management and Evaluation Plans (FMEP).

Strategy 1. The objectives of the Washington Department of Fish and Wildlife's (WDFW) Fish Management and Evaluation Plans (FMEP) (Appendix C.) are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3)

genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997a). In addition, fisheries will be managed to insure adult size, timing, distribution of the migration and spawning populations, and age at maturity are the same between fished and unfished populations.

Strategy 2. Intensive efforts will be needed to determine the extent of the balance between harvest and escapement to fully seed the available habitat. Commercial and recreational fisheries will be monitored to prevent over harvest and insure comparable and temporal similarities between fished and unfished populations. Coded wire tags will identify the disposition of captured fish. Genetic sampling should be conducted to ascertain wild and hatchery genetic profiles and potential stray rates.

Objective 3: Develop management guidelines for game and nongame species that are endangered, threatened or sensitive (ETS) and identify, map, and update the Priority Habitats and Species (PHS) data.

Strategy 1. Maintaining diversity statewide can best be achieved by maintaining diversity in individual watersheds. The wildlife species in the Washougal are a diverse group of native, game and ETS species. Proper management of these species in the watershed will aide in maintaining diversity.

Objective 4: Conduct and support research to investigate the population status, habitat requirements and the natural ecology of wildlife species of concern and determine abundance, distribution and composition of game populations and incorporate into GIS database.

The Lower Columbia Fish Recovery Board and its Technical Advisory Committee has developed goals and strategies that they will use to:

A. Identify and rank habitat restoration and protection needs; and
B. Evaluate and rank habitat project proposals.

It should be noted that this document is an ***interim*** habitat strategy. The adequacy and sophistication of available information on fish stocks, watershed functions, and habitat conditions varies significantly across the lower Columbia region. The strategy will be refined, as better information and analytical tools become available. It is anticipated that this strategy will evolve over the next several years to become an integral element in a comprehensive salmonid recovery plan for the lower Columbia.

In the near-term, this strategy will assist the Board and project sponsors to better target limiting factors and habitat protection needs in a way that will help maximize benefits for fish recovery and ensure the most effective use of limited resources.

The strategy provides fish recovery and habitat recovery goals. It prioritizes fish stocks and habitat recovery and protection needs. And, finally, it sets forth the means the Board and TAC will use to evaluate and rank project proposals.

Goals

The Lower Columbia Fish Recovery Board (LCFRB) was established by RCW 77.85.200 to coordinate fish recovery activities in the lower Columbia region of Washington State. The Board's key activities include recovery planning, watershed planning and habitat restoration and protection.

It is the overall habitat goal of the Lower Columbia Fish Recovery Board to provide the habitat necessary to support healthy, harvestable populations of ESA listed fish species in the lower Columbia region of Washington. Specific goals for fish recovery and habitat restoration and protection are:

Fish Recovery Goals of the Lower Columbia River Fish Recovery Board

1. Support Recovery of ESA listed stocks.

First priority in achieving this objective will be given to stocks that are listed under the federal Endangered Species Act (ESA). Four of six lower Columbia salmonid species are currently listed as threatened. These are chinook and chum salmon, steelhead, and bull trout. The ESA defines species as threatened when it is "likely to become endangered within the foreseeable future throughout all or a significant portion of its range." A species is considered endangered when it is "in danger of extinction throughout all or a significant portion of its range."

Second priority will be given to species that are candidates or are proposed for listing under the ESA. Currently coho salmon are a candidate for listing. Sea-run cutthroat are proposed for listing as a threatened species.

2. Support biodiversity through recovery of native wild stocks.

The maintenance of genetic and life-cycle diversity across the region is critical to the recovery of listed fish species. To help preserve this diversity, priority will be given to habitat projects benefiting naturally spawning, locally adapted fish stocks with minimal hatchery influence. The stock origin and production type classifications used for identifying and prioritizing stocks to achieve this objective are those provided in:

a. The 1993 Washington Department of Fish and Wildlife (WDFW) Salmon and Steelhead Stock Inventory (SASSI);
b. The 1998 Salmonid Stock Inventory for bull trout (SaSI);
c. The 2000 Salmonid Stock Inventory for coho (SaSI); and
d. The Lower Columbia Steelhead Conservation Initiative (LCSCI, 1997).

SASSI notes that its stock origin designations should be considered as preliminary until such time as more detailed information confirms or refutes the current origin designations. For this reason, the SASSI data will be augmented by more recent information where and when it becomes available. In developing project proposals, sponsors are encouraged to bring forward any additional information available regarding stock identification, origin, production and status.

Based on the SASSI information, first priority under this objective will be given to stocks that are designated as being of **native** origin and **wild** production. Second priority will be given to stocks of **mixed** or **unknown** origin and **wild** production. Third priority will be given to stocks of **mixed** origin and **cultured** or **composite** production.

SASSI defines a **native** as "an indigenous stock of fish that has not been substantially impacted by genetic interactions with non-native stocks, or by other factors, and is still present in all or part of its original range." **Mixed** stocks are defined as those whose individuals originated from commingled native and non-native parents, and/or by mating between native and non-native fish; or a previously native stock that has undergone substantial genetic alteration." Stocks of **unknown** origin are those "where there is insufficient information to identify stock origin with confidence."

SASSI defines a **wild** production stock as one that "is sustained by natural spawning and rearing in natural habitat, regardless of parentage." A **cultured** stock is defined as one that "depends upon spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility." A **composite** stock is a stock "sustained by both wild and artificial production."

