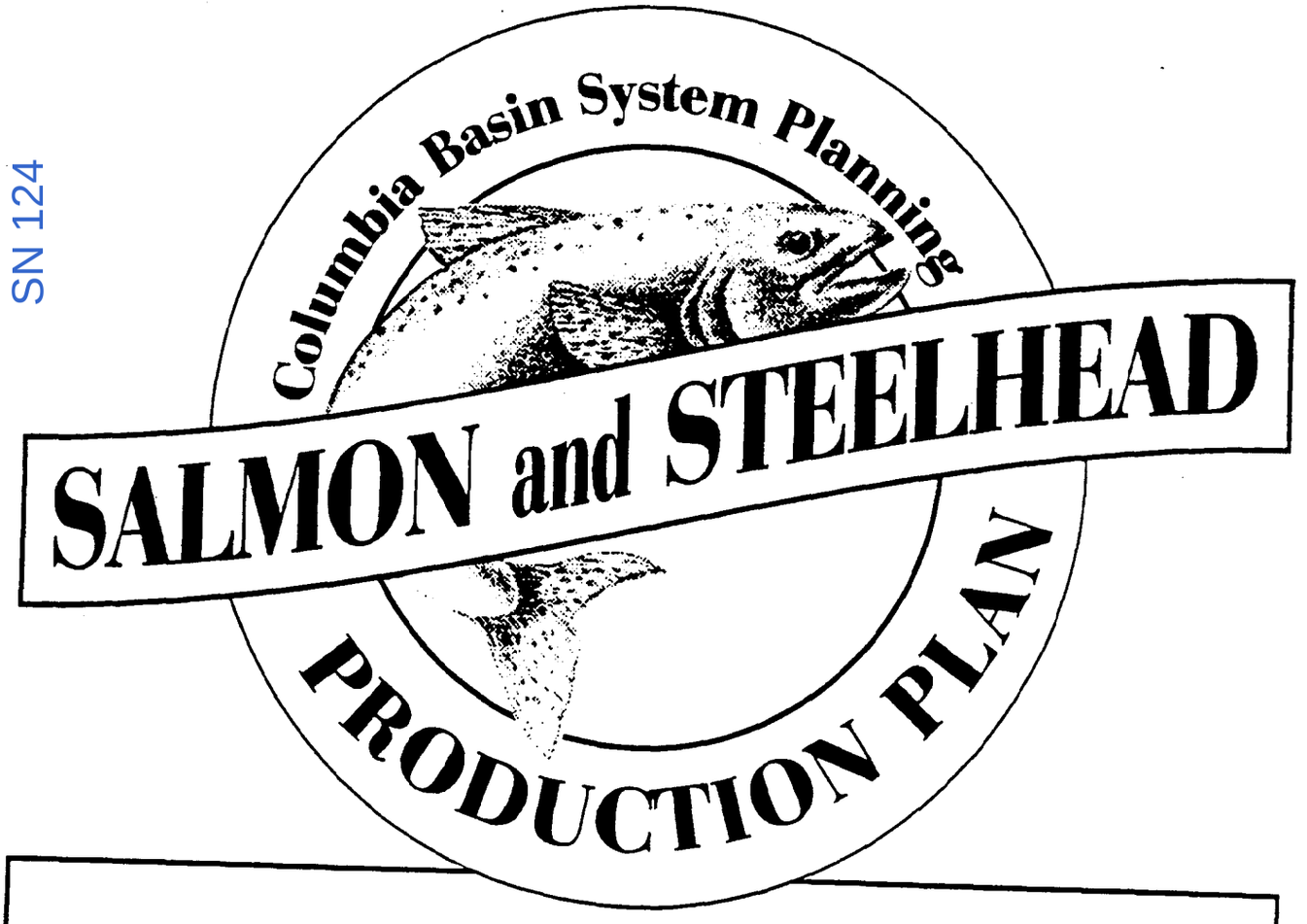


# UMATILLA RIVER SUBBASIN

**September 1, 1990**

# UMATILLA RIVER SUBBASIN
## Salmon and Steelhead Production Plan

September 1, 1990

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**Columbia Basin System Planning**

Funds Provided by
the Northwest Power Planning Council,
and the Agencies and Indian Tribes of the
Columbia Basin Fish and Wildlife Authority

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Special recognition also goes to the individual writers from the various fish and wildlife agencies and Indian tribes who have spent countless hours writing and rewriting the plans.

The System Planning Group also wants to acknowledge Duane Anderson of the Northwest Power Planning Council's staff for his assistance and expertise in computer modeling. Eric Lowrance and Leroy Sanchez from the Bonneville Power Administration also deserve recognition for developing the useful salmon and steelhead distribution maps, which appear in many of the subbasin plans.

Last, but not least, the System Planning Group recognizes the members of the System Planning Oversight Committee and the Columbia Basin Fish and Wildlife Authority's Liaison Group for their guidance and assistance over the past several months.

## INTRODUCTION

The Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program calls for long-term planning for salmon and steelhead production. In 1987, the council directed the region's fish and wildlife agencies, and Indian tribes to develop a systemwide plan consisting of 31 integrated subbasin plans for major river drainages in the Columbia Basin. The main goal of this planning process was to develop options or strategies for doubling salmon and steelhead production in the Columbia River. The strategies in the subbasin plans were to follow seven policies listed in the council's Columbia River Basin Fish and Wildlife Program (Appendix A), as well as several guidelines or policies developed by the basin's fisheries agencies and tribes.

This plan is one of the 31 subbasin plans that comprise the system planning effort. All 31 subbasin plans have been developed under the auspices of the Columbia Basin Fish and Wildlife Authority, with formal public input, and involvement from technical groups representative of the various management entities in each subbasin. The basin's agencies and tribes have used these subbasin plans to develop the Integrated System Plan, submitted to the Power Planning Council in late 1990. The system plan will guide the adoption of future salmon and steelhead enhancement projects under the Northwest Power Planning Council's Columbia Basin Fish and Wildlife Program.

In addition to providing the basis for salmon and steelhead production strategies in the system plan, the subbasin plans attempt to document current and potential production. The plans also summarize the agencies' and tribes' management goals and objectives; document current management efforts; identify problems and opportunities associated with increasing salmon and steelhead numbers; and present preferred and alternative management strategies.

The subbasin plans are dynamic plans. The agencies and tribes have designed the management strategies to produce information that will allow managers to adapt strategies in the future, ensuring that basic resource and management objectives are best addressed. Furthermore, the Northwest Power Planning Council has called for a long-term monitoring and evaluation program to ensure projects or strategies implemented through the system planning process are methodically reviewed and updated.

It is important to note that nothing in this plan shall be construed as altering, limiting, or affecting the jurisdiction, authority, rights or responsibilities of the United States, individual states, or Indian tribes with respect to fish, wildlife, land and water management.

The Umatilla River Subbasin Plan was jointly developed by a management committee of state and tribal fishery agencies, a public advisory committee representing a range of fishery interests, and a technical committee that included land management agencies and tribal representatives. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) were assigned the lead authorship role. The Technical Committee met during the planning process to generate background information, review and critique drafts, and offer ideas and suggestions concerning the management of fishery resources. Material generated by the Technical Committee was submitted to the Public Advisory Committee for consideration and to obtain comments and suggestions. The Fish Management Committee then developed final versions of the plan based on input from the technical and public advisory committees. The committees did not function as completely separate entities. Fish Management and Technical Committee members also attended Public Advisory Committee meetings to answer questions and explain proposed management strategies.

The Public Advisory Committee members were as follows:

Hadley Akins (Umatilla Basin Steering Committee)
Bill Porfily (Irrigation District Manager)
Stuart Barclay (OR Trout/E. OR Fly Fishing & Fiction Soc.)
Chuck Norris (State Representative - Dist. 57)
Virgil Rupp (Agri-Times NW)
Bill Hansell (Umatilla County Commissioner)
Diane Berry (Oregon Trail Tourism Council)
Greg Smith (KUMA/Sportsman)
Mike Henderson (Industry/State Water Planning Gp.)
Tyler Hansell (Farmer/State Water Planning Gp.)

The Technical Committee included the following representatives from the tribe, state, and federal agencies:

Gary James* (CTUIR), Pendleton
Doug Olson* (CTUIR), Pendleton
Ed Chaney (CTUIR), Pendleton
Jim Phelps* (ODFW), Pendleton
Ron Boyce (ODFW), Portland
Rich Carmichael* (ODFW), La Grande
John Sanchez (USFS), Pendleton
Rich Prange (BR), Boise, ID
Ron Garst (USFWS), Portland
Mike Ladd (OWRD), Pendleton
Steve Brutscher (OWRD), Salem

*Fish Management Committee Members

Initial policy review and input has been provided by the fishery management entities:

CTUIR, Fish and Wildlife Committee
ODFW, NE Region and Portland

## PART I. DESCRIPTION OF SUBBASIN

### Location and General Environment

The Umatilla River in northeast Oregon originates on the west slope of the Blue Mountains east of Pendleton (Fig. 1). The river flows northwesterly across the Umatilla Plateau for about 115 miles to its confluence with the Columbia River at River Mile (RM) 289. Virtually all of the 2,290-square-mile drainage is within Umatilla County.

The basin is comprised of two major physiographic regions. Multiple flows of basalt formed the Deschutes-Umatilla Plateau, a broad upland plain that slopes northward from the Blue Mountains to the Columbia River. Elevations range from about 270 feet at the Columbia River to about 3,000 feet along the toe of the Blue Mountains.

The high relief Blue Mountains region was created by faulting and folding of a variety of volcanic, sedimentary and metamorphic rock. The mountains stretch along the southern and eastern boundary of the basin. Elevations range from 3,000 feet to 6,000 feet. A small percentage of the basin's area, the Blue Mountains are the source of the subbasin's major rivers and streams.

Multiple flows of lava known as the Columbia River basalt underlie nearly all of the Umatilla River Subbasin. Older volcanic, sedimentary and metamorphic rocks are exposed along the crest of the Blue Mountains. Sedimentary deposits cover the basalt throughout much of the subbasin. Alluvium deposited by modern rivers and streams is common in valleys and floodplains. Much of the subbasin is covered by windblown silt and fine sand.

Annual precipitation ranges from less than 10 inches in a band along the Columbia River, up to 45 inches in the Blue Mountains. Annual temperatures for the lower elevation areas average from 50 degrees to 55 degrees Fahrenheit (10 to 13 degrees Celsius). Extremes of 115 F (46 C) and minus 21 F (minus 29 C) recently have been recorded.

Principal forest species in the Blue Mountains include lodgepole pine, ponderosa pine, Douglas fir, white fir, grand fir, subalpine fir, Engelmann spruce, and larch. On the plateau lands, overgrazing by domestic livestock and cultivation has converted native grassland to sagebrush, rabbit brush, bitter brush and other drought-tolerant species. Vast areas of upland soils are dryland farmed and have sparse vegetative cover from late fall to early spring. Thousands of acres of sagebrush and grass in the lower reaches of the subbasin have been converted to irrigated cropland.

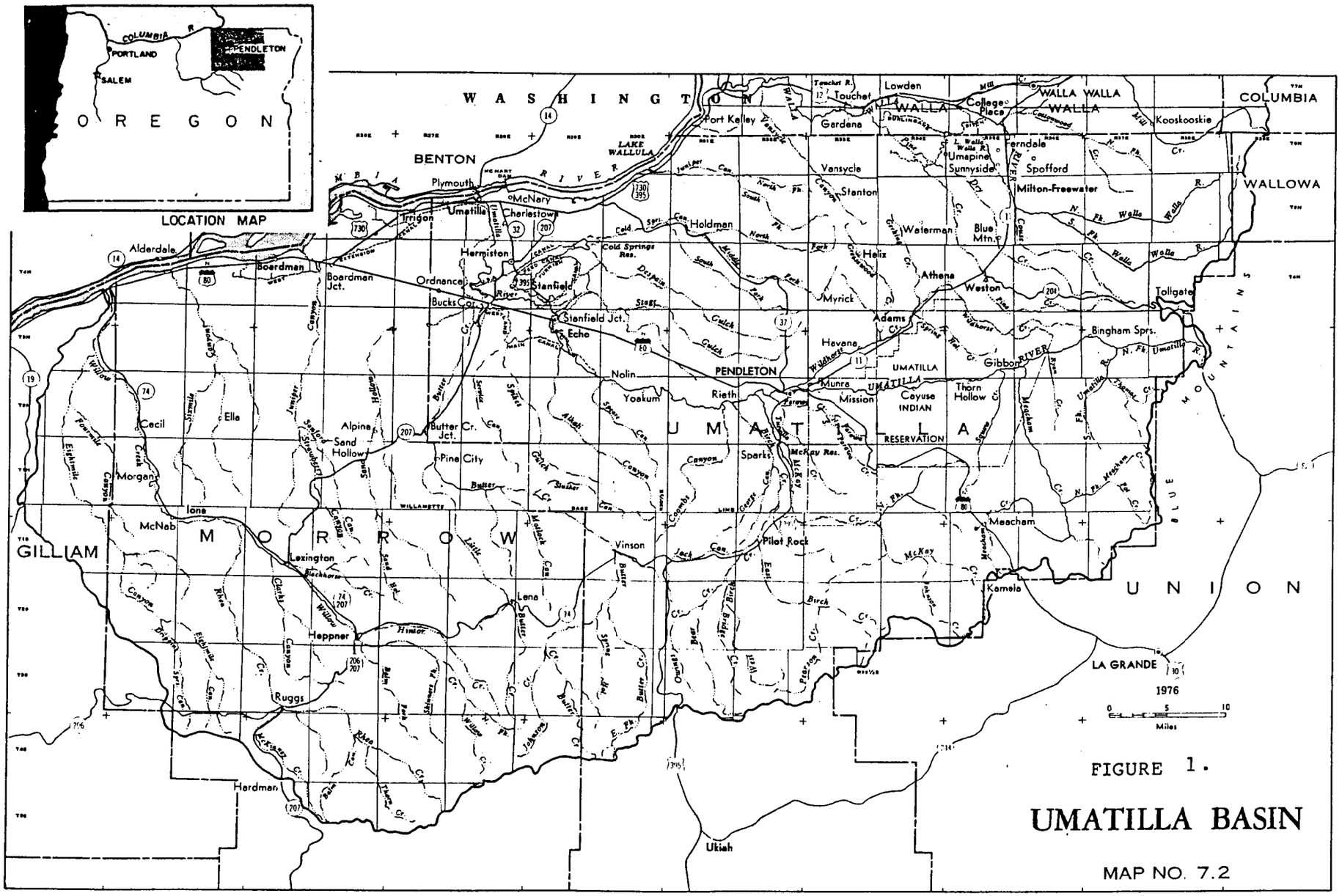



FIGURE 1.

# UMATILLA BASIN

MAP NO. 7.2

Riparian vegetation on reaches of the mainstem Umatilla and many tributary streams is in poor condition. Approximately 70 percent of 422 miles of streams in the Umatilla inventoried by the Oregon Department of Fish and Wildlife would benefit from riparian improvements (ODFW 1987). Headwater areas are generally well shaded by a conifer canopy. On the mainstem Umatilla between the Forks (RM 90) and Meacham Creek (RM 79), a mixture of deciduous trees and conifers provides a moderate amount of shading. Below Meacham Creek, the river channel widens and deciduous trees, shrubs, and grasses provide little shading (CTUIR 1984).

Seven irrigation diversion dams on the mainstem Umatilla River obstruct upstream and downstream migration of anadromous fish. Passage improvements are planned at all these structures and have been completed at Three Mile Dam, the largest, lowermost diversion, which serves the West Extension Irrigation District.

Irrigation-related dewatering and related high summer water temperatures effectively block fish passage (and spawning and rearing) in the lower 32 miles of the mainstem Umatilla River, generally from June through September.

## Water Resources

Groundwater in the basalt flows very slowly, discharging at springs and into streams where basalts are exposed. Umatilla Subbasin groundwater ultimately discharges to the Columbia River. There is little natural recharge to the basalt groundwater reservoir underlying the subbasin. Alluvial groundwater in the subbasin is recharged by infiltration from precipitation and hydraulically connected surface water sources, and by infiltration of irrigation water. Alluvial groundwater discharges to surface waters through springs and subsurface outflow.

Irrigation diversions frequently dewater sections in the lower 32 miles of the Umatilla River from late spring through summer, but return flows from these operations significantly enhance flows in this area in later summer and fall.

In many areas of the subbasin, withdrawals for irrigation, municipal and industrial use have severely depleted basalt and alluvial groundwater.

State imposed restrictions on further withdrawals and increased energy costs of high pumping lifts has increased competition for surface water already badly overappropriated during periods critical to anadromous fish (OWRD 1988).

Major Umatilla River tributaries include the North Fork (enters the Umatilla at RM 90) and the South Fork Umatilla River (RM 90), and Meacham (RM 79), Birch (RM 51), McKay (RM 48), and Butter (RM 15) creeks. Stream gradients range from 2 percent to 5 percent in the headwaters and 0.5 percent to 1 percent from the Forks to Meacham Creek. Below Meacham Creek, the Umatilla gradually widens; gradient is less than 0.5 percent (CTUIR 1984).

Runoff generally peaks in the spring as high elevation snowpack melts. Flows diminish throughout the summer to lows in August or September. Isolated storms may cause locally high flows for short periods during the summer and early fall. Streamflows increase in late fall and winter in response to storms pushing in from the Pacific Ocean. Figure 2 shows annual runoff distribution for the Umatilla River at four locations.

Table 1 contains average monthly discharge at gages in the subbasin. The mainstem Umatilla River extends 90 miles from its mouth to the confluence with its North and South Fork tributaries. The watershed above Pendleton is 637 square miles, about 25 percent of the total drainage. Average discharge of the Umatilla River at Pendleton (RM 53) is about 369,000 acre-feet per year (OWRD 1988).

The drainage area above the Yoakum gauge, just 17 miles downstream from Pendleton, is about 1,280 square miles, twice that above Pendleton. However, the average annual discharge is only about 126,000 acre-feet more or 495,000 acre-feet (OWRD 1988).

Butter Creek is the only major tributary to the Umatilla River below Yoakum. Downstream, the watershed is low elevation farmland that yields relatively little runoff except during periods of heavy rain. Adding the Butter Creek yield of 20,000 acre-feet to the gaged yield at Yoakum indicates a conservative total annual yield for the Umatilla River of 515,000 acre-feet, compared to the 336,000 acre-feet yield gaged at RM 2 near Umatilla. The difference is primarily due to extensive withdrawals for irrigation (OWRD 1988).

Irrigation is the largest use of surface and groundwater in the Umatilla River Subbasin. Industrial and municipal users largely rely on groundwater. Tables 2 and 3 list water rights by area and use. Many of the streams in the Umatilla Basin are overappropriated. In many areas cumulative water rights and irrigation demands exceed available streamflow.

Table 1. Average Streamflows (cfs)

| USGS Gage Stations | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ANN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| #2000 Umatilla River by Meacham Creek | 59.5 | 126 | 248 | 270 | 315 | 378 | 545 | 458 | 202 | 66.6 | 48 | 47.8 | 228 |
| #2100 Umatilla River at Pendleton | 74.1 | 241 | 585 | 662 | 834 | 1044 | 1361 | 885 | 326 | 76.2 | 39.1 | 45.8 | 508 |
| #2200 Umatilla River by McKay Creek | 99.8 | 293 | 413 | 564 | 767 | 1125 | 1193 | 660 | 223 | 43.5 | 24.2 | 45.8 | 453 |
| #22500 McKay Creek nr Pilot Rock | 7.56 | 40.7 | 121 | 162 | 199 | 271 | 279 | 125 | 38.3 | 4.63 | .73. | 1.95 | 103 |
| #2500 Birch Creek at Reith | 3.57 | 14.4 | 43 | 65.3 | 77.5 | 108 | 159 | 97.4 | 26.6 | 1.87 | .35 | .75 | 48.6 |
| #2600 Umatilla River at Yoakum | 91.1 | 240 | 625 | 753 | 970 | 1277 | 1665 | 1032 | 501 | 355 | 308 | 166 | 669 |
| #32000 Butter Creek nr Pine City | 2.63 | 81.8 | 23.4 | 39.2 | 53.2 | 72 | 76.4 | 46.4 | 14.6 | 3.15 | .98 | 1.29 | 28 |
| #33500 Umatilla River nr Umatilla | 80.2 | 231 | 559 | 718 | 913 | 1089 | 1153 | 579 | 121 | 21.3 | 23.1 | 35.5 | 457 |

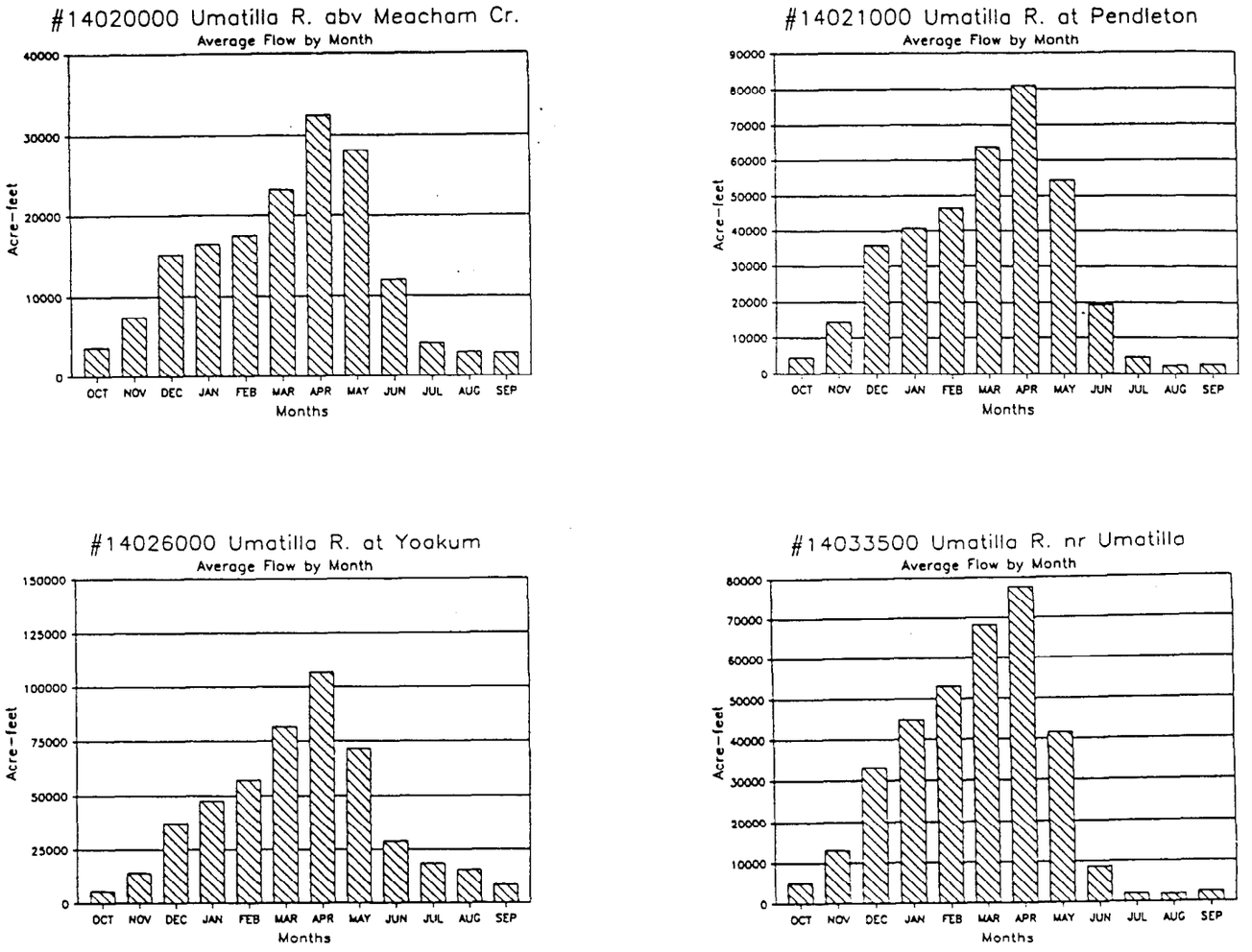



Figure 2. Distribution of annual runoff at selected gages (OWRD 1988c).

Table 2. Umatilla basin surface water rights (OWRD 1988c).

| | Irrigation | Domestic | Livestock | Municipal | Industrial/ Manufact. | Commercial | Fire Protect | Temp. Control | Sewage Effluent | Storage | Power | Fish | Wildlife | Mining |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Umatilla Drainage** (Upper Umatilla & Columbia-Umatilla Plateau Subbasins) | 1776.427 | 0.503 | 0.141 | 31.2 | 6.131 | 0 | 0.012 | 0 | 0 | 55,907.467 AF | 108 | 32.511 | 0.002 | 0 |
| Umatilla R. above Pendleton | 7.681 | 0.146 | 0 | 7.7 | 2.119 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| Umatilla River | 1282.032 | 0.21 | 0.035 | 31.2 | 5.119 | 0 | 0 | 0 | 0 | 55,509.4 AF | 108 | 32.51 | 0.002 | 0 |
| **Butter Creek Subbasin** | 390.408 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 6.7 AF | 0 | 0 | 0 | 0 |
| Butter Creek | 238.728 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Birch Creek Subbasin** | 61.324 | 0.198 | 0.012 | 0 | 1 | 0 | 0 | 0 | 0 | 0.14 AF | 0 | 0 | 0.002 | 0 |
| Birch Creek | 28.839 | 0.143 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **McKay Creek Subbasin** | 30.285 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 73,250 AF | 0 | 0 | 0 | 0 |
| McKay Creek | 29.66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 73,250 AF | 0 | 0 | 0 | 0 |
| **Wildhorse Creek Subbasin** | 9.09 | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wildhorse Creek | 3.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

All rights in cfs except where noted.
These water rights tabulations are provisional.
These figures do not incorporate diversion rates for alternate uses.
Diversions would be double counted if that were the case.
Storage is separate from the use of stored water.
Assumptions operated under:
1) Irrigation rights are for purposes of calculation 180 days.
2) Primary and supplemental rights are combined.

Table 3. **SURFACE WATER CLASSIFICATION SUMMARY** (OWRD 1988b).
**June 24, 1988**

| | Domestic | Livestock | 1/2 Acre Irrigation | Irrigation | Municipal | Industrial | Power | Mining | Artificial Ground Water Recharge | Fish Life | Wildlife | Recreation | Public Instream Uses | Frost Control | Pollution Abatement | Minimum Streamflow | Storage | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. WALLA WALLA SUBBASIN | | | | | | | | | | | | | | | | | | 1/ Walla River and tributaries withdrawn from and including Little Walla Walla diversion to the stateline. |
| Walla Walla Subbasin generally 1/ | X | X | | X | X | X | X | X | X | X | X | X | X | X 2/ | X | X | X | 2/ Water for frost control from Walla Walla River limited to total permits of 35 cfs with priority after December 2, 1985. |
| Walla Walla River & Tributaries upstream from Little Walla Walla diversion | X | X | X | | X | | | X | X | X | X | X | X | | X | X | X | |
| Mill Creek & Tributaries | X | X | X | | X | | | | X | X | X | X | X | | X | X | X | 3/ Minimum flows on Couse Creek and tributaries only. |
| Couse & Pine Creeks & Tributaries | X | X | X | | | | | | X | X | X | | X | | X | X 3/ | X | 4/ Wildhorse Creek and tributaries withdrawn from June 1 through October 31 classified uses allowed only from November 1 through May 31. |
| 2. WILDHORSE CREEK SUBBASIN | | | | | | | | | | | | | | | | | | |
| Wildhorse Creek & Tributaries 4/ | X | X | X | | | | X | X | X | X | X | X | X | | X | | X | 5/ Upper Umatilla River and tributaries withdrawn from June 1 through Oct. 31. Classified uses allowed only from November 1 through May 31. |
| 3. UPPER UMATILLA SUBBASIN | | | | | | | | | | | | | | | | | | |
| Upper Umatilla River & Tributaries 5/ | X | X | X | | X | X | X | X | X | X | X | X | X | | X | X 6/ | X | 6/ Minimum flows on main stem Umatilla River and several tributaries. |
| 4. BIRCH & MCKAY CREEKS SUBBASIN | | | | | | | | | | | | | | | | | | |
| Birch & McKay Creeks & Tributaries 7/ | X | X | X | | X | X | X | X | X | X | X | X | X | | X | X 8/ | | 7/ Birch and McKay Creeks and tributaries withdrawn from June 1 through Oct. 31. Classified uses allowed only from November 1 through May 31. |
| 5. COLUMBIA - UMATILLA PLATEAU SUBBASIN | | | | | | | | | | | | | | | | | | |
| Umatilla River Main Stem 9/ | X | X | X | | X | X | | X | X | X | X | X | X | X | X | X 10/ | X | 8/ Minimum flows on Birch Creek and tributaries. |
| Umatilla River Tributaries 9/ | X | X | | X | | | X | X | X | | | | | X | X | | X | |
| Non-Umatilla River Tributaries | X | X | | X | | | X | X | X | | | | | X | | | X | 9/ Umatilla River and tributaries withdrawn from June 1 to October 31. |
| 6. BUTTER CREEK SUBBASIN | | | | | | | | | | | | | | | | | | |
| Butter Creek & Tributaries 11/ | X | X | X | | | | X | | X | X | X | X | X | | X | | X | 10/ Minimum flows on main stem Umatilla River. |
| 7. WILLOW CREEK SUBBASIN | | | | | | | | | | | | | | | | | | |
| Willow Creek & Tributaries | X | X | X | | X | X | X | X | X | X | X | X | X | | X | | X | 11/ Butter Creek and tributaries withdrawn from June 1 to October 31. Classified uses allowed only from November 1 through May 31. |

Table 4. Stream flow and major diversions (cfs)

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pendleton Gage | 74.4 | 229 | 582 | 672 | 855 | 1044 | 1316 | 880 | 326 | 76.4 | 39.3 | 46.2 |
| Yoakum Gage | 88 | 253 | 655 | 788 | 1032 | 1278 | 1665 | 1102 | 513 | 369 | 323 | 173 |
| Furnish Canal | .6 | 0 | 0 | 0 | 0 | 11 | 84 | 114 | 114 | 115 | 105 | 45 |
| Feed Canal | 21 | 103 | 159 | 143 | 174 | 189 | 176 | 172 | 61 | 0 | 0 | 0 |
| Allen Canal | 15 | .2 | 0 | 0 | 0 | 0 | 15 | 16 | 16 | 15 | 14 | 14 |
| Maxwell Canal | 21 | 0 | 0 | 0 | 0 | .2 | 54 | 68 | 50 | 38 | 35 | 30 |
| Western Land Canal | 4 | 3 | 3 | 1 | 2 | 47 | 197 | 200 | 178 | 183 | 164 | 81 |
| West Diversion Canal | 94 | 16 | 3 | 0 | 3 | 46 | 142 | 166 | 160 | 165 | 165 | 142 |
| | 156 | 122 | 165 | 144 | 179 | 293 | 668 | 736 | 579 | 516 | 483 | 312 |
| Umatilla Gage | 86.3 | 249 | 596 | 757 | 980 | 1090 | 1175 | 590 | 127 | 21.6 | 23.3 | 36 |
| Available Flow Yoakum minus Canals | | 131 | 490 | 644 | 853 | 985 | 997 | 366 | | | | |
| Umatilla MPSF from McKay Cr. to Mouth | 300 | 300/250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 120 | 85 | 85/250 |

Note (1) Gage station data is for period 1935-1986.
(2) Gaged data on canals for the period of record 1920/1921 - 1985.
(3) Feed canal primary period of diversion is Nov. - June, but varies with conditions. In some years there are no diversions in Nov., Dec., and June.
(4) Since 1979 Western Land Canal has diverted on average: 42 cfs in Oct., 29 cfs in Nov., 24 cfs in Dec., 7 cfs in Jan., and 15 cfs in Feb.
(5) Data for Dillon Canal not included. Quantity diverted similar to Allen Canal.
(6) There is no correlation between stream flow gaged at Yoakum with gaged flow near Umatilla because of diversions and indeterminable return flow to the river between Echo and Umatilla.

Irrigation-depleted streamflow in the lower 32 miles of the mainstem Umatilla River is the major factor limiting production of anadromous fish in the Umatilla River Subbasin. Six major diversions frequently dewater reaches of the lower mainstem (Table 4). In addition to presenting a physical obstacle to fish passage, typically June to September, these depletions contribute to elevated summer water temperatures exceeding the upper lethal temperatures for anadromous salmonids (75 F to 78 F).

Minimum streamflows as established by the Oregon Water Resources Department (Table 5) are usually not achieved in the lower mainstem Umatilla River during June, September, October, and November (Figs. 3 and 4).

Umatilla River headwaters generally are cool, clear, low in pollutants, and high in dissolved oxygen. High levels of suspended solids and fecal coliform are present in the lower 57 miles of the Umatilla River. City of Pendleton effluent discharge periodically exceeds water quality standards. Feedlots, irrigation return flows and other non-point sources of nutrients and bacteria exceed water quality standards in summer months when low streamflows concentrate pollutants. Summer water temperatures in lower reaches of the watershed chronically exceed 70 F (OWRD 1988).

The Umatilla River Subbasin produces large amounts of sediment, mostly from agricultural land. Peak sedimentation occurs during freeze and thaw periods accompanied by rainstorms or rapid snowmelt. The Wildhorse Creek drainage, which discharges into the mainstem Umatilla River at RM 55, is a major sediment producer (OWRD 1988).

Surface water quality is monitored at four stations on the mainstem Umatilla River.

## Land Use

Approximately 51 percent of the Umatilla River drainage basin is privately owned; 37 percent is managed by federal agencies, principally the U.S. Forest Service; 1 percent is owned by the state of Oregon; and approximately 11 percent lies within the boundaries of the Umatilla Indian Reservation, much of which is privately owned (CTUIR 1984).

Table 5. Minimum Perennial Streamflows (cfs) (OWRD 1988b).

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | PRIORITY DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **UPPER UMATILLA SUBBASIN** | | | | | | | | | | | | |
| **Umatilla River from below the confluence of the Forks to the confluence of Meacham Creek.** | | | | | | | | | | | | |
| 25 | 25 | 60 | 60 | 97 | 97 | 97 | 97 | 60 | 40 | 40 | 40 | 3-31-88 |
| Umatilla River from Meacham Creek to McKay Creek. | | | | | | | | | | | | |
| 200 | 200 | 200 | 200 | 240 | 240 | 240 | 240 | 200 | 100 | 60 | 60 | 11-3-83 |
| Umatilla River from McKay Creek to the mouth. | | | | | | | | | | | | |
| 300 | 300/ 250* | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 120 | 85 | 85/ 250* | 11-3-83 |
| North Fork Umatilla River from below the confluence of Coyote Creek. | | | | | | | | | | | | |
| 12 | 12 | 25 | 25 | 40 | 40 | 40 | 40 | 25 | 25 | 25 | 25 | 3-31-88 |
| South Fork Umatilla River from below the confluence of Thomas Creek. | | | | | | | | | | | | |
| 15 | 15 | 30 | 30 | 58 | 58 | 58 | 58 | 30 | 30 | 30 | 30 | 3-31-88 |
| Buck Creek at the mouth. | | | | | | | | | | | | |
| 5 | 5 | 10 | 16 | 16 | 16 | 16 | 16 | 15 | 5 | 5 | 5 | 3-31-88 |
| Thomas Creek from below the confluence of Spring Creek to the mouth. | | | | | | | | | | | | |
| 3 | 3 | 15 | 15 | 25 | 25 | 25 | 25 | 15 | 8 | 3 | 3 | 3-31-88 |
| North Fork Meacham Creek from below the confluence of Bear Creek. | | | | | | | | | | | | |
| 10 | 10 | 40 | 40 | 70 | 70 | 70 | 70 | 40 | 25 | 10 | 10 | 3-31-88 |
| Camp Creek at the mouth. | | | | | | | | | | | | |
| 5 | 5 | 11 | 11 | 11 | 11 | 11 | 11 | 5 | 5 | 5 | 5 | 3-31-88 |
| Squaw Creek from below the confluence of Little Squaw Creek. | | | | | | | | | | | | |
| 4 | 4 | 20 | 20 | 27 | 27 | 27 | 27 | 20 | 12 | 4 | 4 | 3-31-88 |
| Ryan Creek at the mouth. | | | | | | | | | | | | |
| 5 | 10 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 5 | 5 | 3-31-88 |

* flow levels are split for days 1-15/16-31

(continued.)

Table 5 continued. Minimum perennial streamflows (cfs).

| OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | PRIORITY DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BIRCH AND MCKAY CREEKS SUBBASIN** | | | | | | | | | | | | |
| **Birch Creek from the confluence of the East and West Forks of Birch Creek to the mouth.** | | | | | | | | | | | | |
| 8 | 8 | 20 | 20 | 30 | 30 | 30 | 30 | 20 | 12 | 8 | 8 | 11-3-83 |
| **West Fork Birch Creek from below the confluence of Owings Creek.** | | | | | | | | | | | | |
| 5 | 5 | 20 | 20 | 24 | 24 | 24 | 24 | 20 | 10 | 5 | 5 | 3-31-88 |
| **Bridge Creek at the mouth.** | | | | | | | | | | | | |
| 2 | 2 | 5 | 7 | 7 | 7 | 7 | 7 | 2 | 2 | 2 | 2 | 3-31-88 |
| **Stanley Creek at the mouth.** | | | | | | | | | | | | |
| 2 | 2 | 5 | 6 | 6 | 6 | 6 | 6 | 2 | 2 | 2 | 2 | 3-31-88 |
| **Pearson Creek at the mouth.** | | | | | | | | | | | | |
| 2 | 2 | 5 | 18 | 18 | 18 | 18 | 18 | 10 | 5 | 2 | 2 | 3-31-88 |

* flow levels are split for days 1-15/16-31

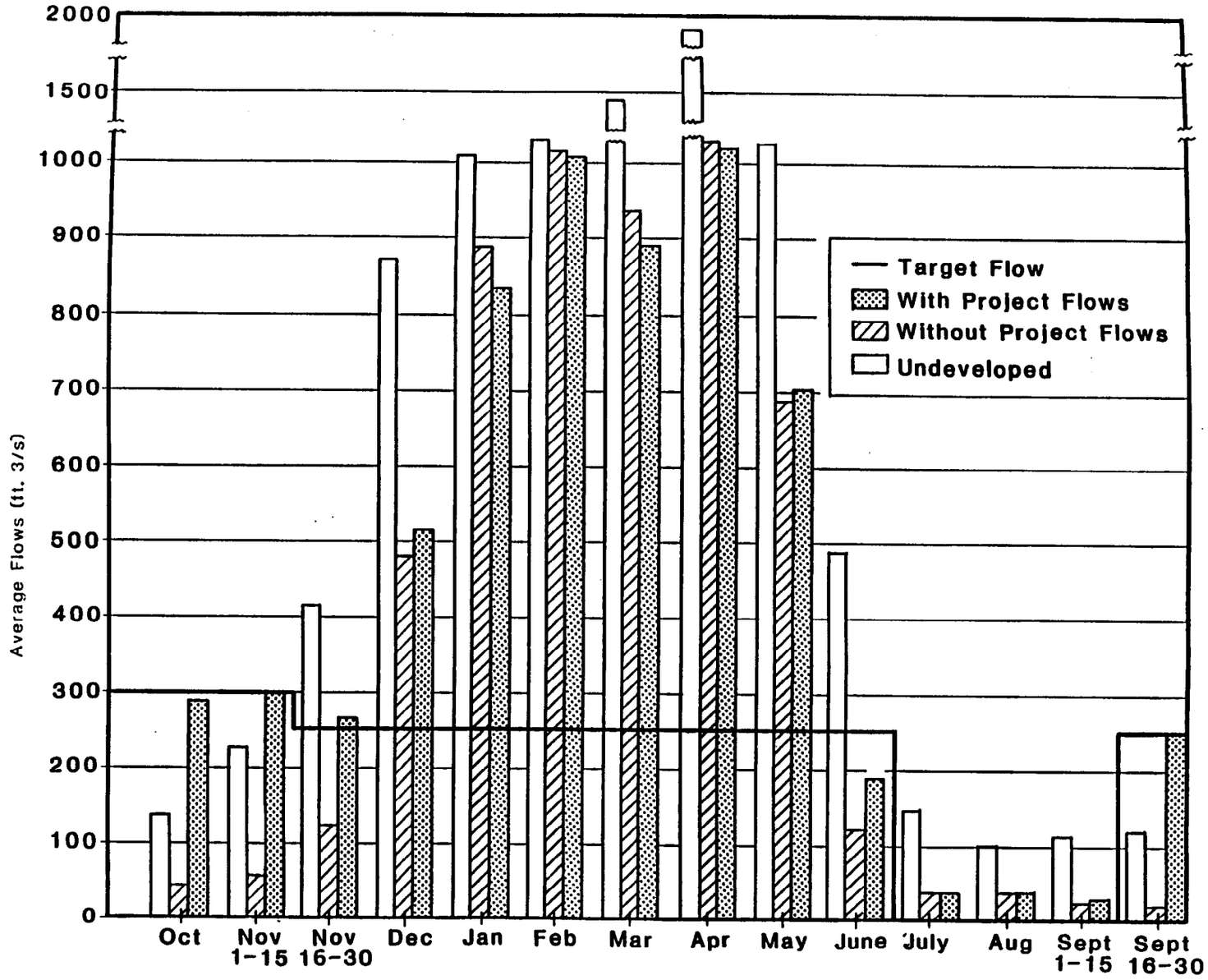



Figure 4. Flows at Echo (BOR 1988).

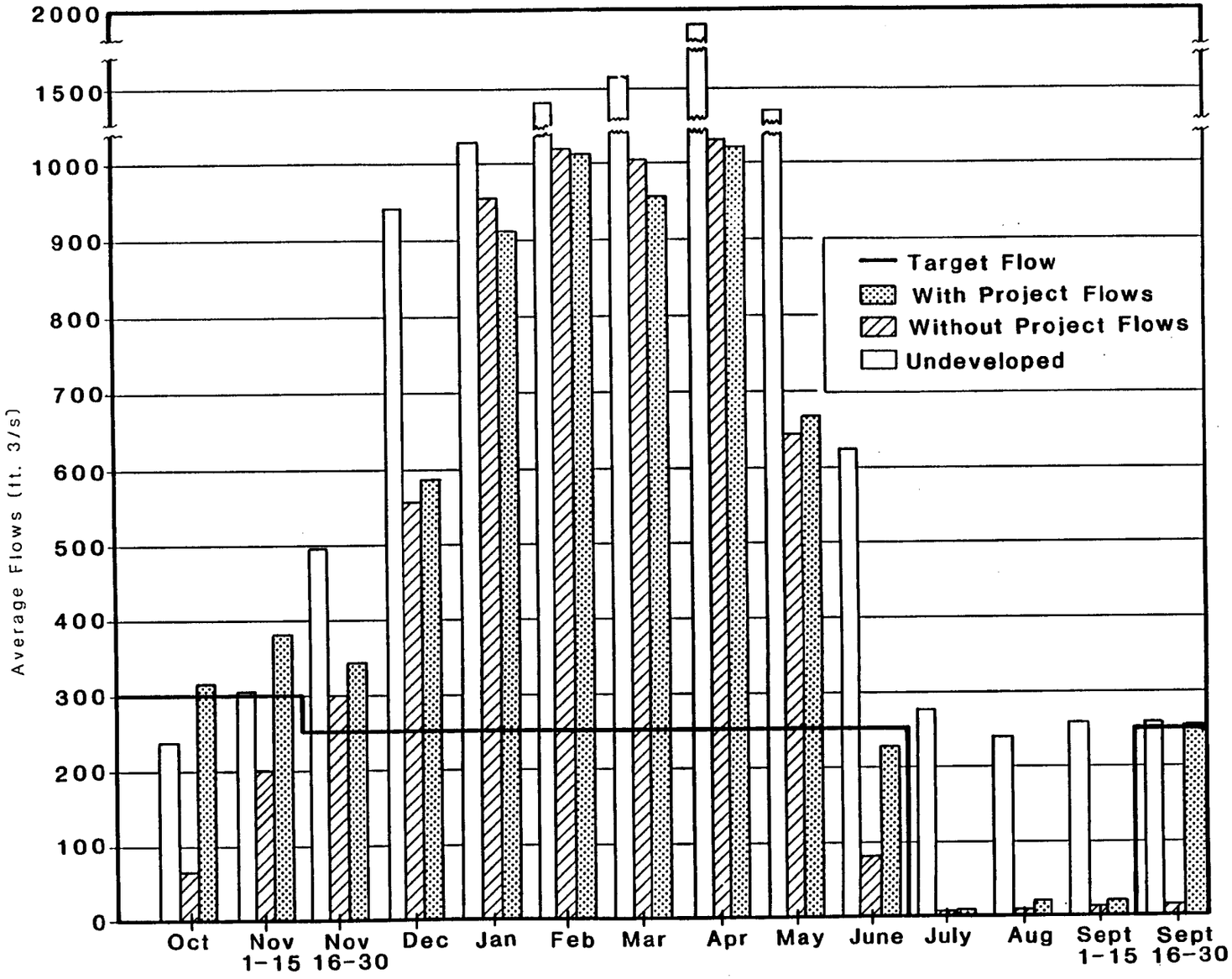



Figure 3. Flows at Umatilla (BOR 1988).

Table 6. Umatilla County Resources, 1983.

| Land Ownership | | |
|---|---|---|
| Total County Area | | 2,074,496 acres |
| Private Land | | 1,612,901 acres* |
| Federal Land | | 406,655 acres |
| U.S. Forest Service | 376,504 acres | |
| Bureau of Land Management | 9,869 acres | |
| Bureau of Reclamation | 4,487 acres | |
| Corps of Engineers | 5,426 acres | |
| Department of Defense | 9,672 acres | |
| U.S. Fish & Wildlife Service | 467 acres | |
| Bonneville Power Administration | 230 acres | |
| State of Oregon | | 27,320 acres |
| Umatilla County | | 12,242 acres |
| Urban-Municipal | | 15,378 acres |

*Includes 85,351 acres on the Umatilla Reservation of which 16,364 acres are tribal owned and 68,981 acres are in individual ownerships.

| Land Use | |
|---|---|
| Dry Cropland - Grains | 622,700 acres |
| Field and Truck Crops | 58,265 acres |
| Orchards | 3,290 acres |
| Hay and Silage | 61,500 acres |
| Grass and Legume Seed | 3,880 acres |
| Nursery and Greenhouse Products | 200 acres |
| Rangeland | 581,311 acres |
| Woodland | 250,755 acres |
| Land in Houselots, Barnlots, Ponds and Roads | 31,000 acres |

Approximately 110,300 acres are irrigated in the County.

All headwater tributaries originate on the Umatilla National Forest. The majority of flow in the upper mainstem Umatilla River drains from the 20,144-acre North Fork Umatilla Wilderness Area. Forest lands are managed for multiple uses including timber harvest, domestic livestock grazing and motorized recreation. Timber harvest and road construction are proscribed on wilderness lands; low impact recreation and limited livestock grazing are permitted. Lower elevation, non-timbered uplands are predominately privately owned and devoted to livestock grazing and dryland agriculture.

The lower reaches of the basin have been extensively and intensively developed for irrigated agriculture. The largest development is the Umatilla Project constructed by the Bureau of Reclamation in the early 1900s. It provides water to about 30,000 acres in four irrigation districts in the lower Umatilla River valley and west along the Columbia River. A total of approximately 50,000 acres are irrigated in the basin.

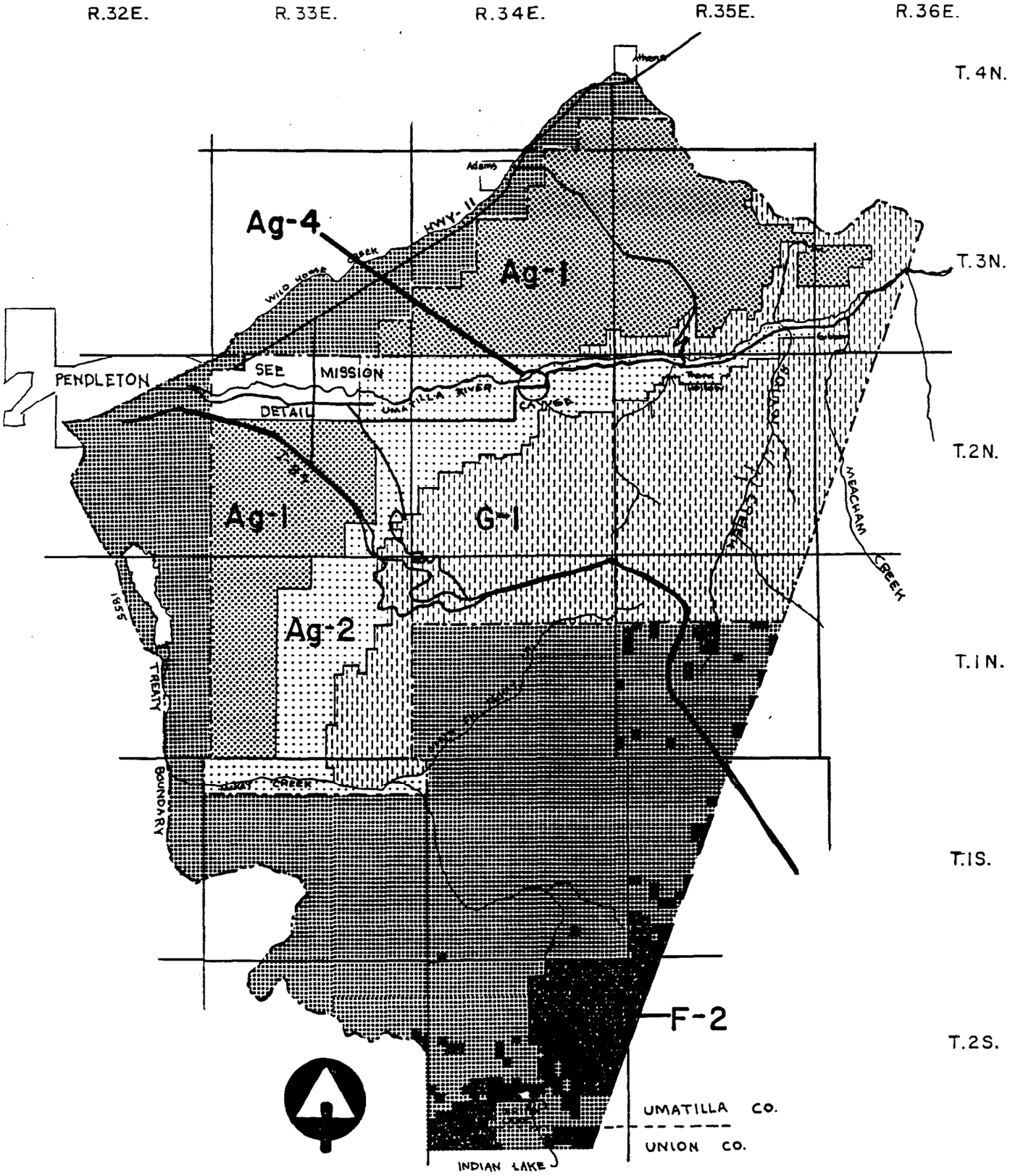
A small hydroelectric project began operation at Umatilla RM 10 in 1989. This was closely coordinated with fishery management agencies to ensure minimal fishery impacts.