3. Restore or sustain geographic distribution of stocks.

Maintaining multiple stocks across the region is necessary to reduce the risk that changes in environmental conditions, catastrophic events, and disease will result in unacceptable risk of species extinction. Priority will be given to restore or sustaining the historic geographic distribution of stocks. Noteworthy in this regard are listed chum stocks. Currently only three relatively small stocks of chum exist in the region. They are located in the Grays River, Hardy Creek and Hamilton Creek. Other stocks with limited geographic distribution are summer steelhead and bull trout. Efforts should be made to increase the number and distribution of these stocks throughout their historic range within the region through habitat restoration activities.

4. **Maintain healthy stocks of a listed species.**

   Maintaining healthy stocks of listed salmonid species can substantially reduce the biological risk and costs of species recovery. Rather than allowing habitat conditions to deteriorate to the point that healthy stocks are reduced to depressed or critical levels, priority will be given to projects that protect or restore habitat conditions and habitat – forming processes upon which existing healthy stocks of listed salmonid species depend.

   Of the 46 stocks of listed salmonid species in the lower Columbia, 17 are identified as healthy (13 fall chinook, 2 spring chinook, 1 winter steelhead, and 1 chum). The list is based on the WDFW SASSI and SaSI, LCSCI, and Limiting Factor Analysis (LFA, 1999-2001) reports for WRIA's 26 through 29.

5. **Support recovery of critical stocks of listed species**

   SASSI classifies a stock as "critical" if it is "experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred." SASSI further states that these stocks are "in need of immediate restoration efforts to ensure their continued existence and to return them to a productive state."

   The loss of a critical stock can reduce genetic and life cycle diversity within the region. For this reason habitat restoration and protection actions needed to support the recovery of critical stocks will be given priority. The SASSI report did not identify any critical stocks in the lower Columbia. However, the LCSCI classified Wind River summer steelhead stocks (Mainstem, Panther Creek, Trout Creek) as being in critical condition. Accordingly, habitat projects benefiting these stocks will be a high priority.

Habitat Protection and Restoration Goals

Recovery of salmonid species requires the restoration and protection of the habitat conditions and processes upon which the fish depend. The following goals are listed in priority order.

Restore access to habitat

Removal of man-made barriers to substantial reaches of good quality habitat provides important benefits to fish in both the near and long term. Actions to improve access can include removal or replacement of blocking culverts and reconnecting isolated habitats, such as side channel areas. Protecting or restoring properly functioning habitat conditions are only beneficial if fish have the necessary access to the habitat. In assessing the need to remove a barrier consideration must be given to the stocks and life-history stages affected and the type, quality and quantity of habitat that would be made accessible. LFA reports, barrier inventories, and other watershed and habitat assessments will be used in assessing the need to remove or correct a barrier.

Protect existing properly functioning habitat conditions.

Existing high quality habitat is critical to sustaining current fish abundance and productivity. Habitat restoration can be expensive and technically difficult, if not impossible. For this reason, protecting properly functioning habitat from degradation and loss is an important priority. LFA reports, other watershed and habitat assessments, and stock priorities will be used to identify and rank habitats for protection.

The quality and quantity habitat, the potentially affected stocks, and the nature and urgency of the threat to habitat values are key considerations in determining habitat protection needs. Priority will be given to protection of high quality habitat facing serious near-term threats.

Restore degraded watershed processes needed to sustain properly functioning habitat conditions.

Habitat projects should focus on the restoration of watershed functions that will sustain habitat conditions upon which salmon stocks depend over the long-term. Projects that address a habitat need on a temporary or near-term basis may be justified as a critical interim step in a comprehensive effort to restore natural habitat forming processes over the long-term. IFA reports and other technical assessments will be used to help identify and prioritize key watershed functions requiring restoration or protection in each basin.

Support of critical salmonid life-history stages.

Projects may target habitat conditions needed to support critical life-history stage needs. LFA information and other technical assessments should be used to help identify the key habitat needs for each species in a given basin. Sponsors should provide adequate supporting information linking:

1) The habitat requirements of target species and life-history stages.
2) The availability of those habitat conditions relative to historic conditions.
3) The likelihood that the lack of suitable habitat is restricting population abundance.

Consideration will also be given to a project's contribution to critical life-history stages on a regional level. Some basins, such as the Chinook River, play an important role in the life history of fish stocks from outside the lower Columbia region. Project proposals should clearly identify each species and its life-history stages that will benefit from the proposed action.

Secure near and long-term benefits

Addressing habitat protection and restoration needs that will provide both near-term and sustainable long-term benefits for fish should receive a higher priority than addressing conditions that will provide benefits to fish only in the long-term. Projects that provide only short-term benefits may be justified if they are:

a. Part of a comprehensive effort to restore natural habitat processes over the long-term, and
b. Designed to sustain or protect a stock(s) until natural habitat processes are restored.

Fish Stock Priorities

Stocks for each salmonid species have been categorized into four tiered priority groupings to assist setting habitat priorities within each watershed and across the lower Columbia region. Stocks for each watershed, except the Chinook River, were identified using SASSI. SASSI defines a stock as "the fish spawning in a particular lake or stream(s) at a particular season, which fish to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season."

Since SASSI stock information is not available for the Chinook River, stocks for this watershed were identified using information from Sea Resources WDFW, and the WRIA 24/25 LFA.

The tiered breakdown integrates goals 1 through 5 discussed in Section 2.A above. It uses stock information taken from SASSI, LFA reports, and LCSCI. SASSI definitions of stock origin, production type, and status are outlined in Section 1.A. The criteria for each of the four tiers is provided below:

A. Tier 1 (Highest Priority)

This Tier includes stocks that are (1) listed as threatened pursuant to the ESA and are (2) classified by SASSI as native, mixed, or unknown in origin and wild in production. It also includes all chum, summer steelhead, and bull trout stocks due to their limited geographic distribution. It may include stocks designated by SASSI as healthy, depressed, or critical if the stocks satisfy the ESA, origin, and production type designations for this Tier.