Table 6 contains details on Umatilla County land ownership and use. Figure 5 details land-use zones on the Umatilla Indian Reservation in the middle to upper Umatilla drainage.

Table 7 compares actual and projected Umatilla County populations with its neighboring counties. Table 8 contains data on populations of cities in Umatilla and neighboring Morrow County.

Table 7. County Populations (actual and projected) (OWRD 1988c).

| County | 1960 | 1970 | 1980 | 1985 | 2000 |
|---|---|---|---|---|---|
| Gilliam | 3,069 | 2,342 | 2,057 | 1,900 | 2,200 |
| Morrow | 4,871 | 4,465 | 7,519 | 7,570 | 12,100 |
| Umatilla | 4,352 | 44,932 | 58,861 | 60,000 | 80,000 |
| Total | 52,292 | 51,739 | 68,437 | 69,470 | 94,300 |




# LAND USE MAP of the

## UMATILLA INDIAN RESERVATION
## LAND DEVELOPMENT CODE

Figure 5.

Table 8. City Populations (center for Population Research and Census, Portland State University as cited in OWRD 1988c).

| City | 1960 | 1970 | 1980 | 1985 | 1986 |
|---|---|---|---|---|---|
| **Morrow Co.** | | | | | |
| Boardman | 156 | 192 | 1,261 | 1,275 | 1,560 |
| Heppner | 1,657 | 1,657 | 1,498 | 1,385 | 1,490 |
| Ione | 346 | 355 | 345 | 345 | 380 |
| Irrigon | 256 | 261 | 700 | 775 | 850 |
| Lexington | 240 | 307 | 307 | 240 | 235 |
| **Umatilla Co.** | | | | | |
| Adams | 192 | 219 | 240 | 245 | 240 |
| Athena | 947 | 872 | 965 | 955 | 945 |
| Echo | 465 | 479 | 624 | 605 | 605 |
| Helix | 152 | 152 | 155 | 155 | 155 |
| Hermiston | 4,397 | 4,893 | 9,408 | 9,890 | 9,890 |
| Milton-Freewater | 4,182 | 4,105 | 5,086 | 5,850 | 5,745 |
| Pendleton | 14,304 | 13,197 | 14,521 | 14,400 | 14,445 |
| Pilot Rock | 1,693 | 1,612 | 1,630 | 1,630 | 1,620 |
| Stanfield | 744 | 891 | 1,568 | 1,660 | 1,655 |
| Umatilla | 632 | 679 | 3,199 | 2,980 | 2,965 |
| Weston | 778 | 660 | 719 | 730 | 725 |

## PART II. HABITAT PROTECTION NEEDS

### History and Status of Habitat

The geology, topography, soils, climate and precipitation of the subbasin are broadly described in Part I. All these factors significantly affect fish production in the subbasin. The high elevation Blue Mountains intercept moisture-laden air masses moving inland from the Pacific and ultimately yield the majority of subbasin streamflows. Annual precipitation in the middle and lower reaches of the subbasin is low; fish production is very much dependent upon the annual high-elevation snowpack and to a lesser extent, summer thunderstorms.

Alluvium in the mainstem Umatilla River and its tributaries provides a vast amount of spawning gravels. Steep headwater topography contributes to rapid runoff and bedload movement, which limit fish production in some areas. Soils over much of the subbasin are deep windblown silt and fine sand and are highly erodible, yielding sediments that limit fish production, particularly in the lower reaches of the mainstem Umatilla River.

High elevation lands are dominated by forest with an understory of grass and brush; watershed conditions generally are good. Midelevation lands are characterized by stringers and patches of timber shading into brush and grass as elevation declines; large areas have been converted to dryland farming, which yields prodigious amounts of sediment.

Riparian conditions are generally good in the high elevation headwaters. Domestic livestock grazing, road and railroad building, and to a lesser extent forestry practices and other activities have extensively degraded midelevation riparian areas. Low elevation riparian areas generally are in comparatively poor condition as the result of extensive and intensive farming operations.

Irrigation is the principal water use competing with fish production in the subbasin. A network of tributary and mainstem Umatilla River irrigation diversions block and/or impede juvenile and adult migrants during periods of low streamflow. The lower reaches of the mainstem Umatilla River are frequently dewatered during the irrigation season, blocking emigrant juvenile fish and late arriving adults in the late spring, and early arriving adults in the fall.

Part I contains details on mainstem Umatilla River streamflows. Streamflows characteristically peak in April, dropping sharply in May as high elevation runoff subsides and low elevation irrigation diversions increase. By mid-June, flows in the lower 30 to 40 miles of the mainstem are sufficiently

depleted to block or impede both downstream and upstream migrant salmonids. During the summer months, depleted streamflows and elevated water temperatures have converted this reach of river from cold water salmonid habitat to warm water conditions unsuitable for salmonids. By middle to late October, cooler, wetter weather and cessation of irrigation have restored conditions suitable for anadromous salmonid migration, spawning and rearing.

High elevation headwaters of the subbasin characteristically are cool, clear and pollution-free and provide excellent fish habitat. Fish production in many midelevation fish habitats is limited by high summer water temperatures, low or intermittent summer flows, degraded riparian zones, lack of instream habitat diversity, unstable stream channels and, in some areas, winter icing may be a limiting factor.

## Constraints and Opportunities for Protection

### Institutional Considerations

A large number and wide variety of governmental entities and corporate and private land and water managers directly and indirectly affect fish habitat in the Umatilla Subbasin (see Part III). Federal agencies with key roles in habitat protection include the U.S. Forest Service, which manages much of the upper watershed; the U.S. Fish and Wildlife Service and National Marine Fisheries Service, which provide technical and financial support to habitat protection initiatives; U.S. Soil Conservation Service and Agricultural Stabilization and Conservation Service, which provide technical support for watershed improvement initiatives; and the Bureau of Indian Affairs, which provides technical support and funding for habitat-related initiatives within the reservation and in other areas where the Confederated Tribes of the Umatilla Indian Reservation have rights and interests in fish.

The Confederated Tribes of the Umatilla Reservation exercise authority over fish habitat within reservation boundaries, and play a co-management role in habitat protection over a broader area where the tribe has rights and interests in fish.

The Oregon Department of Fish and Wildlife, Department of Environmental Quality, and Water Resources Department and Commission are the principal state entities involved in habitat protection in the subbasin. The Division of State Lands and the departments of Forestry, and Agriculture, and the Land Conservation and Development Commission also play important, varied roles.

Federal, tribal and state fisheries interests have formulated a comprehensive, coordinated habitat protection and enhancement program. In recent years, the Water Resources Department and Commission have increasingly supported these interests, notably in establishing minimum streamflows and advocating improved watershed and water quality initiatives by entities with the requisite authority.

County- and municipal-level land and water management and regulatory activities have significant implications for fish habitat. To date, these entities have not been fully and formally integrated into habitat protection programs in the Umatilla Subbasin.

**Critical Data Gaps**

The information and data required to protect anadromous salmonid habitat in the subbasin is available. Major, coordinated programs are under way to enhance instream flows, improve riparian conditions and to increase habitat diversity. Minimum streamflows, stream channel and water quality regulations are in place or proposed. Lack of regulations, political will and funding to reduce sediment yield from agricultural lands is the most intractable problem confronting fish habitat in the basin.

## Habitat Protection Objectives and Strategies

**Objectives**

1. Provide adequate passage conditions for migrating adult and juvenile salmon and steelhead to and from natural production habitats within the subbasin.

   Low streamflows, inadequately screened irrigation canals, and inadequately laddered irrigation diversion dams currently limit fish passage conditions in the lower Umatilla River.

2. Establish minimum streamflows for all subbasin migration, spawning and rearing habitats.

   Fish habitat is at risk in streams without minimum streamflow requirements and which have not been withdrawn from appropriation.

3. Protect riparian zones from degradation by domestic livestock, forestry and agricultural practices, and by urban, suburban and commercial development.

Degraded riparian zones reduce water yield and/or adversely alter timing of yield, result in destabilized streambanks and stream channels, increase sedimentation and water temperatures, and decrease fish cover and food availability. Riparian protection improves the quality and quantity of water and enhances both fish and wildlife habitats.

4. Protect fish habitat from point and non-point source pollution, including sediments.

   Low summer streamflows concentrate point and non-point source pollutants at levels inimical to juvenile survival. Sedimentation from extensive sources such as logging, livestock grazing and farming severely reduces production potential in the lower mainstem Umatilla River and adversely affects production in many tributary habitats.

5. Improve instream habitat for adult holding and juvenile rearing.

   Predominantly riffle habitat and general lack of instream habitat diversity currently limits smolt production capacity in many Umatilla Basin streams.

**Strategies**

Several strategies or actions for improving fish habitat have been developed (Table 9) as a part of the Umatilla Subbasin Salmon and Steelhead Rehabilitation Plan (ODFW 1986). The following initiatives (many contained in that plan) are aimed at achieving the objectives of improving habitat within the subbasin.

1. Juvenile bypass screens, adult passage facilities, and juvenile and adult capturing and hauling facilities are approved and programmed to facilitate fish passage past irrigation diversions and seasonally dewatered reaches of the lower mainstem Umatilla River (NPPC 1987).

2. A $40-million project to enhance fish passage flows in the lower mainstem Umatilla River has been authorized by Congress. Columbia River Basin Fish and Wildlife Program Measure 703(a)(15) provides for use of 6,000 acre-feet of storage in McKay Reservoir to enhance instream flows (NPPC 1987). Existing irrigation pumps have been employed to enhance instream flows by pumping Columbia River water to irrigators to displace Umatilla River diversions. A proposal for funding to expand use of existing facilities is pending before the Northwest Power Planning Council (CBFWA 1988). Funding is anticipated to be secured in FY 1992.

Table 9. Umatilla River fishery rehabilitation plan -- priorities and schedules for implementation (ODFW 1986).

| FW Program Reference | Project | Implementation Schedule Years to Complete [a] 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| | **Flow Enhancement Projects** | | | | | |
| 704(d)(2) | 1. McKay Storage Plan | 0 | | | | |
| | 2. Bureau of Reclamation's CRP or CRP/Meacham Dam Plans | + | + | + | + | 0 |
| | **Fishery Rehabilitation Projects** | | | | | |
| 704(i)(1) | 1. Hatchery facility for 200K summer steelhead | + | 0 | | | |
| | 2. Fall and spring chinook and coho hatchery production | + | + | + | + | 0 |
| 704(d)(1) Table 2 | 3. Three Mile Falls upstream and downstream passage improvement | + | + | 0 | | |
| | 4. Adult and smolt trapping/trucking program | | + | 0 | | |
| | 5. Westland upstream and downstream passage improvement and smolt trapping facility | | + | 0 | | |
| | 6. Cold Springs upstream and downstream passage improvement | | | + | 0 | |
| | 7. Maxwell and Stanfield upstream and downstream passage improvement | | | | + | 0 |
| | 8. Small diversions downstream passage improvement | | | | | |
| | a. Brownell and Dillon | + | 0 | | | |
| | b. Umatilla River unscreened diversions (5) | | + | 0 | | |
| | c. Birch Creek unscreened diversions (11) | | | + | 0 | |
| | 9. Habitat improvement | | | | | |
| | a. Meacham and North Fork Meacham Creeks | | + | + | 0 | |
| | b. North and South Fork Umatilla River Thomas Creek | + | + | 0 | | |
| | c. Mainstem Umatilla River (Meacham Creek to Forks) | | + | + | 0 | |
| | d. Squaw Creek | | | + | 0 | |
| | e. Birch and East and West Fork Birch Creeks | | | + | + | 0 |

[a] Subsequent to initial start-up of the rehabilitation plan.
+ Project initiation
0 Project completion

3. The Umatilla River has been withdrawn from further appropriation during periods important to anadromous fish (see Part I and OWRD 1988). Minimum streamflows have been established for the mainstem Umatilla River and key tributaries (Table 5). The newly adopted minimum streamflows (March 31, 1988, priority date) did not consider spring chinook salmon needs. The Umatilla Tribes have proposed increasing the minimum streamflow levels (instream water rights) in all potential spring chinook production areas (Table 10). In many cases, the proposed flows do not meet average monthly flows in the summer and early fall. Headwater storage, water conversation, water right purchases, and riparian habitat improvements are all potential means of increasing flows to the proposed instream water right levels.

4. (NEW ACTION) State and tribal streambank and stream channel alteration regulations are in place in the Umatilla Subbasin. The broader riparian zone needs stronger regulatory protection from degradation by forest and agricultural practices, grazing by domestic livestock and urban, suburban and commercial development.

5. (NEW ACTION) Riparian and instream protection and rehabilitation initiatives are under way in the subbasin. This is most comprehensive approach to riparian protection to date and is programmed under a joint Bonneville Power Administration-funded project of the Oregon Department of Fish and Wildlife, U.S. Forest Service, and Confederated Tribes of the Umatilla Indian Reservation (ODFW et al. 1988). The current five-year implementation plan will have to be expanded to 10 or more years to complete all proposed projects.

6. (NEW ACTION) A more comprehensive, subbasinwide riparian protection strategy is needed. This strategy should be a joint effort of all local, county, state, tribal and federal governmental units within the subbasin. Potentially the most cost effective means to enhance instream water quality and quantity for anadromous fish over the long term, riparian protection initiatives should be given high priority for funding by the Northwest Power Planning Council, state of Oregon, and federal agencies with responsibility for fish and broader watershed resources and values.

7. Riparian protection in Umatilla River headwaters should have highest priority in the policies and programs of the Umatilla National Forest.

Table 10. Additional instream water right recommendations (CFS) by month for the Umatilla Basin. 1/

| Stream Name | Location | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Umatilla R | Above Meacham Creek | 100 | 147 | 147 | 147 | 147 | 100 | 80 | 80 | 80 | 80 | 100 | 100 |
| NF Umatilla R | Below Coyote Creek | 40 | 68 | 68 | 68 | 68 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| SF Umatilla R | Below Thomas Creek | 55 | 110 | 110 | 110 | 110 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| SF Umatilla R | Below Shimmiehorn Cr. | 35 | 60 | 60 | 60 | 60 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Buck Creek | Mouth | 27 | 27 | 27 | 27 | 27 | 20 | 11 | 11 | 11 | 11 | 11 | 15 |
| Thomas Creek | Mouth | 25 | 43 | 43 | 43 | 43 | 25 | 25 | 17 | 17 | 17 | 17 | 25 |
| Meacham | Mouth | 120 | 225 | 225 | 225 | 225 | 120 | 100 | 80 | 80 | 80 | 80 | 120 |
| NF Meacham Creek | Below Bear Creek | 70 | 100 | 100 | 100 | 100 | 70 | 60 | 47 | 47 | 47 | 47 | 70 |
| Camp Creek | Mouth | 11 | 11 | 11 | 11 | 11 | 5 | 5 | 5 | 5 | 5 | 5 | 11 |
| Squaw Creek | Below L. Squaw Creek | 20 | 27 | 27 | 27 | 27 | 20 | 12 | 4 | 4 | 4 | 10 | 20 |
| Ryan Creek | Mouth | 15 | 15 | 15 | 15 | 15 | 15 | 10 | 5 | 5 | 5 | 5 | 15 |
| WF Birch Creek | Below Owings Creek | 20 | 24 | 24 | 24 | 24 | 20 | 10 | 5 | 5 | 5 | 5 | 20 |
| Bridge Creek | Mouth | 7 | 7 | 7 | 7 | 7 | 2 | 2 | 2 | 2 | 2 | 2 | 5 |
| Stanley Creek | Mouth | 6 | 6 | 6 | 6 | 6 | 2 | 2 | 2 | 2 | 2 | 2 | 5 |
| Pearson Creek | Mouth | 18 | 18 | 18 | 18 | 18 | 10 | 5 | 2 | 2 | 2 | 2 | 5 |

1/ Developed by CTUIR Office of Fisheries, and ODFW, Pendleton District and submitted by CTUIR as comment to the OWRD Umatilla River Basin Water Resource Plan (1988).

8. Point-source pollutants generally are effectively controlled under existing law and regulations. Non-point sources of pollution are both more intractable and less effectively regulated. An effective, comprehensive riparian protection strategy (addressed above) would substantially ameliorate non-point source pollution from many sources in the subbasin. Alone, it would not adequately address the prodigious yield of sediment from agricultural land, particularly from extensive dryland farming operations on midelevation uplands. A comprehensive, subbasinwide erosion and sediment control strategy is also needed. This strategy should be a joint effort of all relevant local, county, state, tribal and federal entities. An effective strategy must eschew the traditional limited vision of short-term, on-site cost effectiveness and focus on long-term benefits and costs both on and off site.

## PART III. CONSTRAINTS AND OPPORTUNITIES FOR ESTABLISHING PRODUCTION OBJECTIVES

### Institutional Considerations

A large number and wide variety of governmental entities are directly or indirectly involved in land and water management in the Umatilla River Subbasin.

Federal

- Forest Service
- Bureau of Land Management
- Bureau of Reclamation
- Army Corps of Engineers
- Bureau of Indian Affairs
- Fish and Wildlife Service
- National Marine Fisheries Service
- Bonneville Power Administration
- Soil Conservation Service
- Agricultural Stabilization and Conservation Service
- Federal Energy Regulatory Commission
- Environmental Protection Agency
- Geological Survey

Tribal

- Confederated Tribes of the Umatilla Indian Reservation
- Columbia River Inter-Tribal Fish Commission

State

- Department of Fish and Wildlife
- Department of Environmental Quality
- Division of State Lands
- Department of Forestry
- Department of Agriculture
- Land Conservation and Development Commission
- Water Resources Department and Commission

County

- Umatilla County Board of Commissioners
- Port of Umatilla
- Umatilla County Soil and Water Conservation District

Municipal

Adams
Athena
Echo
Helix
Hermiston
Pendleton
Pilot Rock
Stanfield
Umatilla

Irrigation Districts, Companies and Non-incorporated Ditches

Stanfield-Westland Irrigation District
Hermiston Irrigation District
West Extension Irrigation District
Teel Irrigation District
County Line Water Improvement District
Butter Creek Water Users
Pioneer-Courtenay Ditch Company
Dillon Ditch
Terminal Ditch Company
Wilson Ditch
Cunha Ditch
Crain Lyle

The large number of governmental entities directly and indirectly involved in land and water management in the Umatilla Subbasin requires a high degree of cooperation and coordination. In recent years this has occurred to a high degree and extent.

The Oregon Department of Fish and Wildlife and Confederated Tribes of the Umatilla Indian Reservation co-manage anadromous fish resources in the Umatilla Subbasin. Products of this partnership include strategic (CTUIR 1984) and comprehensive plans (ODFW 1986) for restoring fish runs and fisheries; a $20-million fishery improvement program under the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program (NPPC 1987); cooperative annual artificial propagation and release plans, developing a master plan for cooperative operations of the proposed Umatilla Hatchery and for achieving spawning escapement and harvest objectives (ODFW/CTUIR 1988); cooperative efforts to improve instream flows under existing conditions and to restore irrigation-depleted streamflows via the Umatilla Basin Project, which would exchange Columbia River water for Umatilla River water presently diverted for irrigation (BR 1988).

The Oregon Department of Fish and Wildlife and the Confederated Tribes of the Umatilla Indian Reservation cooperate with Forest Service fisheries personnel in fishery habitat

improvement activities (ODFW et al. 1988). The ODFW, Umatilla Tribes, Oregon Department of Water Resources water master, irrigation districts, Bureau of Reclamation and Bonneville Power Administration participate in a "River Operations Group" established to improve communication and coordination between water managers and users and fishery interests. This group currently coordinates interim pumping operations for fish flow enhancement and will eventually coordinate implementation of the proposed Bureau of Reclamation Umatilla Basin Project.

The Umatilla Tribes, Oregon Fish and Wildlife Department and the Union Pacific Railroad have cooperated in a number of fishery enhancement activities in the Meacham Creek drainage.

The Umatilla Tribes and representatives of a broad cross section of non-tribal economic, civic and municipal interests serve on the Umatilla Basin Project Steering Committee formed to develop public and political support for the proposed $40-million Umatilla Basin Project.

The Umatilla Tribes served as advisors to the Oregon Water Resources Department in the formulation of a draft plan and program for the Umatilla and Walla Walla subbasins (OWRD 1988). The resulting progress in improved state-tribal water relations portends ultimate resolution of complex legal issues and development of a joint long-term plan for protection, conservation and development of waters of mutual interest.

Despite the unprecedented cooperation and coordination among entities involved in land and water management in the subbasin, there remain unresolved issues and opportunities for improved coordination and cooperation. Fisheries entities continue to seek forest management plans and practices that are more responsive to fishery needs and tribal rights and interests. Irrigation-depleted streamflows remain the most serious and intractable problem confronting anadromous fish production in the basin. Accelerated effort among all relevant parties is required to enhance critical streamflows for fish passage in the next few years pending implementation of the proposed Umatilla Basin Project.

Although the state of Oregon, through the Water Resources Commission and Department, acknowledges the Umatilla Tribes' reserved rights to water, much work remains before state-tribal water relations achieve the productive co-management status achieved in state-tribal fisheries relations.

While state, tribal and federal fisheries interests have

Non-point source degradation of water quality has barely been addressed in the basin; particularly sediment yield from dryland farming operations. The future of agriculture on large areas of Umatilla Basin uplands is literally eroding away at an alarming rate. This problem is so severe, so extensive and so intractable it will require a major, long-term effort of all parties involved in land and water management in the Umatilla Subbasin.

An opportunity to implement a comprehensive monitoring and evaluation plan for restoration and enhancement of anadromous species in the Umatilla Subbasin is currently planned as part of the Umatilla Hatchery project. Studies are expected to begin in 1990. The monitoring phase will consist of observation and measurement of performances associated with restoration and enhancement strategies. Evaluation will involve analysis, summarization, and review of the measured performances to provide the information essential for assessing and comparing effectiveness. The monitoring and evaluation goals as stated in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989) are as follows:

1. Provide information and recommendations for culture and release of hatchery fish, harvest regulations, and natural escapement that will lead to the accomplishment of long-term natural and hatchery production goals in the Umatilla River Basin in a manner consistent with provisions of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program.

2. Assess the success of achieving the management objectives in the Umatilla River Basin that are presented in the Master Plan and the Comprehensive Rehabilitation Plan (these fish run objectives are the same as those presented in this plan).

## Legal Considerations

The Confederated Tribes of the Umatilla Indian Reservation reserved certain rights, including the right to fish, in the 1855 Treaty ceding to the U.S. government a vast area of land including the entire Umatilla River Subbasin. These reserved rights provide the basis for a wide range of rights and interests in the protection, enhancement, management and harvest of anadromous fish in the Umatilla River Subbasin. Appendix D summarizes major provisions of the Treaty of 1855 and related federal case law.

The treaty entitles the tribe and its members to engage in fishing activities both throughout this ceded area as well as at other usual and accustomed fishing places.

The treaty authorizes the tribe to adopt and enforce laws that regulate treaty fishing activity of tribal members; to participate in the management of the fishery resources; and to implement management practices to protect the fishery resources. Under the treaty, the tribe can engage in fishing activities free from state regulation except to the extent that the state can show that state regulation is necessary and reasonable for conservation of the resource. The treaty provides the basis for tribal co-management of off-reservation treaty fish resources.

Courts also have held that in establishing Indian reservations, the federal government reserved sufficient water to fulfill present and future uses on the reservations. The Umatilla Tribes have an unquantified reserved right with an 1855 priority date to surface and groundwater running through and rising on the reservation. This priority date precedes all non-tribal water rights in the subbasin.

To date, the Confederated Tribes of the Umatilla Indian Reservation have eschewed litigation in favor of cooperation and co-management as a means of achieving fulfillment of its rights and interests in fish and water.

The earliest non-tribal water right in the Umatilla Subbasin dates to 1860. Approximately 40 percent of the state-granted water rights were initiated prior to the 1909 Oregon Water Code. These rights were established by court decree in 1912 and by a supplemental adjudication in 1949. More than 4,000 water rights totaling more than 4,600 cubic feet per second (cfs) have been granted since then (OWRD 1988). Table 2 breaks down water rights by use and area within the subbasin. Irrigation diversions based upon these rights have made the lower 32 miles of the mainstem Umatilla River unsuitable for summer and early fall rearing of anadromous salmonids. In below-normal water years, diversions for irrigation and refilling storage reservoirs reduce mainstem flows and impede or block the spring outmigration of juveniles from the upper basin, and the immigration of adult fish.