B. Tier 2

This Tier includes stocks that are (1) listed as threatened pursuant to the ESA and are (2) classified by SASSI as mixed, non-native, or unknown in origin and composite in production. It includes all stocks designated by SASSI as healthy or critical and not included in Tier 1. It may also include a stock designated as depressed if the stock satisfies the ESA, origin, and production type designations for this Tier.

C. Tier 3

Tier 3 includes all stocks that are proposed or are candidates for listing under the ESA. They may be of any stock origin, production type, or status designation.

D. Tier 4 (Lowest Priority)

Tier 4 includes all stocks that are not listed or proposed for listing under the ESA. They may be of any stock origin, production type, or status designation.

Habitat Protection and Restoration Priorities

The number of affected stocks and their importance along with the degree to which correction of a limiting factor or protection of habitat would help achieve or sustain properly functioning habitat conditions are key considerations in determining habitat priorities.

As discussed in Section 3, Attachment 1 (Wade, 2001) identifies fish stocks by basin and their priority rating, tiers 1 through 4. It should be noted that not all stocks will be present throughout the basin. Stocks likely to be present in a given river reach can be determined using the LFA fish presence information and maps.

Attachment 3 (Wade, 2001) provides a ranked list of limiting factors. Limiting factors have been identified using LFA reports. The importance of each limiting factor is ranked as high, medium, or low based on the habitat goals set forth in Section 2.B. Attachment 3 presents this ranking information in matrix form. It is organized by basin using the LFA subbasin designations. In addition to ranking limiting factors within a basin, potential restoration and protection actions have been identified for each limiting factor. Finally, fish stocks and their priorities are also listed for each basin.

In general, limiting factors rated as high and affecting multiple high priority (Tier 1 or 2) stocks are a higher priority than limiting factors rated moderate or low and affecting few or lower priority (Tier 3 or 4) stocks.

This information is provided to assist project sponsors in identifying and developing projects that will address the most important habitat protection and restoration needs. It is intended to serve as guidance. It will be refined as additional information on fish stocks and habitat conditions becomes available. It should be further noted that basing a project on a limiting factor that is rated as high and affects high priority fish stocks substantially enhances the likelihood, but does not ensure, that a project will receive a high priority for funding. As discussed in Section 5 below, a project's priority for funding is based on both its benefit to fish and certainty of success. Certainty of success takes into consideration a project's relationship to other limiting factors and restoration efforts as well as project design, cost, and management elements.

Evaluation and Ranking of Habitat Projects

The ranking of habitat project proposals will be done using the same basic approach outlined for establishing habitat priorities but also takes into consideration the degree to which a project addresses an identified habitat priority and factors affecting the level of certainty that a project will produce its intended benefits for fish.

A. Evaluation Criteria

Each proposed habitat project will be evaluated using the following criteria:

1. Benefits to Fish

a. The number of stocks that will be affected and their priorities.
The number of stocks that would benefit from a project and their priority will be determined using the tiered stock listing discussed in Section 3 and the fish presence information contained in the applicable LFA report or other comparable source.

b. The nature and significance of the benefit's the project will have for the affected stocks.

While the benefit for all affected stocks will be considered, greatest weight will be given to the project's potential value to ESA listed species or unique stocks essential for recovery.

c. The degree to which the proposed correction of a limiting factor or protection of habitat would help to achieve and sustain properly functioning habitat conditions.

Factors to be considered include the extent to which a project addresses:

(1) An identified habitat priority as discussed in Section 4 or limiting factors identified in an LFA report or other technical assessment.

(2) Section 2.B habitat goals. These include the value of the project in:

(a) The importance of the project in restoring access to habitat;

(b) Achieving and sustaining properly functioning habitat conditions; and

(c) Providing for critical salmonid life history stages in the reach or basin.

2. Certainty of Success

The level of certainty that the project would produce its intended benefit for fish will be assessed based on the extent to which the proposed project:

a. Complements other habitat protection and restoration programs and projects within a basin.

Habitat projects should be designed, coordinated, and sequenced in concert with other salmon recovery activities with a watershed or basin. This can help to achieve the greatest benefit to fish in the shortest possible time and with the most efficient use of resources.

Specific consideration will be given to whether a project is:

(1) An element of a comprehensive watershed or basin restoration and protection strategy;

(2) Well coordinated and logically sequenced with other habitat projects completed, underway, and planned for a watershed or basin; and/or

(3) Complements and supports other local and state salmon recovery regulations and programs, including land use and development regulations, critical area ordinances, storm water management programs, shoreline master plans, forest management regulations, etc.

b. Has a sound technical basis in addressing habitat forming processes and limiting factors.

The success of a project requires a solid understanding of conditions and watershed processes that cause or contribute to the problem or limiting factor

being addressed. For some projects, existing LFA information may be sufficient. More complex problems may require a more thorough assessment of conditions and watershed processes. This information may be available through existing studies and evaluations. In some cases, site-specific assessments and design work may be required. In order to assess whether a project has an adequate supporting technical basis, it will be important that the project proposal addresses considerations listed for its project type contained in the Guidance on Watershed Assessment for Salmon, Part 3 (Joint Natural Resources Cabinet, State of Washington, May 2001).

c. Demonstrates that sponsor experience and capabilities are commensurate with project requirements.

The success of a habitat project is dependent on the project sponsor's ability to design, plan, implement and monitor a project. Ideally, project sponsors should have experience in successfully completing project of similar nature, scope, and complexity. At a minimum, sponsors should indicate how they would acquire needed experience and expertise that they do not possess. Options for doing so could include partnerships with other agencies or organizations, or contracting for needed services.

d. Applies proven methods and technologies.