There are few statutory restrictions on water use in the Umatilla Subbasin. One statute could have adverse implications for anadromous fish; ORS 538.450 grants the city of Pendleton exclusive rights to use waters of the North Fork Umatilla River, subject to rights existing on March 8, 1941. To date, exercise of this right has not been practical due to the interpretation that these waters must be conveyed 35 miles via pipeline or canal. An interpretation that the Umatilla River channel could be used as a natural conduit might change this situation (OWRD 1988).

Under state law, the Oregon Water Resources Commission is responsible for managing and regulating the state's waters. Commission policy is established pursuant to ORS 536.300 and 536.310. The first administrative water regulatory program in the Umatilla River Subbasin was adopted in 1964, but established few constraints on future appropriation of water. The program was amended in 1981, again with little effect on future appropriation, and no effect on past appropriations largely responsible for the demise of salmon and diminishment of steelhead in the basin (OWRD 1988).

In 1985 the Oregon Water Resources Commission withdrew the Umatilla River and tributaries from further appropriation during June 1 to October 31 each year. Domestic, livestock, fish and wildlife uses and water released from storage are exempt. In addition, the unappropriated waters of the Umatilla River and tributaries have special usage restrictions during November 1 through May 31. The purpose of these withdrawals and special restrictions are to conserve all remaining unappropriated flow for instream purposes (M. Ladd, OWRD, pers. commun.).

The commission also adopted minimum streamflows for the mainstem Umatilla River from Meacham Creek to the mouth and for Birch Creek (Table 5). These minimum streamflows have a priority date of 1983 and, under state law, are junior to all rights with earlier priority dates.

In 1987 the Water Resources Commission instructed the Water Resources Department to update the program for the Umatilla River Basin. The resulting draft policies and recommendations (OWRD 1988) portend to fundamentally change for the better future state water management in the basin, to begin the long, tortuous process of addressing problems resulting from past management, and to set the stage for dramatic improvement in state-tribal water relations, all of which promise to facilitate achieving state and tribal objectives for anadromous fish in the Umatilla Subbasin.

In the fall of 1987, the Umatilla National Forest released its proposed land and resource management plan (USDA/FS 1987). This plan is designed to direct management of forest lands for the next 10 to 15 years, including much of the headwaters of the Umatilla River. The final plan is scheduled for adoption in the summer of 1990. Forest operations under this plan can profoundly affect anadromous fish production in the subbasin.

## PART IV. ANADROMOUS FISH PRODUCTION PLANS

This subbasin plan is intended to:

1. Be consistent with tribal treaty-reserved fishing rights.

2. Be consistent with the United States-Canada Pacific Salmon Treaty and United States vs. Oregon production agreements, and with other applicable laws and regulations.

3. Help restore stocks of fish historically produced in the Umatilla Subbasin.

4. Help achieve optimum fish production from existing and potential natural habitats.

5. Contribute to Northwest Power Planning Council's doubling goal.

6. Restore historic tribal and non-tribal fisheries within subbasin.

7. Contribute to Columbia River and ocean tribal and non-tribal fisheries.

8. Protect genetic resources of existing summer steelhead populations.

9. Be consistent with tribal and state habitat protection and natural production agreements.

## SPRING CHINOOK SALMON

### Fisheries Resource

#### Natural Production

History and Status

Although once abundant in the Umatilla River Subbasin, spring chinook have not been present for many years. In 1806 Lewis and Clark reported the presence of a large village at the mouth of the Umatilla River where 700 Indians were anxiously awaiting the arrival of the spring chinook. This was one of the largest villages seen between The Dalles area and the mouth of the Snake River. The largest run of chinook on record was in 1914 when Indians and non-Indians caught "thousands upon thousands of salmon from spring to fall" at the site of Three Mile and Hermiston Power and Light dams (Van Cleave and Ting 1960). These authors report salmon and steelhead runs declined following construction of these dams. Forty-one spring chinook reportedly were caught in the Umatilla River in 1956 (OGC 1956). Passage blocks, dewatering of the mainstem Umatilla River, degradation of headwater habitat and mortalities at mainstem Columbia River dams eventually exterminated Umatilla River spring chinook (ODFW/CTUIR 1988).

The potential spawning and rearing habitat of spring chinook in the Umatilla Subbasin is shown in Figure 6. Initial returns of spring chinook will be monitored to determine actual spawning and rearing areas used.

An estimated 1,549 acres (54 stream miles) of spring chinook spawning and rearing habitat exists in the Umatilla Basin including Meacham Creek to the forks, upper mainstem Umatilla from Meacham Creek to the North and South forks, and the North Fork and South Fork (NPPC 1988).

Life History and Population Characteristics

Natural life history information will become known as the spring chinook run is reestablished.

Based on the smolt density model, the estimated spring chinook natural smolt production capacity of the subbasin under existing habitat conditions is 176,600 smolts. The United States vs. Oregon Production Report (ODFW 1987) estimated the current spring chinook natural production capacity at 43,500 smolts and 870 adults. The Umatilla Tribes and Oregon Fish and Wildlife Department feel that the latter estimate is the more accurate.

# UMATILLA SUBBASIN

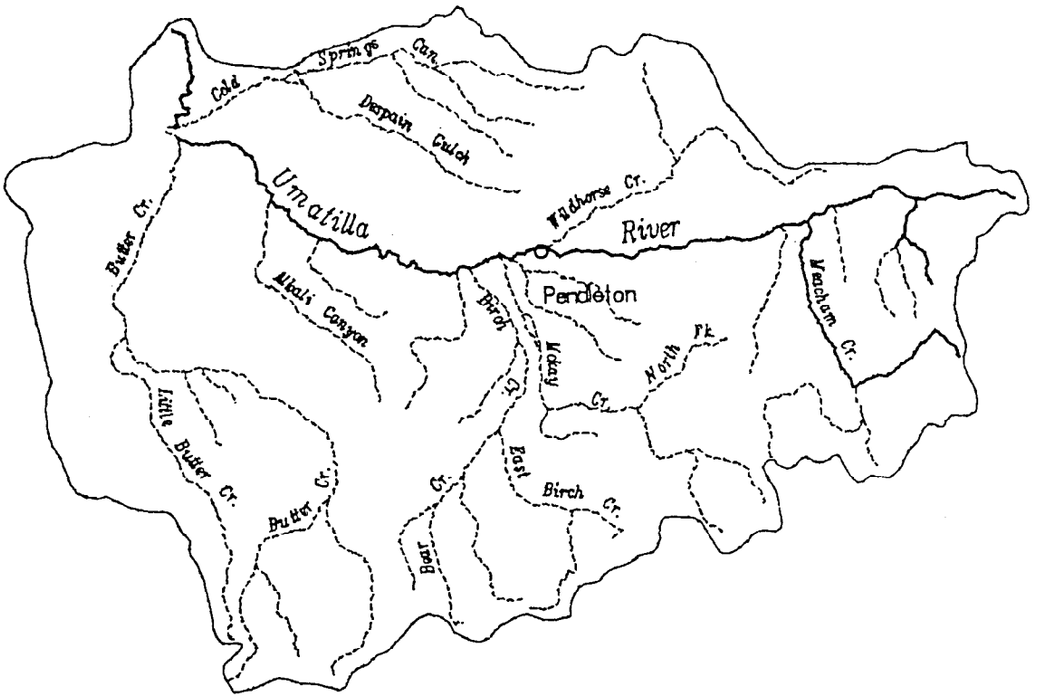
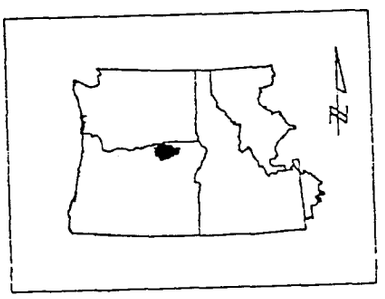



Figure 6.

## SPRING CHINOOK DISTRIBUTION*

——————— PRESENT/POTENTIAL

---------- ABSENT



GIS GEOGRAPHIC INFORMATION SYSTEM

BONNEVILLE POWER ADMINISTRATION

* Due to the limitations of scale, all streams which support anadromous fish are not shown on this map.

## Supplementation History

The Oregon Department of Fish and Wildlife and Umatilla Tribes have embarked upon a major hatchery supplementation program to reintroduce spring chinook into the Umatilla Subbasin. Managers have released yearling and subyearling spring chinook of Carson stock into the subbasin from 1986 through 1988 (Table 12). The first adults from this effort returned to the Umatilla River in 1988.

The purpose of the Oregon Fish and Wildlife Department and Umatilla Tribes' reintroduction program is to restore a naturally spawning population of spring chinook, provide brood stock for continuing and expanding hatchery operations, provide tribal and non-tribal harvest, comply with the Umatilla Tribes treaty-reserved right to fish, and assist in meeting Columbia River Basin fish production goals established in the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program.

The pending Umatilla Hatchery will produce 1.29 million spring chinook smolts for annual release into the Umatilla River system. Other facilities will release an additional 939,000 smolts annually.

## Fish Production Constraints

Major habitat constraints limiting natural spring chinook production are shown in Table 11. Low streamflow is the chief factor limiting production of spring chinook in the subbasin (ODFW 1985). Associated high water temperatures limit summer rearing habitat to upper areas of the watershed. Irrigation-depleted mainstem flows expose juvenile migrants to high water temperatures that reach lethal levels in the summer and fall, and increase mortality at inadequate juvenile bypass and collection facilities on irrigation diversions.

Seven irrigation diversion dams on the lower mainstem Umatilla impede juvenile and/or adult passage. The largest, Three Mile Dam, recently has been retrofitted with new juvenile and adult passage facilities. Passage improvements are programmed for all mainstem diversion structures. Sixteen unscreened small ditches (diverting less than 5 cfs) exist in the Birch Creek drainage.

Table 11. Major habitat contraints in the Umatilla Subbasin.

| Location | Anadromous Fish Present | Sedimentation Problems | Low Flow Problem | Water Quality | Migration Barriers | Other |
|---|---|---|---|---|---|---|
| Umatilla River[1/] (mouth to RM 32) | Chs, Chf, Sts, Coho | --- | During spring & fall irrigation | High temps in Spg. & Fall | At Irrigation Dams during low flows | --- |
| Meacham Cr. (mouth to RM 30) | Chs, Sts | --- | During Summer | High Summer temperatures | At subterannial flow areas | --- |
| Squaw Creek (mouth to RM 4) | Sts | --- | During Summer | High Summer temperatures | At subterannial flow areas | --- |
| Buckaroo Cr. (mouth to RM 2) | Sts | --- | During Summer | High Summer temperatures | At subterannial flow areas | --- |
| Wildhorse Cr. (mouth to RM 20) | remant Sts | severe bank cutting | During Summer | High Summer temperatures | At subterannial flow areas | --- |
| Birch Cr. (mouth to RM 16) | Sts | moderate bank cutting | During Summer | High Summer temperatures | At irrigation dams during low flows | unscreened irrigation ditches |
| W. Fk. Birch Cr. (mouth to RM 7) | Sts | --- | During Summer | High Summer temperatures | " | " |
| E. Fk. Birch Cr. (mouth to RM 10) | Sts | --- | During Summer | High Summer temperatures | --- | " |
| Butter Creek[2/] (mouth to RM 20) | None[3/] | moderate bank cutting | Spring through Fall Irrigation | High summer temperatures | Low flow area during irrigation | " |
| McKay Creek[2/] (mouth to RM 10) | None[3/] | --- | below McKay Res. during fill periods | High temp. due to low/no flow | McKay Dam - No fish ladder | No McKay storage designated for fish flow enhancement |

[1/] Area used for adult passage during mid-September through mid-June
[2/] These streams are not included in current ODFW/CTUIR/USFS habitat enhancement program due to lower priority.
[3/] Summer steelhead were eliminated due to migration barriers; spring chinook also formerly existed in McKay Creek.

Table 12. Release of hatchery spring chinook in the Umatilla Subbasin.

| Release Year | Brood | Stock | Hatchery | Number | Juvenile No/lb | Release Location | In Facility | In River | Fish Marked Yes | Fish Marked No |
|---|---|---|---|---|---|---|---|---|---|---|
| 1986 | 84 | Carson | Carson | 99,970 | 22.8 | Bonifer | Mar. 27 | Apr. 11 | | X |
| 1986 | 85 | Carson | Irrigon | 300,442 | 87.0 | Upper Uma. | ----- | Apr. 7 | | X |
| 1986 | 85 | Carson | Irrigon | 75,000 | 19.8 | Bonifer | Jul. 28 | Oct. 21 | | X |
| 1987 | 85 | Carson | Carson | 99,897 | 10.4 | Bonifer | Mar. 24 | Apr. 21-24 | | X |
| 1987 | 86 | Carson | Oxbow | 169,100 | 199 | Upper Uma. | ----- | Apr. 9 | | X |
| 1988 | 86 | Carson | Carson | 100,000 | 8-10 | Lower Uma. | ----- | Apr. 11-12 | | X |
| 1988 | 86 | Carson | Bonneville | 90,000 | 8-10 | Lower Uma. | ----- | Apr. 11 | | X |
| 1988 | 86 | Carson | Bonneville | 100,000 | 8-10 | Bonifer | Mar. 29-Apr. 1 | Apr. 18-19 | CWT 75,000 | |
| 1988 | 86 | Carson | Bonneville | 100,000 | 8-10 | Near Bonifer | ----- | Apr. 18-19 | CWT 75,000 | |
| 1988 | 87 | Carson | Bonneville | 1,200 | 10-12 | Bonifer | Sept. 13 | Nov. 10 | CWT 1,200 | |
| 1988 | 87 | Carson | Bonneville | 75,000 | 10-12 | Nr. Bonifer | ----- | Nov. 8 | CWT 75,000 | |
| 1989 | 87 | Carson | Bonneville | 80,000 | 8-10 | Bonifer | Mar 7-8 | Mar 27 & 28 | CWT 75,000 | |
| 1989 | 87 | Carson | Bonneville | 80,000 | 8-10 | Nr. Bonifer | ----- | Mar 27 & 28 | CWT 68,000 | |
| 1989 | 88 | Carson | Bonneville | 81,000 | 10-12 | Bonifer | Oct. 10 | Oct. 13 | CWT 80,000 | |
| 1989 | 88 | Carson | Bonneville | 84,000 | 10-12 | Nr. Bonifer | ----- | Oct. 13 | CWT 83,000 | |

Degraded riparian habitat along the Umatilla tributaries contributes to poor stream conditions that limit fish production. Poor quality riparian habitat has resulted in 1) greater seasonal variation in flow and water temperature, 2) unstable streambanks, 3) decrease in production of food organisms, and 4) loss of instream and streamside cover (USFWS and NMFS 1982). Approximately 70 percent of 422 stream miles inventoried on the Umatilla could benefit from riparian enhancement (USFWS and NMFS 1982). Intermittent or complete lack of surface summer flow in some sections of Meacham, Squaw, Wildhorse, and Birch creeks is in part a result of extensive losses of riparian vegetation. This problem is being addressed in the Umatilla River Drainage Anadromous Fish Habitat Improvement Implementation Plan, a cooperative effort of the Oregon Department of Fish and Wildlife, U.S. Forest Service and Umatilla Tribes (1988).

Spring chinook production is limited in some areas due to poor instream habitat. Channelization and degradation of riparian vegetation have resulted in unstable systems that have higher summer temperatures, a lack of pools and instream cover, and reduced water storage capacity. This problem also is being addressed in the Habitat Improvement Plan referenced above.

**Hatchery Production**

Description of Hatcheries

No hatcheries exist in the subbasin. Two facilities on the Umatilla Indian Reservation are used for adult fish holding and for temporary rearing or acclimation of juvenile salmon and steelhead to imprint fish on the particular water source and reduce stress from trucking prior to their downstream migration.

The Bonifer Springs salmon and steelhead juvenile release and adult collection facility is located in the upper Umatilla River drainage at Meacham Creek, RM 2. The facility consists of a 1-acre spring-fed pond and a concrete fishway and adult fish holding area at the pond outlet. The Bonifer facility was completed in the fall of 1983 and operations began in early 1984.

The Minthorn Springs salmon and steelhead juvenile release facility is located on Minthorn Springs Creek about four miles east of Mission, Oregon, on the Umatilla Indian Reservation. The facility consists of an adult capture and holding facility, a pump station, and two 120' X 12' X 4' deep concrete raceways. This facility was completed in December 1985 and first used for juvenile acclimation in the spring of 1986.

Both the Bonifer and Minthorn facilities are operated by the Umatilla Tribes under contract with the Bonneville Power

Administration, in cooperation with the Oregon Department of Fish and Wildlife.

The Bonifer and Minthorn facilities are used to hold and spawn adult summer steelhead, and for acclimation and release of juvenile fall and spring chinook, coho salmon and summer steelhead. Facility goals are to develop an upriver source of hatchery brood stock and enhance survival of hatchery juveniles reared elsewhere for release into the Umatilla drainage.

The Bonifer facility has a rearing capacity of about 10,000 pounds of fish, and greater capacity for short-term acclimation of juveniles. The Minthorn facility also has an acclimation capacity of approximately 10,000 pounds of fish.

Table 12 contains annual releases from both facilities; CTUIR (1987) provides details on facility operations. To date spring chinook have been acclimated and released only from the Bonifer facility; additional releases of imported spring chinook juveniles of non-indigenous stock have been made into the Umatilla River and tributaries. All spring chinook released in the subbasin were from Carson stock reared at Carson National Fish Hatchery and Oregon Department of Fish and Wildlife's Bonneville Hatchery.

Managers captured 13 adult fish at Three Mile Dam in the spring of 1988 and 163 (65 adults and 98 jacks) in 1989. These were the first returns resulting from the current spring chinook restoration efforts. No spring chinook returned to the Bonifer Facility release site.

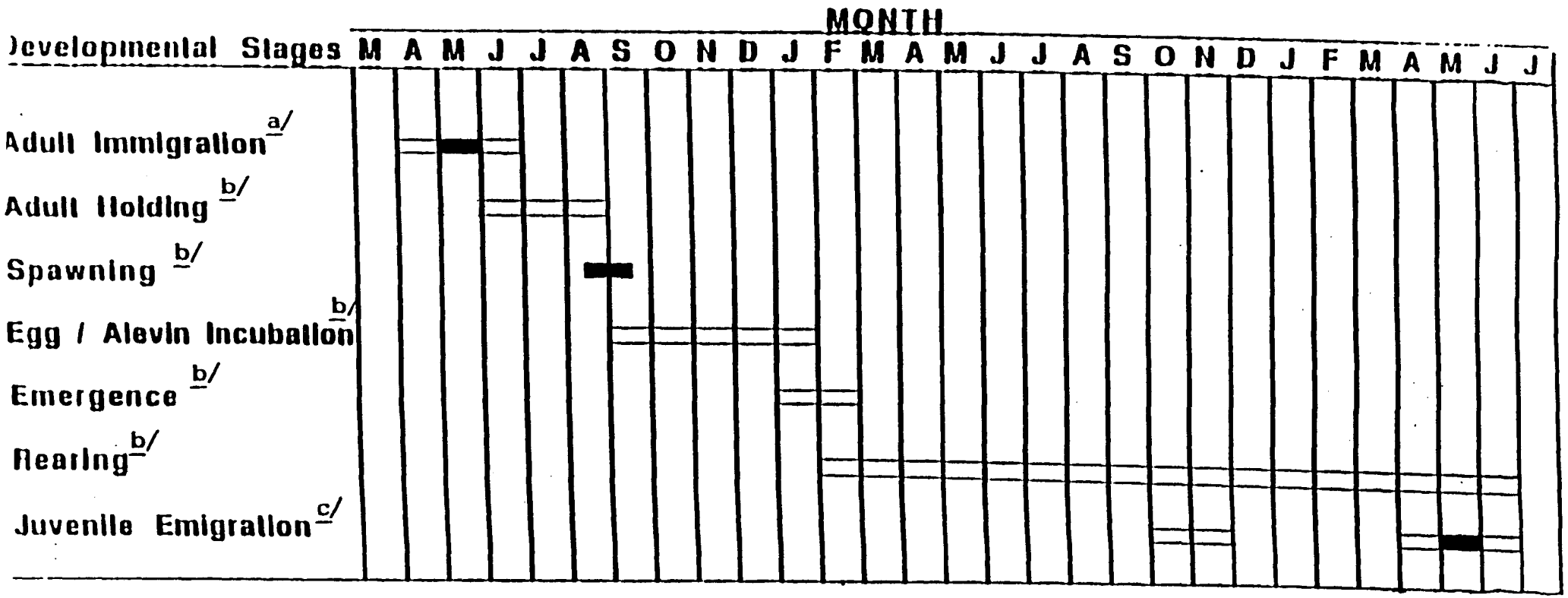
Pending resolution of irrigation-depleted streamflow, spring chinook entry into the Umatilla will depend on the seasonal quantity and temperature of available streamflow. Managers could select brood stock for early arriving adults to Umatilla River to fit the optimum streamflow "window" (Table 13).

## Life History and Population Characteristics

The initial fish returning to the Umatilla River were estimated to be 3- (jacks) and 4-year-olds. Carson stock spring chinook return to Carson and Little White Salmon hatcheries primarily as 4- and 5-year-old adults and lesser numbers of 3-year-old jacks (Howell et al. 1985).

In samples at Carson Hatchery, females comprised an average of 66 percent of 4-year-old returning fish. Females averaged 52 percent of returning 5-year-old fish (Howell et al. 1985).

Table 13. Freshwater life history for Hatchery Spring Chinook; Carson Hatchery Stock




Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Solid bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

a/ Based on counts over McNary Dam. First returns to Umatilla River in 1988.

b/ Carson Hatchery data (Howell et al. 1985).

c/ Umatilla River counts at Westland trap; yearlings released in spring, subyearlings in fall.

Thirteen fish sampled at Three Mile Dam in 1987 (Table 14) had an average fork length of 29.48 inches, with a minimum fork length of 25.98 inches and a maximum of 34.35 inches.

Time of spawning in the Umatilla River system is unknown. At Carson Hatchery, spawning occurs from about August 10 to September 7 (Table 13) (Howell et al. 1985). Researchers observed one occupied redd in the Umatilla River between Squaw and Meacham creeks on September 6, 1988.

From 1968 through 1984, females at Carson Hatchery averaged 4,300 eggs per female (Howell et al. 1985). Based on Carson Hatchery data, egg/alevin incubation occurs from September through January (Table 13). Managers have released yearlings and subyearlings (Table 12).

Yearlings emigrate in the spring. Subyearlings emigrate in fall (Table 13). Egg-to-smolt survival is unknown, but is estimated to be 0.56 (ODFW/CTUIR 1988). Smolt-to-adult survival is also unknown. Estimations for planning purposes are 0.0020 for spring release subyearlings, 0.0040 for fall release subyearlings and 0.0075 for yearlings (ODFW/CTUIR 1988).

Anticipated Production Facilities

Initially the Umatilla/Irrigon Hatchery will rear summer steelhead, spring and fall chinook. The hatchery has a total design capacity of 290,000 pounds of fish. It will produce 1.29 million spring chinook smolts (1.08 million subyearlings, 72,000 pounds; and 210,000 yearlings, 42,000 pounds) for annual release into the Umatilla River Subbasin (ODFW/CTUIR 1988).

Brood stock sources under consideration include Carson National Fish Hatchery, and the Oregon Department of Fish and Wildlife Lookingglass Hatchery (Carson or Rapid River stock). Additional brood stock may become available from the Yakima River in Washington or the Rapid River Hatchery in Idaho. Managers will take brood stock from adult fish returning to the Umatilla River. Eventually the entire hatchery egg-take will be from fish returning to the Umatilla River. Brood stock will be collected at Three Mile Dam, the Bonifer and Minthorn facilities, and possibly new facilities as well (ODFW/CTUIR 1988).

Initially, managers will release all Umatilla/Irrigon Hatchery spring chinook yearling and subyearling spring chinook into the upper mainstem Umatilla River. Release sites have been selected to support planned hatchery evaluation studies and to achieve adult production objectives including brood stock needs, harvest and natural spawning escapement (ODFW/CTUIR 1988).

Table 14. Umatilla River salmon and steelhead returns: October 1987 to June 1988.

| MONTH | Steelhead | Adult Fall Chinook | Jack Fall Chinook | Adult Spring Chinook | Jack Coho | Rainbow Trout |
|---|---|---|---|---|---|---|
| OCT 87 | 7 | 3 | 42 | | 0 | 0 |
| NOV 87 | 44 | 49 | 290 | | 18 | 1 |
| DEC 87 | 13 | 1 | 2 | | 11 | 0 |
| JAN 88 | 220 | | | | | 0 |
| FEB 88 | 642 | | | | | 1 |
| MAR 88 | 754 | | | | | 5 |
| APR 88 | 759 | | | 3 | | 4 |
| MAY 88 | 40 | | | 4 | | 2 |
| JUN 88 | 2 | | | 6 | | 0 |
| SUBTOTAL 1/ | 2481 | 53 | 334 | 13 | 29 | 13 |
| OTHER 2/ | 300 | 72 | 14 | | | |
| TOTAL RUN | 2781 | 125 | 348 | 13 | 29 | 13 |
| AVG F.L.(mm) | 650 | 746 | 403 | 749 | 408 | 428 |
| MIN F.L.(mm) | 510 | 610 | 240 | 660 | 348 | 295 |
| MAX F.L.(mm) | 910 | 1041 | 602 | 870 | 563 | 504 |
| sample size | 1298 | 115 | 339 | 13 | 29 | 12 |

1/ 3 Mile Dam trap counts (2316 native and 165 hatchery origin).

2/ Steelhead harvest below Threemile Dam, 12/87 to 03/88.

2/ Fall Chinook spawning surveys below Threemile Dam in 12/87: Carcasses, 63 adults and 11 jacks; Live, 9 adults and 3 jacks

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In addition to spring chinook production from the Umatilla/Irrigon Hatchery, managers will release 100,000 spring chinook yearlings reared at Carson Hatchery and 150,000 reared at Bonneville Hatchery into natural spawning areas in the upper mainstem Umatilla and tributaries for natural production and harvest. Another 200,000 spring chinook yearlings from Bonneville will be released at Bonifer (100,000 in the pond and 100,000 nearby in the Umatilla River) for acclimation studies, brood stock development and harvest. Biologists will release an additional 589,000 spring chinook yearlings to be reared at other facilities outside the subbasin into the upper mainstem Umatilla River for brood stock production and harvest.

Constraints to Hatchery Production

The principal constraint or problem with existing and anticipated hatchery programs in the Umatilla Subbasin is seasonal low streamflows and related temperature and passage difficulties for both adults and juveniles.

A comparatively minuscule problem at the Minthorn Facility has been created by shifting of the Umatilla River channel, which may make it difficult for returning adults to enter adult holding facilities. The Umatilla Tribes are currently investigating potential solutions to this problem.

A similar problem exists at the Bonifer facility. Bedload movement chronically blocks the entrance to the adult capture facility and prevents complete pond drainage to release juveniles. The Umatilla Tribes have plans to correct this problem. Improved mainstem Umatilla River streamflows, improved juvenile and adult passage facilities at mainstem irrigation diversions and screening of minor irrigation ditches, in that order of importance, would improve adult production from hatchery juveniles released into the subbasin.

The Umatilla Basin Project, authorized by Congress, would restore irrigation-depleted streamflows to near recommended levels for mainstem passage for all species and mainstem spawning and rearing of upriver bright fall chinook. In the interim, incremental improvements in passage flows are being achieved through cooperative efforts of fisheries and irrigation interests with support of the Bureau of Reclamation, Northwest Power Planning Council, and Bonneville Power Administration.

Improved adult and juvenile passage facilities at all mainstem Umatilla River irrigation diversions, and screening of minor irrigation ditches are currently under way.

**Harvest**

"Thousands" of spring chinook were harvested in the Umatilla River in 1914 (Van Cleave and Ting 1960). The last reported sport catch was in 1956 (OGC 1956). There has been no spring chinook harvest since that time.

The Oregon Department of Fish and Wildlife and Umatilla Tribes cooperate in setting subbasin harvest management goals and regulations. Harvest and allocation guidelines (Table 15) are part of the Umatilla/Irrigon Hatchery Master Plan.

The Umatilla Tribes and Oregon Fish and Wildlife Department plan to provide tribal and sport opportunity to fully utilize the harvestable surplus portion of adult return objectives. Procedures to be included in a CTUIR/ODFW Umatilla Subbasin harvest program include:

A) Jointly design and implement annual harvest allocation plans that provide for increasing levels of harvest, brood stock, and natural production as the total run size increases (to be based on harvest guidelines) (Table 15).

B) Implement angling regulations that will allow for meeting the required escapement levels of adults and smolts for natural productions without limiting fishery objectives (regulations will designed to allow a fishery as runs are rebuilding). Regulatory factors will include:

- Harvest numbers
- Harvest method
- Harvest locations and times
- Possible harvest restrictions (such as jacks only, or marked hatchery fish only)

C) Monitor and enforce compliance with angling regulations and evaluate fisheries to assess the degree to which objectives are being met.

D) Determine what Columbia River and ocean harvest rates are on "Umatilla" fish, and the corresponding proportions of that harvest on the total Umatilla return.

No harvest management procedures specific to spring chinook have been formalized. Procedures for coordination, regulation, monitoring and enforcement will be established further as harvestable numbers of fish become available.

Table 15. Harvest plan guidelines for spring chinook[1] (ODFW/CTUIR 1989).

Broodstock Collection Goal = 1,200
Run Size Goal (to mouth) = 11,000 (1,000 natural, 10,000 hatchery)

Interim Spawning Escapement Goal = 600
Optimum Spawning Escapement Goal = 1,200

| Total Run Size[2] | Umatilla Hatchery Broodstock[3] | Spawning Escapement | Research Needs[5] | In-River Harvest |
|---|---|---|---|---|
| 250 | 100 | 50 | 105 | |
| 500 | 200 | 100 | 280 | |
| 750 | 300 | 200 | 350 | |
| 1,000 | 400 | 300 | 350 | Based on |
| 2,000 | 600 | 400 | 490 | available |
| 3,000 | 1,000[7] | 500 | 490 | surplus[6] |
| 4,000 | 1,200[7] | >600 | 490 | |
| 5,000 | 1,200 | >600 | 490 | |
| 6,000 | 1,200 | >600 | 490 | |
| 7,000 | 1,200 | >600 | 490 | |
| 8,000 | 1,200 | >600 | 490 | |
| 9,000 | 1,200 | >600 | 490 | |
| 10,000 | 1,200 | >600 | 490 | |
| 11,000 | 1,200 | >600 | 490 | |

[1] Schedule will be the basis for development of annual harvest plans.

[2] Includes hatchery and natural returns to the mouth of the Umatilla River.

[3] Broodstock requirement for the Umatilla Hatchery only; does not include production at other hatcheries.

[4] Spawning escapement at returns above 5,000 based upon natural production success, available habitat, and other considerations as agreed to by CTUIR and ODFW.

[5] Samples (tags) collected from harvest, spawning surveys, broodstock, and returns to acclimation facilities.

[6] Available surplus is fish available for harvest after broodstock (Umatilla returns or other stocks), spawning escapement, and research needs are met at the various total run sizes as evaluated and agreed to by CTUIR and ODFW.

[7] Broodstock collection goal achieved.

**Specific Considerations**

Spring chinook once were abundant in the subbasin, but the run was exterminated. The subbasin now provides opportunity for a major spring chinook hatchery supplementation program with no genetic resources at risk. An estimated 1,549 acres of unused spring chinook spawning and rearing habitat exist in the subbasin. The Oregon Department of Fish and Wildlife and Umatilla Tribes have a natural run size goal of 1,000 returning adult spring chinook.

The key problem and constraint on production of all species or races in the subbasin is seasonal dewatering of the lower 30 or so miles of the mainstem river by irrigation diversions. This impedes, and during low flow years, can block late spring to early summer juvenile migrants and late spring returning adults. Impending completion of improved juvenile bypass and adult passage facilities, and juvenile and adult collection and transportation facilities will significantly reduce this constraint on achieving optimum fish production. Instream flows necessary for fish passage will be restored with implementation of the Columbia River-Umatilla River water exchange project authorized by the 100th Congress.

The Umatilla River Subbasin:

- Lies above three mainstem Columbia River hydroelectric projects.
- Lies at the head of the Columbia River Zone 6 treaty fishing area.
- Lies within the most populous eastern Oregon county and in close proximity to southeastern Washington population centers; contains important tribal usual and accustomed fishing sites and the reservation of the Confederated Tribes of the Umatilla Indian Reservation, which has treaty-reserved rights to fish.
- Is easily accessible to fishermen; provides geographically extensive opportunities for a wide variety of tribal and non-tribal fisheries.
- Provides opportunities for major terminal, known-stock fisheries on hatchery fish.
- Provides opportunities for intensive management of mixed stocks of wild, natural and hatchery fish and for evaluation of the spectrum of fisheries and habitat management initiatives.

- Is the most likely northeast Oregon subbasin in which major, near-term tribal and non-tribal fisheries can be developed with hatchery outplants.

- Has in recent years been given high priority for restoration of salmon and steelhead runs and fisheries by tribal, state, regional and federal fisheries agencies, top priority by the Umatilla Tribes, and top priority in eastern Oregon by the Oregon Department of Fish and Wildlife.

**Critical Data Gaps**

Life history information necessary for management of spring chinook in the subbasin is nonexistent. Proposed juvenile collection facilities at Westland Diversion Dam, and juvenile and adult counting and collection facilities at Three Mile Dam, plus extensive Umatilla Hatchery and passage facility monitoring and evaluation eventually will fill the data gaps.

## Objectives

**Biological Objective**

Achieve an annual adult return of 11,000 (10,000 hatchery and 1,000 naturally produced) spring chinook salmon to the Umatilla Subbasin to 1) achieve full utilization of existing and potential habitat for natural production; and 2) acquire brood stock necessary for Umatilla Basin artificial production program.

**Utilization Objective**

Accommodate adult recovery requirements for anticipated research as outlined in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989), and provide for a combined tribal and non-tribal annual harvest of 8,800 spring chinook.

These objectives are consistent with the goals stated in the Umatilla Hatchery Master Plan. The utilization component was determined by subtracting the natural production goal and anticipated future brood stock needs from the total run size goal. This interim harvest target may be adjusted as the Umatilla Tribes and Oregon Department of Fish and Wildlife evaluate both hatchery and natural production success in the subbasin.

## Alternative Strategies

Four alternative strategies were proposed that range from current hatchery and habitat programs with no change, to programs that include increased hatchery production and habitat enhancement. Strategy 1 includes action items that are ongoing (planning, design, construction, or operation and maintenance) and already included in the Columbia River Basin Fish and Wildlife Program. Strategy 2 adds lower river flow enhancement action items, which although already initiated, are not as assured for implementation as Strategy 1 action items. The pumping cost associated with flow enhancement is already included in the Columbia River Basin Fish and Wildlife Program. Strategy 3 adds additional spring chinook hatchery production that is currently in the planning phase and included in the Columbia River Basin Fish and Wildlife Program. Strategy 4 adds a headwater storage action item for additional flow enhancement. This action item is not ongoing and is not included (planning or implementation) in the current Columbia River Basin Fish and Wildlife Program. If all Umatilla Subbasin action items are carried out, the likely order of implementation would be those included in Strategy 1, then 2 and 3, and lastly, the action items in Strategy 4.

Modeling results for each strategy are presented in Table 17 as fish produced at "maximum sustainable yield" (MSY). The sustainable yield of a fish population refers to that portion of the population that exceeds the number of fish required to spawn and maintain the population over time. Sustainable yield can be "maximized," termed MSY, for each stock at a specific harvest level. The MSY is estimated using a formula (Beverton-Holt function) that analyzes a broad range of harvest rates. Subbasin planners have used MSY as a tool to standardize results so that decision makers can compare stocks and strategies.

In MSY management, managers set a spawning escapement level and the remaining fish (yield) could theoretically be harvested. In practice, a portion of the yield may be reserved as a buffer or to aid rebuilding. Thus, managers may raise the escapement level to meet a biological objective at the expense of a higher utilization objective.

The amount of buffer appropriate for each stock is a management question not addressed in the subbasin plans. For this reason, the utilization objective, which usually refers to harvest, may not be directly comparable to the MSY shown in Table 17. At a minimum, a strategy should produce an estimated MSY equal to or greater than the utilization objective. A MSY substantially larger than the subbasin utilization objective may be needed to meet subbasin biological objectives.

Estimated costs of the alternative strategies below are summarized in Table 17a.

STRATEGY 1: Substantially increase the spring chinook salmon runs to the Umatilla River Subbasin. Strategy 1 includes adult and juvenile passage improvements (Action IA); holding, spawning and rearing improvements (Action IB); and hatchery production facilities (Action IIIA). All action items in Strategy 1 are currently being implemented (habitat improvements) or are in the final stage prior to implementation (Umatilla Hatchery Master Plan).

Major Hypotheses: The action items in Strategy 1 will improve pre-spawning, smolt-to-smolt, egg-to-smolt and post-release survival and also increase both natural smolt capacity and hatchery production (Table 16).

Critical Assumptions: A critical assumption is that implementation of habitat improvements and increased hatchery production will be completed and annual operation and maintenance will be carried out. Another assumption is that the current natural production capacity (prior to implementation of Strategy 1) is 870 adults and the hatchery smolt-to-adult survival is 0.75 percent (ODFW 1987).

Potential Production using System Planning Models: After Strategy 1, spring chinook total return to subbasin at maximum sustainable yield (MSY) increased 423 percent from baseline (Table 17).

STRATEGY 2: Implement Strategy 1 and enhance lower river flows (Action IIA). This will provide for improved juvenile and adult passage during critical spring and fall migration periods in the lower Umatilla River. Lower river flow enhancement (Umatilla Basin Project) is a U.S. Bureau of Reclamation project and was authorized by Congress in 1988. Congress has appropriated monies for engineering cost and design for phase I (pumping to West Extension Canal). Phase 2 (pumping from Columbia River to Cold Springs Reservoir) will follow completion of Phase I. Both phases are anticipated to be complete by 1996.

Major Hypotheses: Strategy 2 (Action IIA and Strategy 1) will further increase pre-spawning and smolt-to-smolt survival for both hatchery and natural production (Table 16) by increasing flows in the lower Umatilla River to established minimum instream flow levels.

Table 16. Major hypotheses underlying strategies to improve salmon and steelhead runs in the Umatilla River Subbasin.

| Strategy | Action | Species | Parameter | Major Hypotheses Baseline | Major Hypotheses After Action |
|---|---|---|---|---|---|
| 1 for StS, ChS & ChF | I.A.1. | StS | Pre-spawn survival 1/ | 0.80 | 0.90 |
| | | ChS | | 0.50 | 0.75 |
| | | ChF | | 0.50 | 0.75 |
| | I.A.2. | StS | Smolt to smolt survival 2/ | 0.79 | 0.95 |
| | | ChS | | 0.79 | 0.95 |
| | | ChF | | 0.50 | 0.95 |
| | I.B. | StS | Natural egg to smolt survival 3/ | 0.027 | 0.025 4/ |
| | | ChS | | 0.15 | 0.21 |
| | | ChF | | 0.37 | 0.38 |
| | I.B. | StS | Natural smolt capacity 5/ | 60,013 | 94,622 |
| | | ChS | | 172,907 | 341,823 |
| | | ChF | | 2,362,843 | 2,577,015 |
| | III.A. | StS | Utilize existing and planned 6/ | 60,000 | 210,000 |
| | | ChS | Umatilla Hatchery production | 450,000 | 1.74 MIL |
| | | ChF | | 3.2 MIL | 7.0 MIL |
| 2 for StS, ChS & ChF | II.A. | StS | Pre-spawn survival 1/ | 0.80 | 0.95 |
| | | ChS | | 0.50 | 0.90 |
| | | ChF | | 0.50 | 0.90 |
| | II.A. | StS | Smolt to smolt survival 2/ | 0.79 | 1.0 |
| | | ChS | | 0.79 | 1.0 |
| | | ChF | | 0.50 | 1.0 |
| 3 for ChS | III.B. | ChS | Hatchery smolt capacity | 450,000 | 2.3 |
| 3 for StS & ChF | II.B. | ChF | Pre-spawn survival 1/ | 0.50 | 0.95 |
| | II.B. | StS | Natural smolt capacity 5/ | 60,013 | 105,178 |
| 4 for ChS | II.B. | ChS | Natural egg to smolt survival | 0.15 | 0.24 |
| | II.B | ChS | Pre-spawn Survival 1/ | 0.50 | 0.95 |
| | II.B. | ChS | Natural Smolt capacity 5/ | 172,907 | 415,176 |

1/ Estimated by CTUIR and ODFW Biologists.
2/ From ODFW (1986).
3/ Used John Day Subbasin calibration for StS and ChS. Use SPG standard survival rates for ChF net system effect from Tributary Production Model.
4/ System survival decreased because new areas were made available with only fair habitat quality.
5/ Smolt Density Model results.
6/ From Umatilla Hatchery Master Plan (ODFW/CTUIR 1989).

Critical Assumptions: A critical assumption is that funding will continue for the Umatilla Basin Project and construction will soon begin.

Potential Production using System Planning Models: After Strategy 2, spring chinook total return to the subbasin at MSY increased 6 percent from Strategy 1 (Table 17).

STRATEGY 3: Implement Strategy 2 and add Northeast Oregon Hatchery production (Action IIIB). The Northeast Oregon Hatchery is expected to provide the additional spring chinook smolts necessary to achieve the Umatilla Subbasin adult return objective. In addition, evaluate the feasibility and potential benefits from a head water storage project in the upper Umatilla River (Action IIB1) and the feasibility of McKay Creek fish passage and habitat restoration (Action IA3).

Major Hypotheses: Strategy 3 (Action IIIB and Strategy 2) will further increase hatchery production of spring chinook from 1.7 million to 2.3 million smolts (Table 16).

Critical Assumptions: A critical assumption is the completion of Northeast Oregon Hatchery including the master plan, design, construction and operation. It is also assumed that spring chinook smolts produced at this new facility will be designated for release into the Umatilla River.

Potential Production using System Planning Models: After Strategy 3, spring chinook total return at MSY to subbasin increased 29 percent from Strategy 2 (Table 17).

STRATEGY 4: Implement Strategy 3 and add headwater storage (Action IIB). In 1983 the Bureau of Reclamation completed a feasibility study on potential storage sites to provide increased instream flow in the upper Umatilla River. Headwater storage feasibility needs further evaluation.

Major Hypotheses: Strategy 4 (Action IIB and Strategy 3) will increase spring chinook pre-spawning survival and increase spring chinook natural smolt capacity (Table 16).

Critical Assumptions: A critical assumption is that the headwater storage site would provide at least 27,000 acre-feet of storage (based on North Fork Meacham Creek Dam study; BR 1983) for enhancement of flows during critical fish rearing and migration periods (probably summer through early fall).

## Potential Production using System Planning Models: After Strategy 4, spring chinook total return to subbasin increased from Strategy 3 an additional 2 percent (Table 17).

Table 17. System Planning Model results for spring chinook in the Umatilla Subbasin. Baseline value is for pre-mainstem implementation, all other values are post-implementation.

Biological Objective:
Achieve annual return to subbasin of 11,000 adults (10,000 hatchery, 1000 natural) to 1) achieve full utilization of existing and potential habitat; 2) acquire brood stock for artificial production program.

Utilization Objective:
Above return would also 3) accommodate adult recovery required for research as outlined in Umatilla Hatchery Master Plan; and 4) provide for tribal and non-tribal harvest of 8,800 adults annually.

| Strategy[1] | Maximum[2] Sustainable Yield (MSY) | Total[3] Spawning Return | Total[4] Return to Subbasin | Out of[5] Subbasin Harvest | Contribution[6] To Council's Goal (Index) |
|---|---|---|---|---|---|
| Baseline | 1,484 -N | 837 | 3,158 | 593 | 0( 1.00) |
| All Nat | 3,751 -N | 1,300 | 5,683 | 1,089 | 3,997( 1.80) |
| 1 | 11,721 -N | 3,591 | 16,509 | 3,074 | 20,989( 5.22) |
| 2 | 12,931 -N | 4,089 | 17,475 | 3,256 | 22,509( 5.53) |
| 3* | 16,918 -N | 5,075 | 22,558 | 4,188 | 30,488( 7.13) |
| 4 | 17,566 -N | 5,270 | 23,113 | 4,302 | 31,373( 7.31) |

*Recommended strategy.

[1]Strategy descriptions:

For comparison, an "all natural" strategy was modeled. It represents only the natural production (non-hatchery) components of the proposed strategies plus current management (which may include hatchery production). The all natural strategy may be equivalent to one of the alternative strategies below.

1. Adult and juvenile passage improvements; holding, spawning and rearing improvements; and hatchery production facilities. These actions are all being implemented or are in the final planning stages. Post Mainstem Implementation.
2. Strategy 1 plus enhance lower river flows. Post Mainstem Implementation.
3. Strategy 2 plus additional supplementation using Northeast Oregon Hatchery production. Post Mainstem Implementation.
4. Strategy 3 plus headwater storage. Post Mainstem Implementation.

[2]MSY is the number of fish in excess to those required to spawn and maintain the population size (see text). These yields should equal or exceed the utilization objective. C = the model projections where the sustainable yield is maximized for the natural and hatchery components combined and the natural spawning component exceeds 500 fish. N = the model projection where sustainable yield is maximized for the naturally spawning component and is shown when the combined MSY rate results in a natural spawning escapement of less than 500 fish.

[3]Total return to subbasin minus MSY minus pre-spawning mortality equals total spawning return.

[4]Total return to the mouth of the subbasin.

[5]Includes ocean, estuary, and mainstem Columbia harvest.

[6]The increase in the total return to the mouth of the Columbia plus prior ocean harvest (as defined by the Northwest Power Council's Fish and Wildlife Program), from the baseline scenario. The index () is the strategy's total production divided by the baseline's total production.

Table 17a. Estimated costs of alternative strategies for Umatilla spring chinook. Cost estimates represent new or additional costs to the 1987 Columbia River Basin Fish and Wildlife Program; they do not represent projects funded under other programs, such as the Lower Snake River Compensation Plan or a public utility district settlement agreement. (For itemized costs, see Appendix C.)

| | Proposed Strategies | | | |
|---|---|---|---|---|
| | 1 | 2 | 3* | 4 |
| Hatchery Costs | | | | |
| Capital[1] | 0 | 0 | 0 | 0 |
| O&M/yr[2] | 0 | 0 | 0 | 0 |
| Other Costs | | | | |
| Capital[3] | 0 | 0 | 200,000 | 78,000,000 |
| O&M/yr[4] | 0 | 0 | 2,000 | 68,000 |
| Total Costs | | | | |
| Capital | 0 | 0 | 200,000 | 78,000,000 |
| O&M/yr | 0 | 0 | 2,000 | 68,000 |

* Recommended strategy.

[1] Estimated capital costs of constructing a new, modern fish hatchery. In some subbasins, costs may be reduced by expanding existing facilities. For consistency, estimate is based on $23/pound of fish produced. Note that actual costs can vary greatly, especially depending on whether surface or well water is used and, if the latter, the number and depth of the wells.

[2] Estimated operation and maintenance costs per year directly associated with new hatchery production. Estimates are based on $2.50/pound of fish produced. For consistency, O&M costs are based on 50 years.

[3] Capital costs of projects (other than direct hatchery costs) proposed under a particular strategy, such as enhancing habitat, screening diversions, removing passage barriers, and installing net pens (see text for specific actions).

[4] Estimated operation and maintenance costs per year of projects other than those directly associated with new hatchery production. For consistency, O&M costs are based on 50 years.

**Actions**

A listing of 26 Umatilla Subbasin project action items are presented in Table 19 along with project status, anticipated funding source, and cost estimates for each. Various action items are contained in each of the four fisheries enhancement strategies. Estimated capital and annual operation and maintenance costs for each strategy are presented in Table 20.

ACTION I. Improve habitat.

A. Improve juvenile and adult fish passage.

1) Provide adequate adult passage conditions at "problem areas:"

Three Mile Dam (complete construction of ladders and traps).

Partial barrier at Umatilla RM 1.8 (need additional weir to reduce height of drop at existing weir to be added to Cold Springs project contract).

Westland Dam (ongoing project - complete construction of ladder).

Cold Springs Dam (ongoing project - complete construction of ladder).

Stanfield Dam (ongoing project - complete construction of ladder).

Complete fine tuning "fix-ups" on all above projects following operational experience and/or evaluation to ensure adequate adult passage.

Secure annual O&M funds for the above projects.

Secure annual BPA-funded adult trap and haul program for upstream passage.

Jim Boyd Hydro Project (monitor and evaluate operations).

2) Provide adequate juvenile passage conditions at "problems areas:"

Three Mile Dam (complete construction of fish screens in West Extension irrigation canal).

Brownell Dam (remove as part of BR West Extension Irrigation District exchange project - Phase 1).

Complete National Marine Fisheries Service-funded construction of a new screen in the upper Umatilla River mainstem.

Maxwell diversion (ongoing project - complete construction of screens).

Westland diversions (ongoing project - complete construction of screens and juvenile trap).

Cold Springs diversion (ongoing project - complete construction of screens).

Stanfield diversion (ongoing project - complete constructions of screens).

Secure annual O&M funds for the above projects.

Complete fine tuning "fix-ups" on all above projects following operational experience and/or evaluation to ensure adequate juvenile passage.

Secure annual BPA-funded juvenile trap and haul program for downstream passage.

3) McKay Reservoir anadromous fish passage and habitat restoration (possibly trap and haul program). Not modeled at this time but initial feasibility study recommended.

B. Improve juvenile and adult rearing, holding, and spawning areas.

1) Protect riparian zones from degradation by domestic livestock, forestry and agricultural practices, and by urban, suburban and commercial development.

Coordinate with the Soil Conservation Service, U.S. Forest Service, Oregon Department of Forestry, Division of State Lands Extension Service, Soil and Water Conservation District, Land Conservation and Development Commission, Corps of Engineers, Columbia/Blue Mountain Resource Conservation and Development Area, Inc., Eastern Central Oregon Community Action Program, Umatilla County, Oregon Department of Agriculture and other participating agencies.

Deal more with private landowners (education program and technical assistance).

2) Promote enhancement of degraded riparian and instream habitat.

Implement five-year plans of U.S. Forest Service, Oregon Department of Fish and Wildlife, and Umatilla Tribes, and develop and implement a six- to 10-year plan for BPA-funded projects (Table 18).