The certainty of a projects success can be enhanced through the use of proven and accepted methods and technologies. Projects should utilize approaches and technologies that are commensurate with the nature, scope, and complexity of the problem being addressed. Innovative or experimental approaches may be acceptable if no proven method exists or it can be shown that they will reasonably extend knowledge of restoration methodologies.

e. Has community support. The long-term success of habitat restoration and protection efforts depends on the acceptance and support of local communities. Projects should be designed and implemented in a manner that accommodates local values and concerns.

f. Demonstrates that costs are reasonable for the work proposed and the benefit to be derived.

Given that resources for habitat protection and restoration are limited, projects should be designed and implemented in the most efficient and effective manner possible. Project costs should be commensurate with those for projects of similar nature, scope, and complexity. A project's chance of success can also be enhanced through the use of partnerships that can leverage expertise, contributions of materials and labor, and funding.

g. Demonstrates an effective maintenance and monitoring element.

Monitoring the effectiveness of the project is critical to determining the success of the project in meeting its objectives. Maintenance of a completed project may be critical to the project's performance and long-term effectiveness.

B. Scoring and Ranking of Habitat Project Proposals

Habitat projects will be scored by the TAC using a score sheet that is based on the evaluation criteria discussed in section 4.A. above. Each project will be scored on both its benefits for fish and certainty for success. As discussed above a project's benefit to fish is determined by the affected stocks and their priority and the degree to which the proposed correction of a limiting factor or protection of habitat would help to achieve and sustain properly functioning habitat conditions. Certainty of success is the level confidence that a project will achieve its goals.

The scores for each project will be used to rate its benefit for fish and certainty of success as high, medium, or low. Based on these designations a project will be assigned to a priority using the matrix below. Within each priority category projects will be ranked based on their combined benefit and certainty scores. Projects in categories 1, 2 and 3 will be recommended for funding.

Wildlife

Goal: Maintain the historic statewide diversity of native wildlife species.

Objective: Develop management guidelines for game and nongame species that are endangered, threatened or sensitive (ETS).

Objective: Identify, map, and update the Priority Habitats and Species (PHS) data.

Objective: Support the PHS and ILM programs with data dissemination and management recommendations.

Maintaining diversity statewide can best be achieved by maintaining diversity in individual watersheds. The wildlife species in the Elochoman River subbasin are a diverse group of native, game and ETS species. Proper management of these species in the watershed will aide in maintaining diversity.

Goal: Determine the ecological needs and population status of wildlife species of concern in WRIA #25.

Objective: Conduct and support research to investigate the population status, habitat requirements and the natural ecology of wildlife species of concern in WRIA #25.

Spotted owls, bald eagles, and Larch Mountain salamanders are all species of concern statewide and in the Elochoman River subbasin. Whereas the ecological needs and population status of owls and eagles have been well described, little is understood regarding Larch Mountain

salamanders. Work being conducted in the watershed will increase our understanding of this species.

Goal: Develop an inventory of the current habitats of wildlife populations in WRIA #25.
Objective: Use Geographic Information System and remote sensing to map habitats.

Mapping and inventorying wildlife habitats is key to protection of the Elochoman River wildlife. Remote sensing and GIS technologies have been used elsewhere to map current conditions of critical habitat components. WE need to do the same for WRIA #25 for the key species and then model habitat changes and their impacts on wildlife in the future.

Goal: Protect and manage for recovery of all native wildlife classified as endangered, threatened or sensitive in WRIA #25.
Objective: Develop and implement recovery and management plans for ETS species in WRIA #25.

Managing the Elochoman River subbasin at the landscape scale will aide in protecting all native species, including ETS species. Understanding individual species habitat requirements and interactions with other will improve long-term sustainability of wildlife diversity in the watershed.

Goal: Manage game populations for sustainable natural production where feasible.
Objective: Identify and evaluate acquisition needs for important habitat of game species in WRIA #25.
Objective: Determine abundance, distribution and composition of game populations in WRIA #25.
Objective: Develop management plans for game species in WRIA #25.

Elk, deer, and goose populations in the watershed are-doing well and maintaining themselves through natural production and are not imperiled at this time. However, increased human development and changes in land management practices will affect species distribution and productivity. We must model for habitat changes, foresee problem areas, and initiate management strategies now to meet species objectives in the future.

Research, Monitoring, and Evaluation Activities

Fisheries

These activities occur in all lower Columbia subbasins:

- Activity 1 Collection of coded wire tags from hatchery returns and fish spawning in river.
  - Activity 1.1 WDFW staff at various Hatcheries collect and process coded wire tags from returning fish. Tags are read at the WDFW laboratory in Olympia.

- Activity 1.2 PSMFC staff conduct spawning ground surveys, marking redd sites and collecting coded wire tags from returned spawners.

- Activity 2 Creel checks and coded wire tags are recovered through sport check surveys.
- Activity 4 SSHIAP (Salmon Steelhead Habitat Inventory Assessment Program) will provide data for the Elochoman River basin area. This data will include:
  - Activity 4.1 Comprehensive fish barrier coverage.
  - Activity 4.2 Fish Distribution by species, life stages.
  - Activity 4.3 Habitat Typing by segment- breaks stream reaches into small/large tributary, gradients, habitat type (wetlands, etc), and confinement.
  - Activity 4.4 Hydromodifications. SSHIAP will catalogue various hydromodifications in the drainage. Hydromodifications include anthropogenic structures that in some way prohibit natural alluvial processes. These can include riprap banks, bulkheads, roads, and other features present in the active floodplain.
  - Activity 4.5 Other background information such as stream widths and flow will also be added. Habitat typing will be completed by mid November. Hydromodifications will be completed by Dec. 31, 2001. All of this information will be available in GIS format on the web sometime after Dec. 31.