Pursue the Governor's Watershed Enhancement Board, Oregon Water Resources Department or other potential funding sources for project implementation.

Pursue U.S. Forest Service Knutsen-Vandenburg funds for fish habitat enhancement.

Secure funds and implement O&M on above riparian instream projects for extended fisheries benefits.

ACTION II. Enhance instream flow.

A. Provide adequate instream flow conditions for passage of adult and juvenile migrating fish in the lower Umatilla River (below McKay Creek).

1) Pursue construction of Umatilla Basin, Bureau of Reclamation flow enhancement project.

2) Secure annual BPA-funded interim pumping program until entire Bureau of Reclamation project is on line (includes West Extension Irrigation System pumps and Makami pumps).

Table 18. Instream and riparian habitat enhancement projects for the Umatilla Basin

| | STREAM 1/ | REACH (RM) | Mi. OF WORK | EST. IMPL. DATE | COST | IMPL. AGENCY |
|---|---|---|---|---|---|---|
| 1 | S. Fk. Umatilla R. | 0 - 3.2 | 3.2 | 1989 | 248,000 | USFS |
| 2 | Meacham Creek | 0 - 5.5 | 4.0 | 1989-1990 | 460,800 | CTUIR |
| 3 | E. Birch Creek | 0 - 17.0 | 6.0 | 1989-1990 | 291,400 | ODFW |
| 4 | Birch Creek | 0 - 16.5 | 9.0 | 1989-1991 | 437,000 | ODFW |
| 5 | Umatilla River | 89-90 | 2.0 | 1990 | 77,700 | USFS |
| 6 | Meacham Creek | 15 - 35 | 8.0 | 1989-1991 | 283,300 | ODFW |
| 7 | W. Birch Creek | 0 - 16.0 | 10.5 | 1990-1992 | 499,000 | ODFW |
| 8 | N.Fk. Meacham Crek | 0 - 3 | 2.0 | 1990-1992 | 107,900 | ODFW |
| 9 | Squaw Creek | 0 - 7 | 7.0 | 1991-1992 | 377,706 | CTUIR |
| 10 | Meacham Creek | various | 6.0 | 1991 | 275,700 | USFS |
| 11 | N. Fk. Meacham Creek | various | 5.0 | 1992 | 161,350 | USFS |
| 12 | Pearson Creek | 3.5 - 5.5 | 2.0 | 1992 | 84,300 | USFS |
| 13 | Umatilla River | 77 - 82 | 4.0 | 1992 | 391,000 | CTUIR |
| 14 | Buckaroo Creek | 0 - 3 | 3.0 | 1992-1993 | 86,100 | CTUIR |
| 15 | Wildhorse Creek | 0 - 20.5 | 5.0 | 1992-1996 | 531,200 | ODFW |
| 16 | Meacham Creek | 5.5 - 15 | 7.0 | 1992-1996 | 806,400 | ODFW |
| 17 | Birch Cr. Tribs. | various | 32.0 | 1992-1996 | 1,004,700 | ODFW |
| 18 | Pearson Creek | 0 - 3.5 | 3.5 | 1992-1996 | 170,100 | ODFW |
| 19 | Umatilla River | 82 - 89 | 7.0 | 1992-1996 | 377,700 | ODFW |
| 20 | Meacham Creek Tribs. | various | 6.0 | 1992-1996 | 191,700 | ODFW |
| 21 | Moonshine Creek | 0 - 5 | 5.0 | 1993 | 134,950 | CTUIR |
| 22 | Coonskin Creek | 0 - 5 | 5.0 | 1993 | 134,950 | CTUIR |
| 23 | Wildhorse Creek | 20.5 - 26.5 | 6.0 | 1994 | 191,700 | CTUIR |
| 24 | Mission Creek | 0 - 6 | 6.0 | 1994 | 188,940 | CTUIR |
| 25 | Cottonwood Creek | 0 - 5 | 5.0 | 1994 | 134,950 | CTUIR |
| 26 | Umatilla River | 56-77 | 20.0 | 1995-1998 | 1,079,160 | CTUIR |
| 27 | Umatilla River | 20-56 | 10.0 | 1995-1998 | 539,600 | ODFW |
| | | | 198.2 | | $9,298,306 | |

1/ Projects 1 through 14 are currently included in the BPA funded 5-year implementation plans. Additional projects (15-27) are anticipated to be implemented in the 6 to 10-year + implementation plans. McKay and Butter Creek habitat enhancement projects (lower priority) are not included in this table or in Strategy I-18 but may be implemented (start with feasibility studies) in future following completion of higher priority projects.

3) Establish minimum streamflows for all migration, spawning, and rearing habitats.

4) Promote water conservation through coordination with irrigators and Oregon Department of Water Resources.

5) Purchase or lease water rights for instream flow enhancement during critical spring and/or fall fish migration periods.

6) Secure annual use of 6,000 acre-feet of uncontracted storage space from McKay Reservoir (assuming it fills) for release during critical spring and/or fall fish migration periods.

B. Provide increased instream flow in the upper Umatilla River (above McKay Creek).

1) Continue studies regarding headwater storage.

2) Pursue construction at sites feasible for enhancement of flows during critical fish migration periods. Most potential sites when last studied were South Fork Umatilla and North Fork Meacham Dam sites (BR Umatilla Basin Project Study, 1983).

ACTION III. Increase artificial production.

A. Use several existing or planned artificial production facilities to provide spring chinook juveniles for release in the Umatilla River.

1) Continue use of state and federal hatcheries for producing fish to be released in the Umatilla Basin (Irrigon, Bonneville, Carson and Cascade).

2) Continue operations of Bonifer and Minthorn acclimation facilities and seek ways to operate at maximum efficiency.

3) Approve master plan, and complete construction of the Umatilla Hatchery (ongoing project).

4) Secure annual O&M funding for all facilities above.

5) Utilize the most suitable and available stocks for salmon introductions and eventually take brood stock from adult returns when runs increase.

6) Monitor and evaluate artificial production programs (including oxygen supplementation at Umatilla Hatchery) to assess the degree to which objectives are being met (ODFW/CTUIR 1989).

B. Use a portion of Northeast Oregon Hatchery to provide spring chinook juveniles for release in the Umatilla River.

Coordinate with the ongoing Northeast Oregon Hatcheries master planning process for potential additional juvenile spring chinook production for the Umatilla Basin.

**Recommended Strategy**

The Umatilla Tribes and Oregon Department of Fish and Wildlife recommend that Strategy 3 be implemented for spring chinook enhancement. Strategy 3 provides a combination of habitat improvements, flow enhancement, and artificial production needed to achieve run size objectives for spring chinook in the Umatilla River. Although system modeling indicates run size objectives can be met with Strategy 1 or 2 (Table 17), these strategies are not recommended because they do not provide the flows critical for fish passage in the lower Umatilla River. In addition, smolt-to-adult survival rates used in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989) indicate run size objectives can only be met with the additional hatchery supplementation included in Strategy 3.

The Umatilla Subbasin is unique in that most action items are already under way as part of the existing fisheries enhancement program. Strategies 1, 2, and 3 contain action items that are already in a planning, design, construction, or operational and maintenance phase. Strategy 3 also includes an evaluation of headwater storage in the upper Umatilla River and the feasibility of McKay Creek fish passage and habitat restoration. Strategy 4 includes headwater storage site construction and will be pursued pending the results from the evaluation.

The SMART analysis resulted in exceptional ratings with high confidence for Strategies 1 and 2 while Strategies 3 and 4 produced above-average ratings with high confidence (Appendix B).

TABLE 19. Umatilla Subbasin Plan fisheries enhancement action items, projects, and costs.

| ACTION ITEM | | PROJECT | STATUS | FUNDING | COST $ CAPITAL | COST $ ANNUAL 1/ |
|---|---|---|---|---|---|---|
| I.A. | 2/ 1. | Threemile Dam Rt. Bank adult fish ladder & trap | Done in '88; fix-ups ongoing | BPA | 1,200,000 | 100,000 |
| I.A. | 2/ 2. | Threemile Dam Lf. Bank ladder, screens, & trap | Done in '88; fix-ups ongoing | BPA | 2,900,000 | 100,000 |
| I.A. | 2/ 3. | Westland Dam adult fish ladder | Start construction '90 | BPA | 600,000 | 20,000 |
| I.A. | 2/ 4. | Westland Diversion juvenile screens & trap | Start construction '89 | BPA | 1,700,000 | 25,000 |
| I.A. | 2/ 5. | Cold Springs diversion dam adult fish ladder | Start construction '89 | BPA | 200,000 | 5,000 |
| I.A. | 2/ 6. | Cold Spring diversion juvenile fish screens | Start construction '89 | BPA | 1,000,000 | 15,000 |
| I.A. | 2/ 7. | Stanfield Diversion Dam adult fish ladder | Start construction '90 | BPA | 400,000 | 10,000 |
| I.A. | 2/ 8. | Stanfield Diversion juvenile fish screens | Start construction '90 | BPA | 700,000 | 15,000 |
| I.A. | 2/ 9. | Maxwell Diversion juvenile fish screens | Done in '89 | BPA | 300,000 | 10,000 |
| I.A. | 2/ 10. | Birch Cr. system diversion dam ladders (3) | Construction in '90-'92 | BPA | included in project #14 | |
| I.A. | 2/ 11. | Adult and juvenile fish trap & haul program | Starting in '89 | BPA | 175,000 | 200,000 |
| I.A. | 2/ 12. | Monitor and evaluate fish ladder & screen pjcts. | Starting in '90 thru '93 | BPA | --- | 300,000 |
| I.A. | 2/ 13. | Screen irrigation ditches; Birch Cr (16) & Umatilla R. (1) | Starting in '90 thru '93 | WMFS | 162,000 3/ | 6,500 4/ |
| I.A. | 2/ 14. | McKay Cr. Rehab. feasibility | | ? | 100,000 | --- |
| I.A. | 2/ 15. | Butter Cr. Rehab. feasibility | | ? | 100,000 | --- |
| I.A. | 2/ 16. | Instream & riparian fish habitat enhancement | Ongoing thru approx. '98 | BPA | 7,230,000 | 138,000 5/ |
| II.A. | 2/ 17. | Umatilla interim pumping (WEID & Makami) | Ongoing thru approx. '95 | BR/BPA 6/ | 50,000 | 100,000 |
| II.A. | 18. | Umatilla Basin fish flow enhancement project | Construction in '89-'95 7/ | BR | 43,000,000 | 410,000 |
| II.A. | 2/ 19. | Umatilla Basin Project operational pumping | Start Phase I in '92 & II in '96 | BPA | --- | 750,000 |
| II.B. | 20. | Planning Rpt. Env. Stmt. - Umatilla headwater storage | No plans at this time | BR? | 200,000 8/ | --- |
| II.B. | 21. | Umatilla headwater storage project | No plans at this time | ? | 78,000,000 | 66,000 8/ |
| III.A. | 22. | Utilize existing hatcheries for releases in Umatilla 9/ | Ongoing & increasing in future | ODFW/USFWS | --- | 230,000 10/ |
| III.A. | 2/ 23. | Utilize Umatilla Hatchery for releases in Umatilla | Start Construction in '90 | BPA | 12,000,000 11/ | 900,000 11/ |
| III.A. | 2/ 24. | Umatilla Satellite Facilities | Start site feasibility in '90 | BPA | 4,000,000 11/ | 250,000 11/ |
| III.A. | 2/ 25. | Monitor & evaluate Umatilla artificial production pgm. | Starting in '90 thru '99 | BPA | --- | 400,000 11/ |
| III.B. | 2/ 26. | Utilize NE OR Hatchery for CHS releases in Umatilla 12/ | Master plan & siting start in '89 | BPA | 3,000,000 13/ | 210,000 10/ |

1/ Annual operation & maintenance or evaluation costs.
2/ Part of existing Umatilla fisheries program projects already in BPA budget plans.
3/ Assumes construction of 17 new screens and refurbishing of 25 screens after 25 years.
4/ Average annual O & M cost on 25 screens for a 50 year period.
5/ Averge annual O & M costs for 15-20 yrs. (annual costs would be lower initially and higher later on when all projects are in place).
6/ BR to cover WEID O & M, Makami capital and O & M costs; BPA to cover WEID and Makami pumping costs (maximum est.)
7/ Project authorized by Congress in 1988; construction pending congressional appropriations
8/ Based on Meacham Dam & Reservoir (27,000 AF storage) 1982 price levels; BR Umatilla Basin Project Planning Aid Report (1983)
9/ Existing hatcheries include Irrigon, Bonneville, Carson, Cascade, & Oak Springs for CHF, CHS, STS, & COH production
10/ Based on $3.50/lb to produce CHS and $3.00 for CHR (includes rearing, trucking, and administration).
11/ Cost estimates from Umatilla Hatchery Master Plan (ODFW/CTUIR 1989).
12/ Assumes 589,000 spring chinook smolts produced for release into Umatilla Basin.
13/ Based on facility construction cost of $50.00 per lb. of fish produced.

Table 20. Umatilla Subbasin fisheries enhancement strategies, descriptions, and cost summaries.

| STRATEGY | ACTION ITEM | DESCRIPTION | COST | | HATCHERY PRODUCTION (milions of smolts) 3/ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | CAPITAL | ANNUAL | UMATILLA HATCHERY | | | OTHER HATCHERIES | |
| | | | | | ChS | ChF | StS | ChS | ChF |
| 1 | I.A. | Adult and juvenile passage improvements | 9,337,000 | 806,500 | | | | | |
| for ChS, ChF, | I.B. | Instream and riparian habitat enhancement | 7,230,000 | 138,000 | | | | | |
| and StS | III.A. | Utilize Umatilla and other existing hatcheries | 16,000,000 | 1,780,000 | 1.29 | 5.94 | 0.21 | 0.45 | 1.06 |
| | | TOTAL | 32,567,000 | 2,724,500 | | | | | |
| 2 | Above Items | See description above | 32,567,000 | 2,724,500 | | | | | |
| for ChS, ChF, | I.A.3. | McKay and Butter Creek restoration planning | 200,000 | | | | | | |
| and StS | II.A. | Umatilla Basin flow enhancement project | 43,050,000 | 1,260,000 | | | | | |
| | II.B.1. | Headwater storage feasibility | 200,000 | | | | | | |
| | | TOTAL | 76,017,000 | 3,984,000 | | | | | |
| 3 for ChS | Above Items | See description above | 76,017,000 | 3,984,500 | | | | | |
| | III.B. | Utilize portion of NE OR Hatchery | 3,000,000 | 210,000 | | | | 0.60 | |
| | | TOTAL | 79,017,000 | 4,194,500 | | | | | |
| 3 for ChF, StS | Above Items | See descriptions above | 79,017,000 | 4,195,500 | | | | | |
| and | II.B.2. | Umatilla headwater storage project | 78,000,000 | 66,000 | | | | | |
| 4 for ChS | | TOTAL | 157,017,000 | 4,260,500 | | | | | |

Note: Stratege 2 is the preferred strategy for ChF and StS.
Strategy 3 is preferred strategy for ChS.

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## SUMMER STEELHEAD

### Fisheries Resource

### Natural Production

History and Status

The Umatilla River once produced large runs of steelhead that supported productive tribal and non-tribal fisheries. Contemporary summer steelhead runs to the mouth of the river have been conservatively estimated to contain approximately 2,600 fish, a fraction of historical run sizes.

The dramatic decline of summer steelhead is largely the result of hydroelectric and irrigation operations on the mainstem Umatilla River. Hermiston Power and Light hydroelectric project (RM 10) and Three Mile Dam (RM 3), built on the Umatilla River in 1910 and 1914, respectively, are believed to have caused the largest decline of steelhead in the Umatilla Subbasin. Additional losses resulted from habitat degradation and extremely low streamflows and dewatering of the lower mainstem Umatilla River by irrigation diversions, and by construction and operation of mainstem Columbia River hydroelectric projects.

Steelhead survived the summer and early fall dewatering of the lower mainstem Umatilla River by irrigation diversions, which was largely responsible for eliminating salmon from the drainage. For many years steelhead was the only anadromous salmonid naturally spawning in the Umatilla Subbasin.

The Confederated Tribes of the Umatilla Indian Reservation and the Oregon Department of Fish and Wildlife have embarked on a comprehensive plan for rehabilitation of anadromous fish stocks in the Umatilla River Basin (ODFW 1986). This plan includes a major steelhead hatchery supplementation program.

An estimated 4,104 acres (314 stream miles) of summer steelhead spawning and rearing habitat exist in the basin (NPPC 1988). Streams include Meacham Creek, North Fork Umatilla River, South Fork Umatilla River, upper mainstem Umatilla River, and Squaw, Birch and other small tributary creeks. The present distribution of summer steelhead in the Umatilla Subbasin is shown in Figure 7.

# UMATILLA SUBBASIN

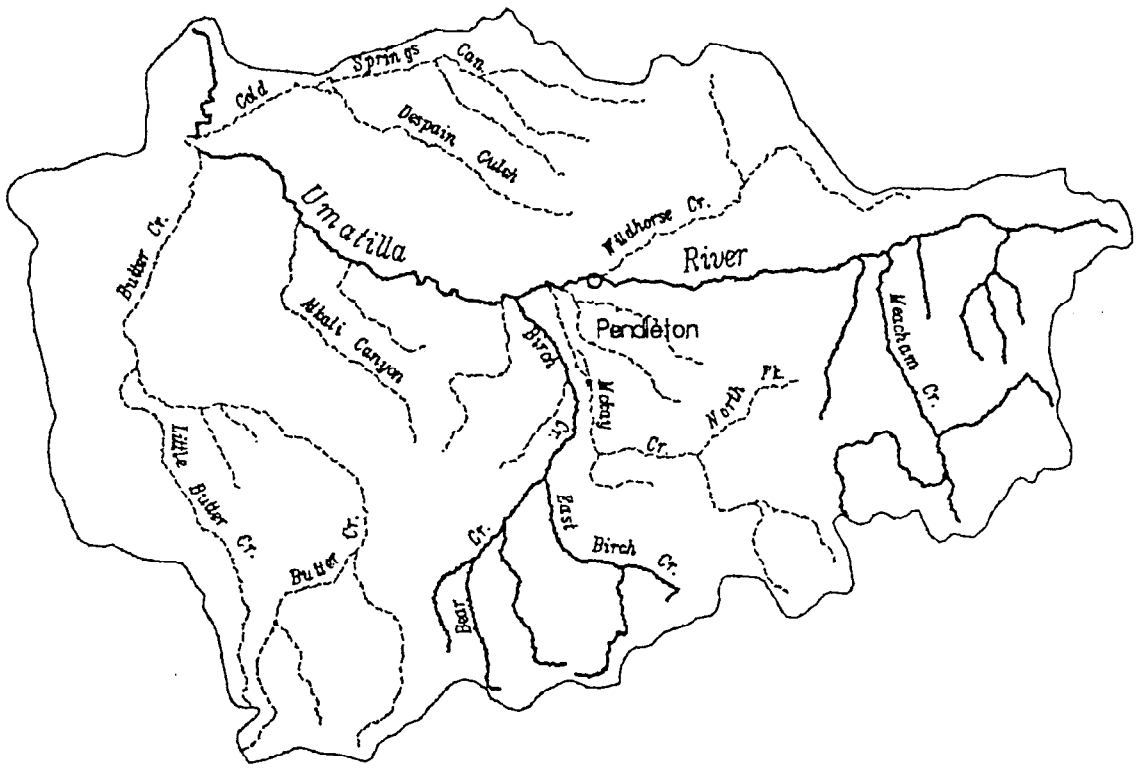
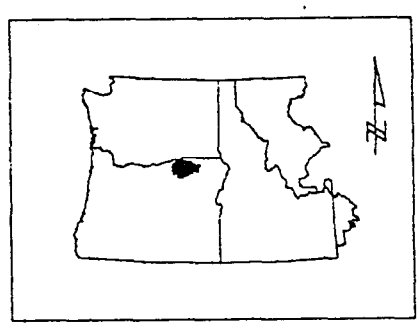



Figure 7.

SUMMER STEELHEAD DISTRIBUTION*

———— PRESENT/POTENTIAL

---------- ABSENT



GIS GEOGRAPHIC INFORMATION SYSTEM

BONNEVILLE POWER ADMINISTRATION

* Due to the limitations of scale, all streams which support anadromous fish are not shown on this map.

## Life History and Population Characteristics

Adult time of entry into the river varies depending upon the quantity and temperature of streamflow (Table 21). In average and above-average water years, small numbers of adults may enter the river as early as the first week in October following cessation of major irrigation diversions. Peak upstream migration occurs from January to March (Table 22). Time of entry into the river may change in the future in response to ongoing initiatives to enhance instream flows beginning in mid-September.

Summer steelhead have been counted at Three Mile Dam in the lower Umatilla River for run years 1972 through 1988 (Table 14 and 22). The latter is the best available data based on actual counts at Three Mile Dam and creel census below the dam.

Steelhead rear one to three years in the Umatilla Subbasin, most for two years. Fish spend one to two years in the ocean; most spend two years. Of 73 fish sampled from run years 1983 through 1988, ages ranged from 3 to 6 years; 5 years of age was most common (CTUIR 1987a).

There is limited information on Umatilla steelhead sex ratios for the years 1978 to 1982 (CTUIR 1987a). The ratio was 1 male to 1.7 females for 1,278 fish sampled in 1987-1988, the only complete run year data available (Table 23).

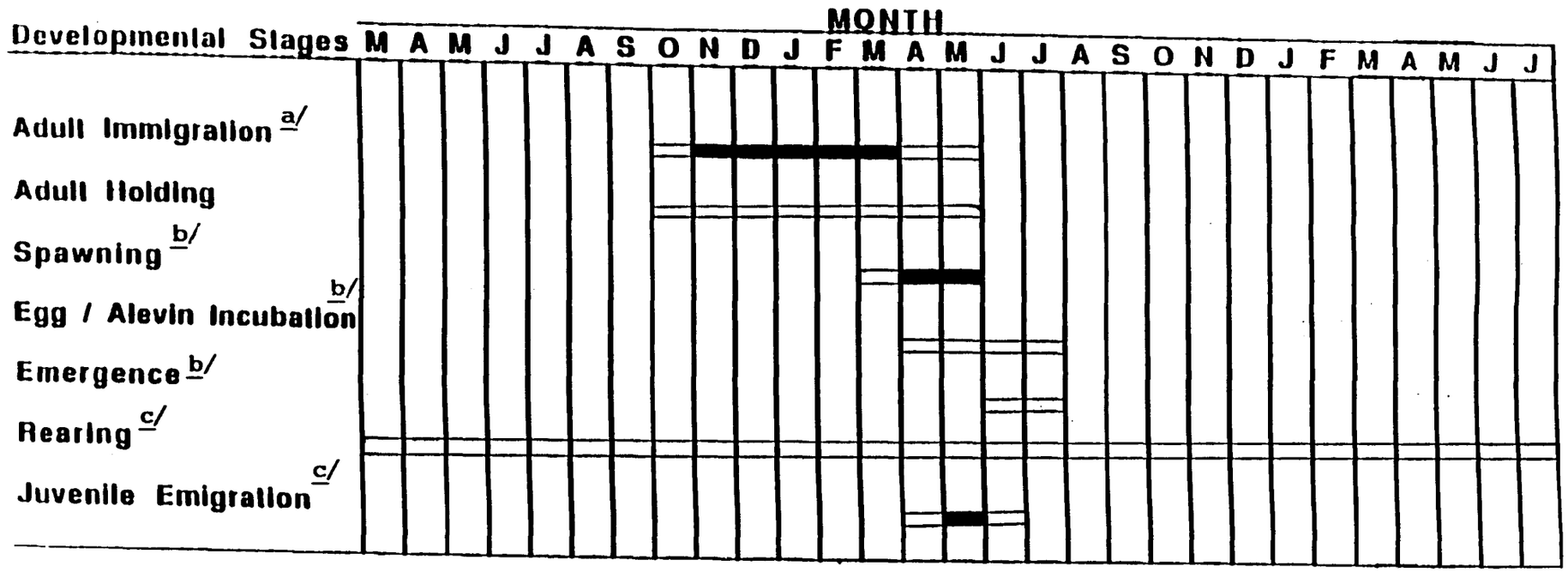
Individual steelhead weights and lengths were collected for run years 1982 through 1985 (CTUIR 1987a). The most complete data was obtained from the 1987-1988 run year; the 991 fish sampled averaged 65.1 cm (25.62 inches) fork length (Table 14 and Fig. 8).

Spawning generally begins to occur in March with peak activity in April and May (Table 21).

Average fecundity in 157 fish sampled from 1983 to 1987 was 5,184 eggs per female (CTUIRa). Thirty one fish spawned in 1988 averaged 5,696 eggs per female. Average fork length was 25.19 inches. Figure 9 shows fork length and fecundity relationships for fish spawned in 1988.

Umatilla steelhead emerge in June and July (Table 21). Juvenile steelhead rear for one to three years; most migrate to the Columbia River as 2-year-olds. Migration occurs April through June, peaking in May (Table 21).

Table 21. Freshwater life history for summer steelhead (natural production) in the Umatilla Basin.




Notes:

1. The developmental stage timing represents basin-wide averages, local conditions may cause some variability.
2. Solid bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

a/ Adults to Three Mile Dam, 1972-73 to 1987-88.

b/ Estimated from spawning ground surveys and average environmental conditions.

c/ Juveniles rear 1 to 3 years; most migrate out as 2-year olds (ODFW Umatilla Fish District data as reported in ODFW et al. 1985).

Table 22. Three Mile Dam, Umatilla River steelhead counts 1972-1973 to 1988-1989.

| YEAR | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| % By Month | 1% | 11% | 13% | 21% | 20% | 23% | 10% | 1% | 100% |
| 1972-73 | | 0 | 0 | 32 | 204 | 1821 | 0 | 0 | 2057 |
| 1973-74 | | 680 | 557 | 570 | 355 | 478 | 0 | 0 | 2640 |
| 1974-75 | | 0 | 264 | 315 | 1476 | 59 | 40 | 17 | 2171 |
| 1975-76 | | 0 | 258 | 966 | 1190 | 108 | 12 | 0 | 2534 a/ |
| 1976-77 | | 22 | 100 | 163 | 21 | 222+ | 25+ | 0 | N/A b/ |
| 1977-78 | | - | 828 | 1432 | 641 | 179 | 0 | 0 | 3080 c/ |
| 1978-79 | | - | - | - | - | - | - | - | N/A d/ |
| 1979-80 | | 0 | 870 | 147 | 427 | 609 | 269 | 45 | 2367 |
| 1980-81 | | 210 | 492 | 319 | 47 | 142 | 78 | 10 | 1298 e/ |
| 1981-82 | 34 | 91 | 155 | 77 | 73 | 178 | 129 | 31 | 768 e/ |
| 1982-83 | 32 | 95 | 133 | 218 | 225 | 276 | 280 | 5 | 1264 e/ |
| 1983-84 | 118 | 569 | 293 | 878 | 158 | 242 | 56 | 0 | 2314 f/ |
| 1984-85 | | 500 | 11 | 27 | 21 | 1548 | 1069 | 21 | 3197 f/ |
| 1985-86 | 69 | 79 | 89 | 1525 | 692 | 350 | 82 | | 2885 f/ |
| 1986-87 | 76 | 1349 | 465 | 89 | 631 | 477 | 351 | 6 | 3444 f/ |
| 1987-88 | 7 | 44 | 13 | 220 | 642 | 754 | 759 | 42 | 2481 g/ |
| 1988-89 | 15 | 385 | 209 | 361 | 54 | 867 | 506 | 79 | 2476 g/ |

a/ Count from December 24 until May 31. The count is quite low because many fish passed upstream uncounted prior to December 24, after the ladder was opened on October 22.

b/ Extremely low flows prevented adequate steelhead passage during much of the season. The Department of Fish & Wildlife transported 205 steelhead upstream to a release point near Reith (RM50). The counter was removed for a two-week period in late March and early April when flows good. Many fish passed during that time.

c/ Count from December 13 to March 9. Counter not installed nor operating until December 13. Vandals ruined counter March 10.

d/ No count this year due to vandalism of counter previous year.

e/ This number includes 100 fish (25 males and 75 females which were used for brood stock.)

f/ This number includes brood fish. This estimate is derived from the actual count in the west bank ladder, times a corrected marked to unmarked ration from the fishery above Three Mile Dam. This estimate of the annual run was broken back to monthly estimates by percentage of fish that arrived at the west ladder by month. Data corrected 5-18-89.

g/ This number includes brood fish. These are actual total counts at Three Mile Dam trap.

NOTE: Adult steelhead counts at 3 Mile Dam were by electronic counter 1972-73 to 1982-83 (ODFW) and by mark-recapture survey 1983-84 to 1986-87 and by actual trap count 1987-88 to 1988-89.

Table 23. Sex ratios for Umatilla River steelhead, 1987-1988.

| MONTH | TALLY MALE | TALLY FEMALE | Monthly Sex Ratio Male | Monthly Sex Ratio Female |
|---|---|---|---|---|
| OCT 87 | 0 | 2 | -- | -- |
| NOV 87 | 16 | 4 | 1.00 | 0.25 |
| DEC 87 | 0 | 3 | -- | -- |
| JAN 88 | 69 | 74 | 1.00 | 1.07 |
| FEB 88 | 146 | 228 | 1.00 | 1.56 |
| MAR 88 | 94 | 157 | 1.00 | 1.67 |
| APR 88 | 133 | 312 | 1.00 | 2.35 |
| MAY 88 | 7 | 33 | 1.00 | 4.71 |
| TOTAL | 465 | 813 | | |
| RATIO | 1.0 | 1.7 | | |

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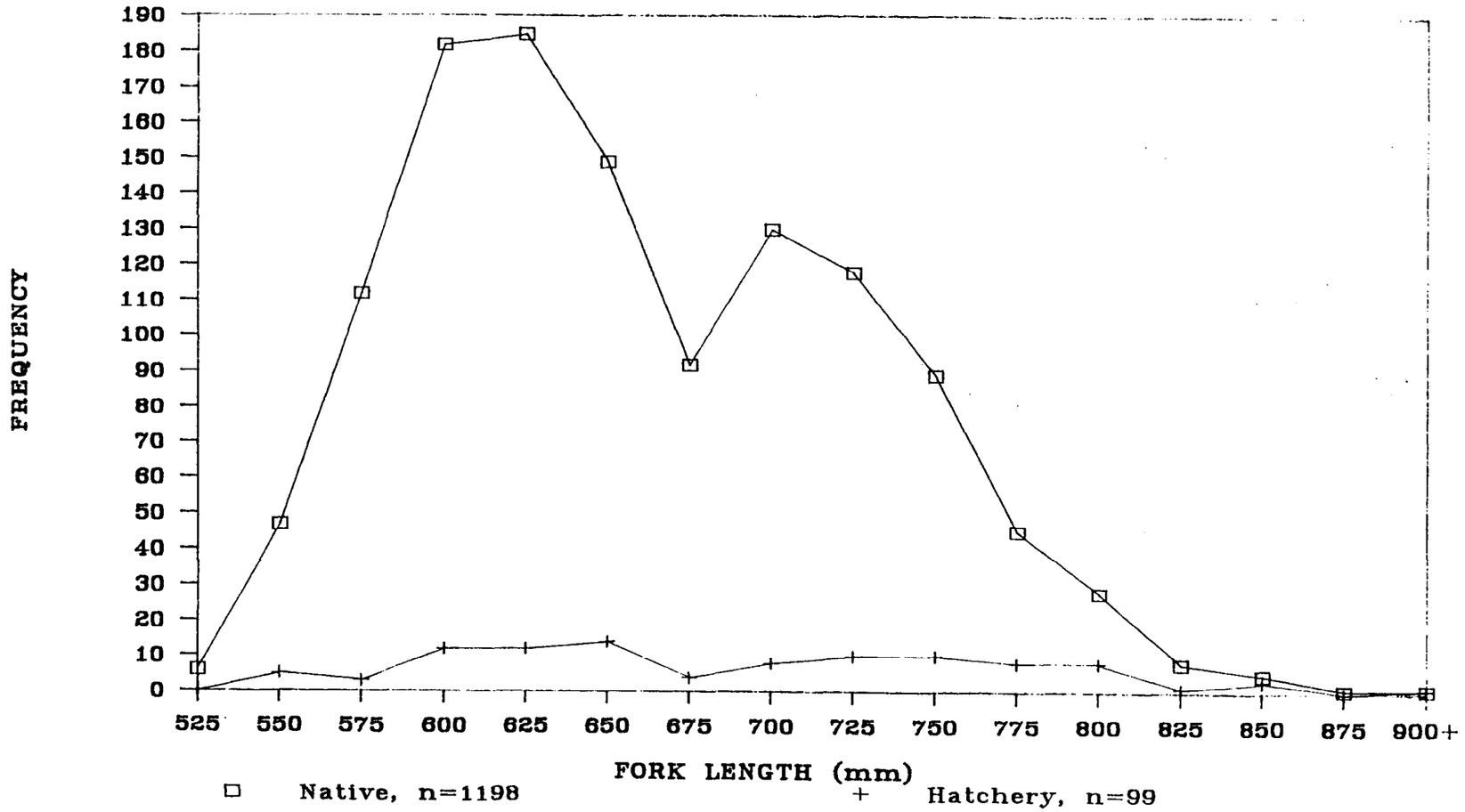



Figure 8. Length frequency of Umatilla River summer steelhead, 1987-1988 (summer steelhead were sampled at Three Mile Dam trap; 1,198/2,316 native and 99/165 hatchery origin fish were sampled for lengths).

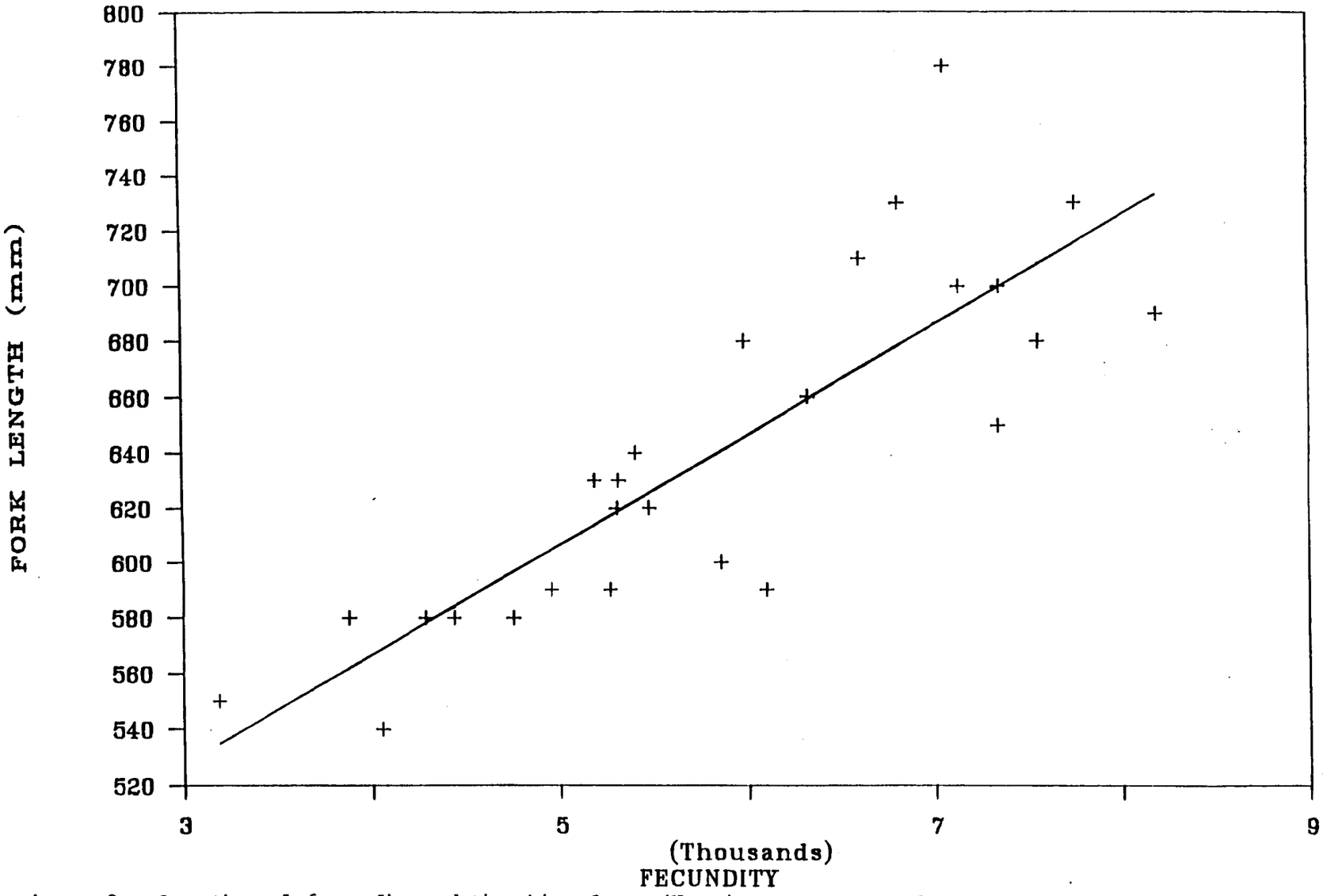



Figure 9. Length and fecundity relationship of Umatilla River Steelhead, 1988 Spawn

No egg-to-fry or fry-to-smolt survival rates are currently known for naturally produced Umatilla summer steelhead. An estimate of egg-to-smolt survival was made for two years when complete steelhead smolt counts were made in the lower Umatilla River. Since most smolts migrate out at age 2, the adult escapement (based on Three Mile Dam counts minus harvest above Three Mile Dam) two years prior to the known smolt outmigration was used to derive the number of eggs (using available fecundity data and a 1-1 male-female ratio). Based on 1988 data, this ratio may not be correct. The estimate of total eggs deposited was compared to the known smolt numbers to estimate an egg-to-smolt survival rate for two years. Good smolt information existed for five years, but no adult escapement data was available for the corresponding brood year in three of those years. The average of the two egg-to-smolt survivals for brood years 1966 and 1975 is 1.46 percent. The estimated survival rates indicate a smolt seeding level between 61 and 77 percent (ODFW 1987).

No reliable data is available on smolt-to-adult survival rates. Using the average smolt count of 54,224 fish at irrigation diversion screens in run years 1966 through 1980 (prior to most hatchery releases), and an average adult return to the mouth of the Umatilla River of 2,066 fish, the smolt-to-adult survival would be 3.8 percent.

"According to Northwest Power Planning Council methodology, the total summer steelhead smolt capacity in the Umatilla Basin is 60,900. This is believed to be far less than the actual capacity. In years of low spring flows in the Umatilla, all or most smolts are captured and trucked the last 27 miles to the Columbia River in order to avoid dewatered areas. In 1977, 107,500 smolts were captured at the Westland trap in the lower Umatilla and transported to the mouth. This was the basis for calculation of steelhead carrying capacity in the United States vs. OR reports (ODFW 1987). The 107,500 smolt capacity can be considered a minimum and may still be low if the 1977 smolt count was not representative of fully seeded available habitat" (CTUIR 1987a).

Present estimated adult steelhead carrying capacity of 4,787 fish is based on the number of adults required to produce 107,500 smolts (ODFW 1987).

The Umatilla Tribes and Oregon Department of Fish and Wildlife conducted steelhead spawning ground surveys in 1985 through 1988. An average of 3.8 redds per mile were found in various Umatilla River tributaries (Table 24).

Table 24. Umatilla River steelhead spawning ground survey, 1985 through 1988 summary.

| YEAR | Number of Streams Surveyed 1/ | Miles Surveyed | Live | Dead | Redds | Redds Per Mile |
|---|---|---|---|---|---|---|
| 1985 | 9 | 22.0 | 16 | 6 | 33 | 1.5 |
| 1986 | 8 | 20.9 | 9 | 0 | 134 | 6.4 |
| 1987 | 17 | 53.5 | 17 | 2 | 150 | 2.8 |
| 1988 | 18 | 61.0 | 28 | 2 | 275 | 4.5 |
| Average | 13 | 38.8 | 18 | 3 | 146 | 3.8 |

1/ Pesent steelhead streams include East and West Birch Pearson, Buckaroo, Squaw, North and East Fork Meacham, Boston Canyon, Camp, Owlsley, Ryan, North and South Fork Umatilla River, Buck, Saddle Hallow, Bear, Thomas, and Shimmiehorn Creeks. Not all streams were surveyed each year.

Supplementation History

The purpose of the summer steelhead supplementation program is to increase harvest and increase natural production.

Managers have released various steelhead stocks in the Umatilla River since 1967 (Table 25). Since 1981, all hatchery releases have been progeny of adult steelhead trapped at Three Mile Dam in the lower Umatilla River. Although emphasis has been placed on using only naturally produced Umatilla steelhead for brood stock, scale analysis has shown that some hatchery fish may have been spawned (CTUIR 1987a). These fish may have been returns from previous unmarked Umatilla releases or strays from elsewhere. Managers take approximately 50 females and 50 males each year for brood stock. Brood stock is collected and held starting in late fall and spawned in April and May. Juveniles have been reared for one year at Oak Springs and released back into the Umatilla during April and May.

The proposed Umatilla/Irrigon Hatchery will produce 210,000 smolts for release in the Umatilla River drainage.

The genetic character of the existing summer steelhead population will be maintained by continuing to take brood stock from adults returning to the Umatilla River and rearing these fish to full-term yearling smolts (five fish per pound). Managers will avoid detrimental shifts in the genetic character of the native stock by marking all hatchery fish and giving brood stock priority to unmarked returning adults. The Oregon Department of Fish and Wildlife plans special, more restrictive regulations on harvest of unmarked, naturally produced fish (ODFW/CTUIR 1988).

Fish Production Constraints

Steelhead natural production constraints are the same as those discussed for spring chinook (Table 11).

**Hatchery Production**

Description of Hatcheries

See previous discussion of hatchery facilities under spring chinook. Annual releases from both facilities are shown in Table 25. Details on facility operations are provided in CTUIR (1987b).

All steelhead released from these facilities were of Umatilla River origin reared at the Oregon Department of Fish and Wildlife Oak Springs Hatchery on the Deschutes River.

Table 25. Releases of summer steelhead hatchery fish in the Umatilla Subbasin.

| Release Year | Hatchery | Number Released | Release Location | Stock | (Fish/lb.) Size |
|---|---|---|---|---|---|
| 1967 | Gnat Creek | 109,805 (f) | Barnhart to South Cr. bridge | Skamania | 75 |
| 1967 | Oak Springs | 238,020 (f) | " | Idaho (Oxbow) | 117 |
| 1967 | Wallowa | 142,240 (f) | " | Idaho (Oxbow) | 240 |
| 1968 | Gnat Creek | 23,100 (f) | Upper Umatilla | Skamania | 66 |
| 1968 | Gnat Creek | 150,000 | Minthorn Springs? | Skamania | Eggs |
| 1969 | Oak Springs | 174,341 (f) | Upper Umatilla | Skamania | 145 |
| 1970 | Carson | 23,400 (y) | Upper Umatilla | Skamania | 9 |
| 1970 | Carson | 16,089 (y) | Upper Umatilla | Skamania | 8 |
| 1975 | Wizard Falls | 11,094 (y) | Upper Umatilla | Umatilla River | 9 |
| 1981 | Oak Springs | 17,600 (y) | " | Umatilla River | 6-9 |
| 1981 | " | 9,400 (f) | " | " | 145 |
| 1982 | " | 59,500 (y) | " | " | 7-8 |
| 1982 | " | 68,000 (f) | " | " | 124 |
| 1983 | " | 60,500 (y) | " | " | 11 |
| 1983 | " | 52,700 (f) | " | " | 62 |
| 1984 | " | 58,000 (y) | Bonifer Facility | " | 6.5 |
| 1984 | " | 22,000 (f) | " | " | 135 |
| 1985 | " | 53,900 (y) | " | " | 7 |
| 1985 | " | 39,100 (f) | " | " | 150 |
| 1986[a] | " | 54,100 (y) | " | " | 8.4 |
| 1987[a] | " | 1,485 (y) | Upper Umatilla | " | 5.5 |
| 1988[b] | " | 30,000 (y) | Minthorn Facility | " | 6-8 |
| 1988[b] | " | 30,000 (y) | Near Minthorn Facility | " | 6-8 |
| 1988[a] | " | 30,000 (y) | Upper Umatilla | " | 6-8 |
| 1989[b] | " | 30,000 (y) | Minthorn Facility | " | 6-8 |
| 1989[b] | " | 30,000 (y) | Near Minthorn Facility | " | 5-6 |
| 1989[a] | " | 22,000 (y) | Bonifer facility | " | 8-10 |

[a] Adipose clip only
[b] CWT, Adipose, LV

(f) fingerling sub-yearling
(y) yearling smolt

Hatchery steelhead adult returns comprised roughly 10 percent of Three Mile Dam count in run years 1986 through 1988.

Seven hatchery-origin steelhead returned to Bonifer in 1987 and two returned in 1988. These counts probably do not represent total returns to facility. Numerous adults and redds have been observed in the immediate vicinity of the adult trap.

Life History and Population Characteristics

Data on adult hatchery returns is very limited. With increased returns, it is assumed that hatchery reared fish released from the Bonifer and Minthorn facilities will show similar timing characteristics of life history stages as naturally produced summer steelhead (Table 26).

Adult age structure data is very limited. It is assumed fish released from the Bonifer and Minthorn facilities will show the same characteristics as naturally produced summer steelhead.

Sex ratio data is very limited as well. The male-female ratio of 110 marked hatchery fish returning to Three Mile Dam in 1987-1988 was 1-to-2.13.

Adult weight and length data is also very limited. Of 99 hatchery fish sampled at Three Mile Dam in 1987-1988, the average fork length was 26.73 inches, the minimum 20.86 inches and the maximum 35.82 inches (Fig. 8).

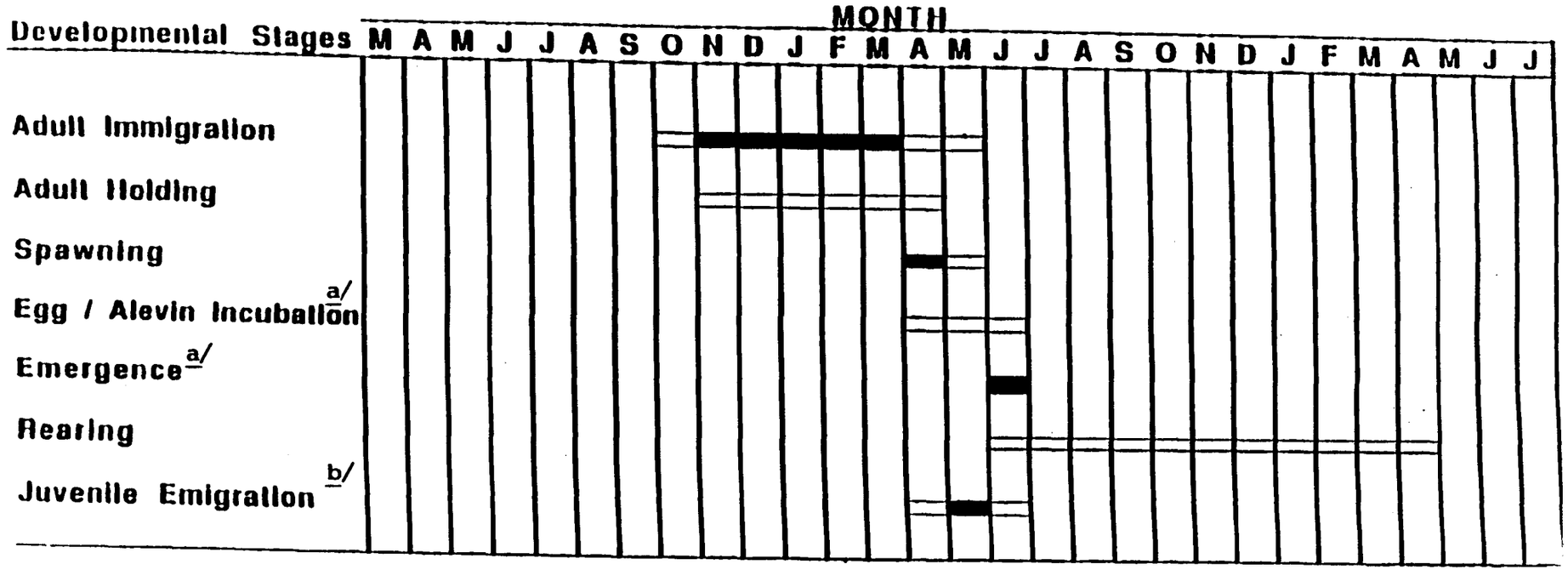
Fecundity data is very limited. Managers assume that hatchery-reared fish released from the Bonifer and Minthorn facilities will show the same fecundity characteristics as naturally produced summer steelhead (Fig. 9).

Incubation occurs in April and May (Table 26). In recent years, incubation has been at the Oregon Department of Fish and Wildlife's Irrigon Hatchery and fry were transferred to Oak Springs Hatchery. Incubation is briefer in the relatively warm water at Irrigon than under natural conditions.

Although fry and yearlings have been released in the past (Table 25), the current steelhead program is based on yearling releases. Fry in excess of hatchery needs occasionally are released into habitat.

Hatchery releases generally have been in April (Table 26). Smolt trapping at Westland Diversion Dam has shown hatchery smolts emigrate from April to early June, similar to the timing of natural smolt emigration.

Table 26. Fresh water life history for Umatilla Basin summer steelhead, hatchery origin (Umatilla stock).




Notes:

1. The developmental stage timing represents basin-wide averages, local conditions may cause some variability.
2. Solid bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

a/ Irrigon Hatchery - (Ray Hill, pers. comm.)

b/ Emigrating juveniles, hatchery origin, are primarily yearlings.

Estimated Umatilla hatchery steelhead egg-to-smolt survival is 0.53 (ODFW/CTUIR 1988). Recent smolt-to-adult survival rates for hatchery steelhead in the Umatilla River have been extremely low (0.005). Estimated Umatilla hatchery steelhead smolt-to-adult survival is 0.027 (ODFW/CTUIR 1988).

Anticipated Production Facilities

The Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program [704(i)(1) and 703(f)(1)(a)] authorizes construction of the Umatilla Hatchery near Irrigon, Oregon, approximately 10 miles downstream from the Umatilla River's confluence with the Columbia.