Wildlife

- Activity 1 Develop management guidelines for game and nongame species that are endangered, threatened or sensitive (ETS) and identify, map, and update the Priority Habitats and Species (PHS) data.
- Activity 2 Conduct and support research to investigate the population status, habitat requirements and the natural ecology of wildlife species of concern and determine abundance, distribution and composition of game populations.
- Activity 3 Develop and implement recovery and management plans for ETS species and develop management plans for game species in the Elochoman River subbasin.
- Activity 4 Identify and evaluate acquisition needs for important habitat of game species in Elochoman River subbasin.

Statement of Fish and Wildlife Needs

Evaluate and monitor fisheries for meeting performance indicators identified in the NMFS Fisheries Management and Evaluation Plan (FMEP) for the Lower Columbia River.
Rationale: Limited monitoring of fish populations is presently occurring (see existing monitoring activities), but should be expanded to insure populations are not exceeding levels identified in the FMEP. This would allow harvest of surplus population while protecting wild populations.

- Determine abundance, distribution, survival by life-stage, and status of fish and wildlife native to the watershed including steelhead, coastal cutthroat, fall chinook, bull trout, coho salmon, lamprey, crayfish, and others.

Rationale: Elochoman River steelhead and chinook salmon are part of the Lower Columbia River ESU and are currently listed under the ESA. Abundance and survival estimates will be needed to determine if habitat restoration programs are working and to determine if these fish can be removed from the Endangered Species list. Coastal cutthroat trout have been proposed for listing under ESA and coho salmon are considered a candidate for listing under ESA because of possible lowered status across their distributional range. Little is known about historical and current distribution and status of these fish in this watershed. The abundance of pacific lamprey have declined and incidental recent observations during fish sampling efforts and comparison of these observations with historical observations suggest that crayfish have disappeared from some of their former range. Crayfish and lamprey are likely an important part of the food chain, and documenting their distribution and status is an important factor for assessment of health of the Elochoman River ecosystem.

Determine genetic and life history types of native fish and wildlife and the strength of their current expression relative to historical and desired future conditions.

Rationale: Maintaining life history and genetic diversity allow fish to be productive under the current and a wide variety of future conditions. Determining these levels of diversity will help develop successful recovery strategies.

- Determine the effectiveness of habitat restoration projects on achieving the desired physical change and measure the response of wild steelhead populations to these changes.
  Rationale: Large-scale monitoring and site-specific monitoring projects are needed to evaluate the effectiveness of habitat restoration projects in the rebuilding of fish populations.

- Conduct routine surveys for chum salmon in the Elochoman River subbasin. Evaluate seeps and other potential spawning areas for chum production.
  Rationale: Chum are present in the Elochoman River subbasin. Seeps and springs within the subbasin are important for successful chum spawning.

- Implement restoration actions identified in the watershed assessments that are consistent with recovery of fish and wildlife populations and their habitat.
  Rationale: Restoration projects that are the outcome of watershed assessments and have gone through a review process have addressed factors that limit the recovery of fish and wildlife populations. These projects should have a high probability for success. The above or modified monitoring and evaluation programs should be funded as part of these restoration activities.

- Continue watershed coordination and local stewardship programs.

Rationale: The land and resource management decision needed to recover fish and wildlife populations and their habitat will impact local residents. Many of these people are knowledgeable about these resources and should be part of the decision process.

- Determine abundance, distribution, survival by life-stage, and status of fish and wildlife native to the watershed including steelhead, coastal cutthroat, chum, chinook, bull trout, coho salmon, lamprey, crayfish, and others.
  Rationale: Elochoman River steelhead and chinook salmon are part of the Lower Columbia River ESU and are currently listed under the ESA. Abundance and survival estimates will be needed to determine if habitat restoration programs are working and to determine if these fish can be removed from the Endangered Species list. Coastal cutthroat trout have been proposed for listing under ESA and coho salmon are considered a candidate for listing under ESA because of possible lowered status across their distributional range. Little is known about historical and current distribution and status of these fish in this watershed. The abundance of pacific lamprey have declined and incidental recent observations during fish sampling efforts and comparison of these observations with historical observations suggest that crayfish have disappeared from some of their former range. Crayfish and lamprey are likely an important part of the food chain, and documenting their distribution and status is an important factor for assessment of health of the Elochoman River ecosystem.

- Determine genetic and life history types of native fish and wildlife and the strength of their current expression relative to historical and desired future conditions.
  Rationale: Maintaining life history and genetic diversity allow fish to be productive under the current and a wide variety of future conditions. Determining these levels of diversity will help develop successful recovery strategies.

- Determine the effectiveness of habitat restoration projects on achieving the desired physical change and measure the response of wild steelhead populations to these changes.
  Rationale: Large-scale monitoring and site-specific monitoring projects are needed to evaluate the effectiveness of habitat restoration projects in the rebuilding of fish populations.

- Implement restoration actions identified in the watershed assessments that are consistent with recovery of fish and wildlife populations and their habitat.
  Rationale: Restoration projects that are the outcome of watershed assessments and have gone through a review process have addressed factors that limit the recovery of fish and wildlife populations. These projects should have a high probability for success. The above or modified monitoring and evaluation programs should be funded as part of these restoration activities.

Elochoman Subbasin Recommendations

Projects and Budgets

The following subbasin proposals were reviewed by the Lower Columbia and Estuary Province Budget Work Group and are recommended for Bonneville Power Administration project funding for the next three years.

New Projects

Project: 30003 - Evaluation of Two Captive Rearing Methods for Assisting with Recovery of Naturally Spawning Populations of Steelhead and Coho Salmon

Sponsor: U.S. Fish and Wildlife Service (USFWS)

Short Description:

Test and evaluate two hatchery reform methodologies; Assess natural reproductive success of returning hatchery-origin adults; Establish Abernathy, Germany, and Mill creeks as a Tier 3 "monitoring and evaluation" site for anadromous salmonids.

Abbreviated Abstract

We will investigate two hatchery methodologies that can potentially assist with recovery of naturally spawning populations of steelhead (Oncorhynchus mykiss) and coho salmon *(O. kisutch*) in the Columbia River (NMFS RPA Action #184). These two methodologies are (1) development of native broodstocks of steelhead via captive rearing of natural-origin (NOR) juveniles (age 0+ parr) to sexual maturity, and (2) overwintering (6-7mos.) of NOR, pre-smolt coho salmon in hatchery raceways to (a) increase freshwater survival prior to smoltification and outmigration and (b) evaluate this strategy as a potential source of fish for reintroduction programs. The long-term goal of this work is to assess the natural reproductive success of returning, hatchery-origin (HOR) adults relative to NOR adults in a test stream, Abernathy Creek (NMFS RPA Action #182), and evaluate new hatchery strategies for potentially assisting with recovery of natural populations. Two adjacent streams, Germany and Mill Creeks, will serve as natural population "controls" for evaluating demographic responses in Abernathy Creek. Rotary smolt traps will be used to estimate the overall natural productivity of steelhead, coho, and other anadromous salmonids in each of the three streams. Upstream migrating adults will be trapped and monitored in Abernathy Creek via a permanent weir at the Abernathy Fish Technology Center (AFTC) and secondarily at a fishway located 0.5 miles upstream of the weir. We further request that Abernathy, Germany, and Mill creeks be designated a Tier3 Monitoring and Evaluation Site (NMFS RPA Action #183) for salmon and steelhead ESUs in the Columbia Estuary Province (Lower Columbia and S.W. Washington ESUs). This proposal is part of a long-term goal to use Abernathy Creek as an experimental test stream and the AFTC as a

research hatchery and science center for (a) investigating new artificial propagation strategies associated with long-term conservation goals (i.e. hatchery reform) and (b) genetic/ecological interactions between hatchery and natural-origin fish.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
200101200	Evaluate new methodologies for monitoring Pacific salmon and steelhead / Evaluation of long-range PIT tags in Abernathy Creek	Companion project

Review Comments

This project also has applications upstream of Bonneville and could be considered in the Mainstem and Systemwide Province if not funded here. NMFS has identified this project as a BiOp project.

Budget

FY2003	FY2004	FY2005
Rec: $446,101 Category: High Priority	Rec: $687,800 Category: High Priority	Rec: $309,050 Category: High Priority

Project: 30008 - Instream evaluation of populations, migration timing, individual adult return rates, and wild-hatchery interactions of 3 naturally produced salmonids

Sponsor: U.S. Fish and Wildlife Services (USFWS)

Short Description:

Evaluate distribution and abundance of juvenile and adult coho salmon, steelhead trout, and cutthroat trout in Abernathy Creek using new PIT tag techniques.

Abbreviated Abstract

The 2000 NWPPC Fish and Wildlife Program and various NMFS Biological Opinions have identified the need to monitor and evaluate various aspects of salmonid biology. Of particular interest in both of these documents is evaluating aspects of the freshwater life stages of naturally spawned salmonids. The current study will explicitly quantify freshwater life characteristics such as instream smolt survival, migration timing, population status monitoring, survival to adult, population changes due to altered habitat attributes for naturally spawned coho salmon, steelhead trout, and cutthroat trout. These life history characteristics will be quantified remotely with PIT tag monitoring systems that do not depend on traditional smolt traps or physically trapping adults. Adult migration timing and return rates of fish tagged as juveniles will be monitored continuously throughout the year. This will allow estimates of adult escapement for coho salmon and steelhead trout as well as estimates of estuarine use by cutthroat trout. In addition, frequency and magnitude of interactions between hatchery and naturally spawned steelhead trout will be directly quantified. Population estimates using PIT tag monitoring will be compared with more

traditional measures including smolt trapping and depletion estimates. System validation, efficiency, tag retention, and the effects of tagging on growth, smolt physiology and behavior will be quantified.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
198331901	New PIT Tag monitoring equipment	Both studies are working together to provide new and different PIT tag monitoring technology
199701501	Imnaha Smolt Survival and Smolt to Adult Return Rate Quantification (formerly the Imnaha Smolt Monitoring Program)	Researchers of the Imnaha Project hope to implement the technologies established in the current proposal. Results from this proposal will be important for their establishment of smolt emigration monitoring.
199008000	Columbia Basin PIT-Tag Information Systems	The current proposal will be providing information for the databases established by PSMFC in project #199008000. PSMFC has helped establish the infrastructure required for continuous connectivity to the database.

Relationship to Existing Goals, Objectives and Strategies

The 2000 Northwest Power Planning Council (NWPPC) Fish and Wildlife Program and various National Marine Fisheries Service (NMFS) Biological Opinions have identified the need to monitor and evaluate various aspects of salmonid biology. Abernathy Creek has been used as a model stream for the assessment of new methods of monitoring populations of salmonids, anadromous and resident, throughout the Columbia River Basin. These newly applied methods have already enabled remote quantification of freshwater life history characteristics including juvenile migration timing, microhabitat use, and age at downstream migration. The tools will be even more powerful when they are applied to monitor adult migration timing, adult age at return, and smolt to adult return rates. This proposal provides the requirements to meet the critical need of determining the utility of stationary PIT tag monitoring systems to assess adult return rates. Furthermore, results from this study will provide information regarding population health for use in adaptive management strategies.

This project is particularly relevant to objectives identified in Sections III C 2a1, III C 2a3, III D 4, III D 5, III D 9 of the 2000 NWPPC Fish and Wildlife Program. According to the Basinwide Biological Objectives (Section III C 2) efforts must be made to describe responses of populations to habitat conditions in terms of abundance and life history diversity. Life history diversity will be documented for three species of salmonids in this study including resident fish (III C 2a3) and anadromous fish that are considered to be at "depressed levels." The consistency of Artificial Production Strategies with principles of fish recovery will be evaluated in this project (Section III D 4). Specifically, artificial production strategies implemented at AFTC will be conducted as experimental with an evaluation of risks and benefits of hatchery-wild interactions of individuals. Management decisions will be based on hatchery vs. wild or

naturally spawning fishes that will be evaluated directly with instream comparisons of life history characteristics such as migration timing of naturally spawned and artificially produced juveniles and returning adults. Furthermore, adult return rates of hatchery and wild fish will be assessed through the project and will be used to determine changes necessary to allow harvest to occur in Abernathy Creek (addressing Section III D 5). This project has measurable and quantitative objectives that will be made available to the public through a previously established database used throughout the Columbia River Basin (meeting the objectives of Section III D 9).

Continued monitoring and evaluation of freshwater life history information will be collected to improve management and conservation of wild and naturally spawning populations (identified as a need in Section III D 4). Baseline information (e.g., time of migration, age at migration, winter survival) will be compared to post-manipulation situations to assess life history changes associated with modifications in hydropower operation (Section III D 6) or habitat manipulations (Section III C 2). Specifically, Cowlitz County is in the process of purchasing Conservation Easements on Abernathy Creek. How the planting of riparian areas effects salmonid populations in the future will when conducting analyses of habitat-altering actions the status and biological requirements of the potentially impacted species and the effects of the action on species must be determined. The specific effects on Abernathy Creek will be monitored and evaluated using these methodologies. Further, the relative effectiveness of these comparisons can be applied to other tributaries of the Columbia River Basin. Of particular interest in many cases is the effect on juvenile survival, which is directly quantifiable using these methods.

Baseline freshwater life history information will be collected to determine population status of native species (Section III C 2a1) and resident fish (Section III C 2a3, cutthroat trout). There is a growing interest in data collection for managing wild and naturally spawning populations. The Wild and Naturally Spawning Population Policy states that management measures must be developed to maintain life history, morphology and genetic characteristics of wild and naturally spawning populations. Little is know concerning the life history characteristics of cutthroat trout or native steelhead trout or coho salmon in Abernathy Creek. Washington Department of Fish and Wildlife (WDFW) has only recently started to collect information at a smolt trap operated at the mouth of Abernathy Creek in the spring. Total production estimates are 11,000 steelhead smolts, 7,000 coho smolts, and 750 cutthroat trout with trapping efficiencies between 22 and 30 %. However, this leaves the void of other seasonal movements that may be integral to tributary and estuarine habitat use in summer, fall and winter. This has already been revealed for cutthroat trout in Abernathy Creek since over 450 individuals of “smolt-size” were captured and tagged in the fall of 2001. Therefore there are likely to be many more than 750 cutthroat trout in Abernathy Creek that would not be accounted for by the smolt trap being operated at the mouth of the creek. Furthermore detection efficiencies at the PIT tag detection units are estimated at 50-100%. Important aspects of the freshwater portion of coho salmon, steelhead and cutthroat trout will be collected.

Section 9 of the NMFS 2000 FCRPS Biological Opinion identifies the need for novel fish detection and tagging techniques for use in long-term research and monitoring and evaluation efforts (RPA 193). The techniques being used in this study (new and innovative PIT tag technology) that are being compared with other long-term research monitoring and evaluation

techniques have enormous potential for wide-ranging applicability throughout the Columbia River Basin. Also, RPA 188 states that studies of PIT tagged wild stocks from the lower river streams need to be conducted to contrast stock productivity and hydrosystem effects. This will clearly be addressed for three populations of salmonids in the Lower Columbia Estuary Province.

Assessment of a new captive broodstock program at AFTC provides "additional sampling efforts and specific experiments to determine relative distribution and timing of hatchery and natural spawners" (RPA 174 #4) in Abernathy Creek. This assessment will enable quantification of "survival of adult salmonids migrating upstream and factors contributing to unaccounted losses" (RPA 107) in the Lower Columbia Estuary Province. Techniques employed in this proposal will allow detection of not only individual fish PIT tagged in Abernathy Creek but also any fish PIT tagged in the Columbia River Basin. Therefore, we will be able to quantify any straying losses of coho salmon or steelhead trout migrating in the Lower River before they encounter the first hydroelectric facility.

Work from this proposal will directly "determine whether hatchery reforms reduce the risk of extinction for Columbia River basin salmonids and whether conservation hatcheries contribute to recovery" (RPA 184, 9.6.5). WDFW characterized the steelhead population in Abernathy Creek as "depressed" but stable. This population serves as a distinct surrogate for listed steelhead populations in the Lower Columbia River ESU (NMFS Biological Opinion 9.7.2.10 states the need for evaluating these populations). Population estimates of naturally spawning steelhead trout in the Abernathy Creek system are currently being collected. We will establish baseline life history information for a stock that we have recently started developing a native broodstock program. Steelhead trout smolts will be released into Abernathy Creek as first year progeny from native broodstock fish in the spring of 2003. We will have the opportunity to not only monitor differences in migration timing between naturally produced and hatchery produced individuals but also quantify interactions between those individuals by extensively documenting microhabitat preferences of individuals of both wild and hatchery origin.

Review Comments

This project may also be considered in the Mainstem and Systemwide Province. Some portions may be funded under that province. NMFS has identified this project as a BiOp project.

Budget

FY2003	FY2004	FY2005
Rec: $238,740 Category: High Priority	Rec: $340,645 Category: High Priority	Rec: $291,218 Category: High Priority

Project: 30012 - Compare Bacterial Fish Pathogen Populations in Hatchery Water and in Adjacent Creek Water and Evaluate Possible Disease Transfer Between Them

Sponsor: U.S. Fish and Wildlife Service (USFWS)

Short Description:

Determine the presence of bacterial fish pathogens within a hatchery water system and in the waters of an adjacent creek used as part of the hatchery water supply. Determine the potential for pathogen transfer between the two water systems.

Abbreviated Abstract

This project will look at the presence of two bacterial fish pathogens, Aeromonas salmonicida and Flavobacterium psychrophilum, within hatchery waters at the Abernathy Fish Technology Center and in water from Abernathy Creek, the adjacent stream supplying hatchery water. An extremely sensitive polymerase chain reaction assay (PCR) will be used to evaluate water and fish samples for the presence of the two pathogens. Water samples will be taken every two weeks from stream above and below the hatchery. Water samples will also be taken at sites within the hatchery proper. Wild fish from the stream and hatchery production fish will also be sampled periodically for the presence of the pathogens. Pathogen presence and distribution will be evaluated to determine critical control points for minimizing the transfer of these pathogens either into or out of the hatchery system.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
	RPA Action #8	This project may provide a method for risk assessment for hatcheries
	RPA 141	This project may provide additional information on fish pathogens
	RPA 184	This project may provide monitoring and assessment of hatchery fish health
	RPA 195	This project may add to knowledge on juvenile salmonid mortalities.

Review Comments

This project may be better evaluated in the Mainstem and Systemwide Province.

Budget

FY2003	FY2004	FY2005
Rec: $71,678 Category: Recommended Action	Rec: $34,487 Category: Recommended Action	Rec: $0 Category: Recommended Action

Project: 30013 - Role of Bacteria as Indicator Organisms for Watershed Assessment and in Determining Fish Pathogen Relationships with Fauna of Abernathy Creek

Sponsor: U.S. Fish and Wildlife Services (USFWS)

Short Description:

The purpose of this project is to develop techniques to assess watershed health and fish health using bacteria as system indicator organisms.

Abbreviated Abstract

A greater understanding has emerged between the relationships of fish and their respective environments. With this understanding is a need for innovative ways to detect and monitor watershed health and predict fish epizootics. Polymerase chain reaction (PCR) and species-specific primers can be used to show the presence of aquatic bacteria in water and tissues of living organisms. By utilizing these primers and PCR, the bacteria and their relationships to aquatic life can be discerned. By identifying and using specific bacteria (indicator species) found in the water and in other aquatic life, can result in an assessment of the health of the system and a determination of the relationships of fish pathogens with other aquatic bacteria may be possible. Monitoring bacterial indicator species may make it possible to detect the onset of habitat degradation and predict harmful pathogen growth. If an assessment is possible, management actions could be taken to promote health of the system and/or minimize fish loss due to epizootics.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
30008	The use of small stream PIT tag monitoring methods to evaluate movements, life history characteristics and survival of salmonid.	Will collect fish tissue samples from sacrificed fish.
	RPA Action 1	Is a USFWS proposed project which provides research, monitoring, and evaluation of hydro resources and habitat.
	RPA Action 152	Federal agency proposed project that will aid in water quality and biological monitoring information for subbasin and watershed assessments.
	RPA Action 155	Project will aid to determine cause and effect relationships and identify research needs for improvement plans.
	RPA Action 198	Is a USFWS project that will provide data for management of water quality and habitat use and restoration.

Review Comments

This project should be considered under the innovative category (or in the Mainstem and Systemwide Province).

Budget

FY2003	FY2004	FY2005
Rec: $71,100 Category: Recommended Action	Rec: $58,440 Category: Recommended Action	Rec: $60,150 Category: Recommended Action

References

Dobler, Fred. 2001. WDFW Fisheries Biologist. Personal Communication.

LaVier, D. 1970. Washington Department of Game Annual Report, District 9.

Howell P. et al. 1985. Stock assessment of Columbia River anadromous salmonids: Volumes I and II. Bonneville Power Administration.

Manlow, Steve. 2001. WDFW Fisheries Biologist. Personal Communication.

National Marine Fisheries Service (NMFS). 2001. Listing status snapshot. Website address www.nwr.noaa.gov/1salmon/salmesa/index.htm.

Randolph, C. 1986. Characteristics of Skamania and Beaver Creek hatchery anadromous stocks. WDW Report 86-7.

Wade, G. 2001. Salmon and Steelhead Habitat Limiting Factors. Water Resource Inventory Area 25. (Draft) Washington State Conservation Commission.

Washington Department of Fisheries (WDF). 1951. Lower Columbia River Fisheries Development Program (Elochoman River Area). Olympia, Washington.

Washington Department of Fisheries (WDF). 1973. Draft Fisheries Resources in Southwest Washington (Southwest Washington River Basins Study). Olympia, Washington.

Washington Department of Wildlife (WDW). 1990. Elochoman River Subbasin Salmon and Steelhead Production Plan. Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW). 1997. Management Recommendations for Washington's Priority Habitats: Riparian. Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW). 1997a. Wild Salmonid Policy, draft environmental impact statement. Olympia, WA.

Washington Department of Fish and Wildlife (WDFW). 1997b. Preliminary stock status update for steelhead in the Lower Columbia River. Vancouver, WA.

Washington Department of Wildlife (WDFW). 2001. Hatchery and Genetic Management Plan. Elochoman "Wild" Winter Steelhead Program. Olympia, Washington.

Watson, R. 1965. Columbia River creel census, 1963-64. Final Report. Washington State Department of Game. Olympia, Washington.