The Umatilla Hatchery will use 15,000 gallons per minute of water from two nearby Rainey wells and will be tied into water supply of the adjacent Irrigon Hatchery for optimum flexibility and efficiency. The hatchery will have 24 "Michigan-type" raceways using oxygen supplementation and 10 standard raceways similar to those at Irrigon Hatchery. The hatchery will include off-station brood stock collection and holding facilities (ODFW/CTUIR 1988). A comprehensive monitoring and evaluation program will immediately follow hatchery construction.

The Umatilla Hatchery is scheduled for completion in 1990. First releases of juvenile steelhead into the Umatilla Subbasin are projected for the spring of 1991.

In response to Columbia River Basin Fish and Wildlife Program Measure 703 (f)(1)(a), the Oregon Department of Fish and Wildlife and Umatilla Tribes have prepared a Umatilla Hatchery Master Plan to guide production, release, harvest, monitoring and evaluation, and interagency coordination (ODFW/CTUIR 1988).

Initially the Umatilla Hatchery will rear summer steelhead, spring and fall chinook.

The Umatilla/Irrigon Hatchery has a total design capacity of 290,000 pounds of fish. It will produce 210,000 Umatilla River summer steelhead smolts (42,000 pounds).

Biologists will take brood stock from adults returning to Umatilla River. All hatchery-produced fish will be marked. The Oregon Department of Fish and Wildlife will closely regulate non-tribal recreational harvest of unmarked fish. The Umatilla Tribes will regulate tribal harvest of unmarked fish. Unmarked fish will be selected for hatchery brood stock.

Hatchery managers will rear smolts to about five fish per pound. They will be released into the Bonifer and Minthorn facilities for acclimation and into the mainstem Umatilla River

and Meacham Creek nearby the facilities. Release sites have been selected to evaluate the benefits of acclimation and to achieve adult production objectives including harvest and natural spawning escapement.

Constraints to Hatchery Production

Constraints, problems and actions that could improve production of summer steelhead are the same as those discussed for spring chinook.

**Harvest**

Umatilla River steelhead are caught in non-tribal and tribal fisheries in the mainstem Columbia River. Within the subbasin, the non-tribal recreational catch is from the mainstem Umatilla River below Three Mile Dam to the reservation boundary. The tribal catch is predominately from the mainstem Umatilla River and tributaries on the Umatilla Reservation. Table 27 contains estimated harvest and spawning escapement for run years 1972 through 1988.

The Oregon Department of Fish and Wildlife and Umatilla Tribes cooperate in setting subbasin harvest management goals and regulations. Harvest and allocation guidelines (Table 28) are part of the Umatilla Hatchery Master Plan.

The Umatilla Tribes and Oregon Department of Fish and Wildlife plan to provide tribal and sport opportunity to fully utilize the harvestable surplus portion of adult return objectives. Procedures to be included in a CTUIR/ODFW Umatilla Subbasin harvest program include:

A) Jointly design and implement annual harvest allocation plans that provide for increasing levels of harvest, brood stock, and natural production as the total run size increases (to be based on harvest guidelines, Table 28).

B) Implement angling regulations that will allow for meeting the required escapement levels of adults and smolts for natural productions without limiting fishery objectives (regulations will be designed to allow a fishery as runs are rebuilding). Regulatory factors will include:

- Harvest numbers
- Harvest method
- Harvest locations and times
- Possible harvest restrictions (such as jacks only, marked hatchery fish only)

Table 27. Estimated harvest and spawning escapement for summer steelhead (Umatilla stock), 1972-1988.

| Run Year | Sport Catch [1] Adults | Tribal Catch [2] Adults | Escapement [3] Adults | Adult Return [4] 3 Mile Dam | | Sport Below Dam | | Mouth |
|---|---|---|---|---|---|---|---|---|
| 1972-73 | 1913 | 75 | 1026 | 2057 | + | 957 | = | 3014 |
| 1973-74 | 326 | 75 | 2102 | 2340 | + | 163 | = | 2503 |
| 1974-75 | 338 | 75 | 1927 | 2171 | + | 169 | = | 2340 |
| 1975-76 | 379 | 75 | 2270 | 2534 | + | 190 | = | 2724 |
| 1976-77 | 116 | 75 | 1095 | 1228 | + | 58 | = | 1286 |
| 1977-78 | 866 | 75 | 2572 | 3080 | + | 433 | = | 3513 |
| 1978-79 | 280 | 75 | N/A | N/A | | | | |
| 1979-80 | 878 | 75 | 1853 | 2367 | + | 439 | = | 2806 |
| 1980-81 | 630 | 75 | 850 | 1298 | + | 315 | = | 1613 |
| 1981-82 | 495 | 75 | 446 | 768 | + | 248 | = | 1016 |
| 1982-83 | 175 | 75 | 1102 | 1264 | + | 88 | = | 1352 |
| 1983-84 | 196 | 75 | 1889 | 2314 | + | 98 | = | 2412 |
| 1984-85 | 133 | 75 | 3295 | 3197 | + | 67 | = | 3264 |
| 1985-86 | 76 | 75 | 2808 | 2885 | + | 38 | = | 2923 |
| 1986-87 | 219 | 75 | 2830 | 3444 | + | 110 | = | 3554 |
| 1987-88 | N/A | 75 | | 2481 | + | 300 | = | 2781 |

[1] Punch Card Data. ODFW (1983): Run Years 1972-1973 to 1976-77.
ODFW (1987): Run Years 1977-78 to 1984-85.
: Run Years 1985-86 to 1986-87 (Charlie Corrarino pers. comm. 5-19-89).

[2] Don Sampson, CTUIR, personal comm: Average 50 fisherman at 1.5 fish per year.

[3] Total return to mouth minus harvest.

[4] 3 Mile Dam count plus sport harvest (mouth to 3 mile dam).
Sport harvest below 3 mile dam is approximately 50% of the total sport harvest (Phelps, ODFW, pers. Comm.). Adult Steelhead counts at 3 mile dam was by electronic counter 1972-73 to 1982-83 (ODFW, 1983) and by mark-recapture survey 1983-84 to 1986-87. Run year 1987-88 was total count past dam plus angler survey below 3 mile dam.

Table 28. Harvest plan guidelines for summer steelhead[1] (ODFW/CTUIR 1989).

Broodstock Collection Goal = 210
Run Size Goal (to mouth) = 9,670 (4,000 natural, 5,670 hatchery)

Interim Spawning Escapement Goal = 3,000
Optimum Spawning Escapement Goal = 3,400

| Total Run Size [2] | Umatilla Hatchery Broodstock[3] | Spawning Escapement | Research Needs[5] | In-River Harvest |
|---|---|---|---|---|
| 1,000 | 210 | 690 | 140 | Based on available surplus[6] |
| 2,000 | 210 | 1,690 | 280 | |
| 3,000 | 210 | 2,190 | 280 | |
| 4,000 | 210 | 2,590 | 280 | |
| 5,000 | 210 | 3,000[4] | 280 | |
| 6,000 | 210 | 3,000 | 280 | |
| 7,000 | 210 | 3,000 | 280 | |
| 8,000 | 210 | 3,000 | 280 | |
| 9,000 | 210 | 3,000 | | |
| 10,000 | | | | |

[1] Schedule will be the basis for development of annual harvest plans.

[2] Includes wild/natural (unclipped) and hatchery returns (clipped) to the mouth of the Umatilla River.

[3] Wild/natural (unclipped) steelhead will be first priority for broodstock; however, no more than 20% of the unclipped population will be used for broodstock. A maximum of 210 broodstock are needed for the Umatilla Hatchery.

[4] Interim spawning escapement goal achieved.

[5] $O_2$ and acclimation studies (need 140 tags each). Samples would be collected from harvest, spawning surveys, broodstock, and returns to acclimation facilities.

[6] Available surplus is fish available for harvest after hatchery broodstock, spawning escapement, and research needs are met at the various total run sizes as evaluated and agreed to by CTUIR and ODFW.

C) Monitor and enforce compliance with angling regulations and evaluate fisheries to assess the degree to which objectives are being met.

D) Determine what Columbia River and ocean harvest rates are on "Umatilla" fish, and the corresponding proportions of that harvest on the total Umatilla return.

To date harvest management procedures have been limited due to small numbers of available fish. Anticipating the results of habitat improvements and supplementation, the Oregon Department of Fish and Wildlife and Umatilla Tribes will continue to identify the necessary procedures for harvest management coordination, regulation, monitoring and enforcement. These procedures will be developed in more detail and formalized as more data becomes available and more fish become available for harvest.

**Specific Considerations**

A significant amount of underutilized summer steelhead habitat exists in the subbasin. The run entering the river in recent years has contained approximately 2,500 to 3,000 fish. The Oregon Department of Fish and Wildlife and Umatilla Tribes have a run size goal of 4,000 returning naturally produced adults.

The existing steelhead run provides a ready source of excellent brood stock for hatchery supplementation. Returns of hatchery fish in recent years have numbered approximately 300 adult fish from a release of 60,000 smolts (smolt-to-adult survival of 0.005). The ODFW/CTUIR goal is to obtain a smolt-to-adult survival of 0.027 and ultimately 5,670 adult fish from a release of 210,000 smolts.

The key problem and constraint on production of all species or races in the subbasin is seasonal dewatering of the lower 30 or so miles of the mainstem river by irrigation diversions. This impedes and, during low flow years, can block late spring and early summer juvenile migrants and late spring and early fall returning adults. Impending completion of improved juvenile bypass and adult passage facilities, and juvenile and adult collection and transportation facilities will significantly reduce this constraint on achieving optimum fish production. Instream flows necessary for fish passage will be restored with implementation of the Columbia River-Umatilla River water exchange project authorized by the 100th Congress.

The Umatilla River Subbasin:

- Lies above three mainstem Columbia River hydroelectric projects.
- Lies at the head of the Columbia River Zone 6 treaty fishing area.
- Lies within the most populous eastern Oregon county and in close proximity to southeastern Washington population centers; contains important tribal usual and accustomed fishing sites and the reservation of the Confederated Tribes of the Umatilla Indian Reservation, which has treaty-reserved rights to fish.
- Is easily accessible to fishermen; provides geographically extensive opportunities for a wide variety of tribal and non-tribal fisheries.
- Provides opportunities for major terminal, known-stock fisheries on hatchery fish.
- Provides opportunities for intensive management of mixed stocks of wild, natural and hatchery fish and for evaluation of the spectrum of fisheries and habitat management initiatives.
- Is the most likely northeast Oregon subbasin in which major, near-term tribal and non-tribal fisheries can be developed with hatchery outplants.
- Has in recent years been given high priority for restoration of salmon and steelhead runs and fisheries by tribal, state, regional and federal fisheries agencies; top priority by the Umatilla Tribes; and top priority in eastern Oregon by the Oregon Department of Fish and Wildlife.

**Critical Data Gaps**

Steelhead management capability is limited by a general lack of reliable data. Information needs of equal priority are 1) natural production of juveniles; 2) smolt-to-adult survival; 3) adult returns; and 4) harvest, including numbers of fish and area caught. Filling these data gaps will be essential to proper management of mixed natural and hatchery steelhead populations. Juvenile and adult counting and collection facilities at Three Mile Dam and juvenile collection facilities at Westland Diversion Dam will facilitate filling some of these data gaps. Improved harvest data collection is expected to result from implementation

of the ODFW/CTUIR harvest plans and evaluations projected under the Umatilla Hatchery Master Plan.

## Objectives

### Biological Objective

Achieve an annual adult return of 9,670 (5,670 hatchery and 4,000 naturally produced) summer steelhead to the Umatilla Subbasin to 1) achieve full utilization of existing and potential habitat for natural production and 2) acquire brood stock necessary for Umatilla Basin artificial production program.

### Utilization Objective

Accommodate adult recovery requirements for anticipated research as outlined in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989), and provide for a combined tribal and non-tribal annual harvest of 5,460 summer steelhead.

These objectives are consistent with the goals stated in the Umatilla Hatchery Master Plan. The utilization component was derived by subtracting the natural production goal and anticipated future brood stock needs from the total run size goal. This interim harvest target may be adjusted as the Umatilla Tribes and Oregon Department of Fish and Wildlife evaluate both hatchery and natural production success in the subbasin.

## Alternative Strategies

Three alternative strategies are proposed that range from current hatchery and habitat programs to programs that include increased hatchery production and habitat enhancement. Strategy 1 includes action items that are ongoing (planning, design, construction, or operation and maintenance) and already included in the Columbia Basin Fish and Wildlife Program. Strategy 2 adds lower river flow enhancement action items that although already initiated, are not assured for implementation like Strategy 1 action items. The pumping cost associated with flow enhancement is already included in the Columbia River Basin Fish and Wildlife Program. Strategy 3 adds a headwater storage action item for additional flow enhancement. This action item is not ongoing and is not included (planning or implementation) in the current Columbia River Basin Fish and Wildlife Program. If all Umatilla Subbasin action items are carried out, the likely order of implementation would be those included in Strategy 1, then

additional action items in Strategy 2, and lastly, the additional action item in Strategy 3.

Modeling results for each strategy are presented in Table 28a as fish produced at "maximum sustainable yield" (MSY). The sustainable yield of a fish population refers to that portion of the population that exceeds the number of fish required to spawn and maintain the population over time. Sustainable yield can be "maximized," termed MSY, for each stock at a specific harvest level. The MSY is estimated using a formula (Beverton-Holt function) that analyzes a broad range of harvest rates. Subbasin planners have used MSY as a tool to standardize results so that decision makers can compare stocks and strategies.

In MSY management, managers set a spawning escapement level and the remaining fish (yield) could theoretically be harvested. In practice, a portion of the yield may be reserved as a buffer or to aid rebuilding. Thus, managers may raise the escapement level to meet a biological objective at the expense of a higher utilization objective.

The amount of buffer appropriate for each stock is a management question not addressed in the subbasin plans. For this reason, the utilization objective, which usually refers to harvest, may not be directly comparable to the MSY shown in Table 28a. At a minimum, a strategy should produce an estimated MSY equal to or greater than the utilization objective. A MSY substantially larger than the subbasin utilization objective may be needed to meet subbasin biological objectives.

Estimated costs of the alternative strategies below are summarized in Table 28b.

STRATEGY 1: Substantially increase the summer steelhead runs to the Umatilla River Subbasin. Strategy 1 includes adult and juvenile passage improvements (Action IA, 1 & 2); holding, spawning and rearing improvements (Action IB); and hatchery production facilities (Action IIIA). All action items in Strategy 1 are currently being implemented (habitat improvements) or are in the final stage prior to implementation (Umatilla Hatchery Master Plan).

Major Hypotheses: The action items in Strategy 1 will improve pre-spawning, smolt-to-smolt, egg-to-smolt and post-release survival and also increase both natural smolt capacity and hatchery production (Table 16).

Critical Assumptions: A critical assumption is that implementation of habitat improvements and increased hatchery production will be completed and annual operation and

maintenance will be carried out. Another critical assumption is that improved hatchery practices and juvenile passage improvements will increase the hatchery smolt-to-adult survival from 0.5 percent to 2.7 percent (ODFW 1987).

Potential Production using System Planning Models: After Strategy 1, summer steelhead total return to the subbasin at MSY increased 369 percent (Table 28a).

STRATEGY 2: Implement Strategy 1 and enhance lower river flows (Action IIA). This will provide for improved juvenile and adult passage during critical spring and fall migration periods in the lower Umatilla River. Lower river flow enhancement (Umatilla Basin Project) is a U.S. Bureau of Reclamation Project and was authorized by Congress in 1988. Congress has appropriated monies for engineering cost and design for phase I (pumping to West Extension Canal). Phase 2 (pumping from Columbia River to Cold Springs Reservoir) will follow completion of Phase I. Both phases are anticipated to be complete by 1996. Strategy 2 also includes an evaluation of headwater storage in the upper Umatilla River (Action IIB1) and feasibility studies for McKay and Butter Creek fish passage and habitat restoration (Action IA3) which would allow for reestablishment of summer steelhead.

Major Hypotheses: Strategy 2 (Action IIA and Strategy 1) will further increase pre-spawning and smolt-to-smolt survival for both hatchery and natural production (Table 16) by increasing flows in the lower Umatilla River to established minimum instream flow levels.

Critical Assumptions: A critical assumption is that funding will be approved for the Umatilla Basin Project and construction will soon begin.

Potential Production using System Planning Models: After Strategy 2, summer steelhead total return to the subbasin at MSY increased 12 percent from Strategy 1 (Table 28a).

STRATEGY 3: Implement Strategy 2 and add headwater storage (Action IIB). In 1983, the Bureau of Reclamation completed a feasibility study on potential storage sites to provide increased instream flow in the upper Umatilla River. Headwater storage feasibility needs further evaluation.

Major Hypotheses: Strategy 3 (Action IIB and Strategy 2) will increase summer steelhead natural smolt capacity (Table 16).

Critical Assumptions: A critical assumption is that the headwater storage site would provide at least 27,000 acre-feet of storage (based on North Fork Meacham Creek Dam study; BR 1983) for enhancement of flows during critical fish rearing and migration periods (probably summer through early fall).

Potential Production using System Planning Models: After Strategy 3, summer steelhead total return to the subbasin at MSY increased an additional 5 percent from Strategy 2. (Table 28a).

Table 28a. System Planning Model results for summer steelhead (A's) in the Umatilla Subbasin. Baseline value is for pre-mainstem implementation, all other values are post-implementation.

Biological Objective:
Achieve annual return to subbasin of 9,670 adults (5,670 hatchery, 4000 natural) to 1)achieve full util. of existing and pot. habitat; 2) acquire brood stock for art. prod. program.

Utilization Objective:
Above return would also 3) accommodate adult recovery req. for research as outlined in Umatilla Hatchery Master Plan; and 4) provide for tribal and non-tribal harvest of 5,460 adults annually.

| Strategy[1] | Maximum[2] Sustainable Yield (MSY) | Total[3] Spawning Return | Total[4] Return to Subbasin | Out of[5] Subbasin Harvest | Contribution[6] To Council's Goal (Index) |
|---|---|---|---|---|---|
| Baseline | 1,333 -C | 1,358 | 3,030 | 548 | 0( 1.00) |
| All Nat | 4,488 -C | 6,395 | 11,220 | 2,028 | 12,919( 3.70) |
| 1 | 8,243 -C | 5,372 | 14,211 | 2,569 | 17,638( 4.69) |
| 2* | 9,219 -C | 6,342 | 15,894 | 2,873 | 20,292( 5.25) |
| 3 | 9,518 -C | 6,822 | 16,699 | 3,019 | 21,562( 5.51) |

*Recommended strategy.

[1]Strategy descriptions:

For comparison, an "all natural" strategy was modeled. It represents only the natural production (non-hatchery) components of the proposed strategies plus current management (which may include hatchery production). The all natural strategy may be equivalent to one of the alternative strategies below.

1. Adult and juvenile passage improvements; holding, spawning and rearing improvements; and hatchery production facilities. These actions are all being implemented or are in the final planning stages. Post Mainstem Implementation.
2. Strategy 1 plus enhance lower river flows. Post Mainstem Implementation.
3. Strategy 2 plus headwater storage. Post Mainstem Implementation.

[2]MSY is the number of fish in excess to those required to spawn and maintain the population size (see text). These yields should equal or exceed the utilization objective. C = the model projections where the sustainable yield is maximized for the natural and hatchery components combined and the natural spawning component exceeds 500 fish. N = the model projection where sustainable yield is maximized for the naturally spawning component and is shown when the combined MSY rate results in a natural spawning escapement of less than 500 fish.

[3]Total return to subbasin minus MSY minus pre-spawning mortality equals total spawning return.

[4]Total return to the mouth of the subbasin.

[5]Includes ocean, estuary, and mainstem Columbia harvest.

[6]The increase in the total return to the mouth of the Columbia plus prior ocean harvest (as defined by the Northwest Power Council's Fish and Wildlife Program), from the baseline scenario. The index () is the strategy's total production divided by the baseline's total production.

Table 28b. Estimated costs of alternative strategies for Umatilla summer steelhead. Cost estimates represent new or additional costs to the 1987 Columbia River Basin Fish and Wildlife Program; they do not represent projects funded under other programs, such as the Lower Snake River Compensation Plan or a public utility district settlement agreement. (For itemized costs, see Appendix C.)

| | Proposed Strategies | | |
|---|---|---|---|
| | 1 | 2* | 3 |
| Hatchery Costs | | | |
| Capital[1] | 0 | 0 | 0 |
| O&M/yr[2] | 0 | 0 | 0 |
| Other Costs | | | |
| Capital[3] | 0 | 200,000 | 78,000,000 |
| O&M/yr[4] | 0 | 4,000 | 70,000 |
| Total Costs | | | |
| Capital | 0 | 200,000 | 78,000,000 |
| O&M/yr | 0 | 4,000 | 70,000 |

* Recommended strategy.

[1] Estimated capital costs of constructing a new, modern fish hatchery. In some subbasins, costs may be reduced by expanding existing facilities. For consistency, estimate is based on $23/pound of fish produced. Note that actual costs can vary greatly, especially depending on whether surface or well water is used and, if the latter, the number and depth of the wells.

[2] Estimated operation and maintenance costs per year directly associated with new hatchery production. Estimates are based on $2.50/pound of fish produced. For consistency, O&M costs are based on 50 years.

[3] Capital costs of projects (other than direct hatchery costs) proposed under a particular strategy, such as enhancing habitat, screening diversions, removing passage barriers, and installing net pens (see text for specific actions).

[4] Estimated operation and maintenance costs per year of projects other than those directly associated with new hatchery production. For consistency, O&M costs are based on 50 years.

**Actions**

A listing of 26 project action items for the Umatilla Subbasin are presented in Table 19 along with project status, anticipated funding source, and cost estimates for each. Various action items are contained in each of the three fisheries enhancement strategies. Estimated capital and annual operation and maintenance costs for each strategy are presented in Table 20.

ACTION I. Improve habitat.

A. Improve juvenile and adult fish passage.

1) Provide adequate adult passage conditions at "problem areas:"

Three Mile Dam (complete construction of ladders and traps).

Partial barrier at Umatilla RM 1.8 (need additional weir to reduce height of drop at existing weir to be added to Cold Springs project contract).

Westland Dam (ongoing project - complete construction of ladder).

Cold Springs Dam (ongoing project - complete construction of ladder).

Stanfield Dam (ongoing project - complete construction of ladder).

Birch Creek (ladder three irrigation dams).

Complete fine tuning "fix-ups" on all above projects following operational experience and/or evaluation to ensure adequate adult passage.

Secure annual O&M funds for the above projects.

Secure annual BPA-funded adult trap and haul program for upstream passage.

Jim Boyd Hydro Project (monitor and evaluate operations).

2) Provide adequate juvenile passage conditions at "problems areas:"

Three Mile Dam (complete construction of fish screens in West Extension irrigation canal).

Brownell Dam (remove as part of Bureau of Reclamation West Extension Irrigation District exchange project - Phase 1).

Complete NMFS-funded construction of new screens at 16 small irrigation diversions in Birch Creek system and one in upper Umatilla River mainstem.

Maxwell diversion (ongoing project - complete construction of screens).

Westland diversions (ongoing project - complete construction of screens and juvenile trap).

Cold Springs diversion (ongoing project - complete construction of screens).

Stanfield diversion (ongoing project - complete construction of screens).

Secure annual O&M funds for the above projects.

Complete fine tuning "fix-ups" on all above projects following operational experience and/or evaluation to ensure adequate juvenile passage.

Secure annual BPA-funded juvenile trap and haul program for downstream passage.

3) McKay Reservoir anadromous fish passage and habitat restoration (possibly trap and haul program). Not modeled at this time but initial feasibility study recommended.

Butter Creek fish passage and habitat restoration. Not modeled at this time but initial feasibility study recommended.

B. Improve juvenile and adult rearing, holding, and spawning areas.

1) Protect riparian zones from degradation by domestic livestock, forestry and agricultural

practices, and by urban, suburban and commercial development.

Coordinate with the Soil Conservation Service, U.S. Forest Service, Oregon Department of Forestry, Division of State Lands Extension Service, Soil and Water Conservation District, Land Conservation and Development Commission, Corps of Engineers, Columbia/Blue Mountain Resource Conservation and Development Area, Inc., Eastern Central Oregon Community Action Program, Umatilla County, Oregon Department of Agriculture and other participating agencies.

Deal more with private landowners (education program and technical assistance).

2) Promote enhancement of degraded riparian and instream habitat.

Implement five-year plans of U.S. Forest Service, Oregon Department of Fish and Wildlife, and Umatilla Tribes, and develop and implement six- to 10-year plan for BPA-funded projects (Table 18).

Pursue Governor's Watershed Enhancement Board, Oregon Water Resources Department or other potential funding sources for project implementation.

Pursue U.S. Forest Service Knutsen-Vandenburg funds for fish habitat enhancement.

Secure funds and implement O&M on above riparian instream projects for extended fisheries benefits.

ACTION II. Enhance instream flow.

A. Provide adequate instream flow conditions for passage of adult and juvenile migrating fish in the lower Umatilla River (below McKay Creek).

1) Pursue construction of Umatilla Basin, Bureau of Reclamation flow enhancement project.

2) Secure annual BPA-funded interim pumping program until entire Bureau of Reclamation project is on line (includes West Extension Irrigation System pumps and Makami pumps).

3) Establish minimum stream flows for all migration, spawning, and rearing habitats.

4) Promote water conservation through coordination with irrigators and the ODWR.

5) Purchase or lease water rights for instream flow enhancement during critical spring and/or fall fish migration periods.

6) Secure annual use of 6,000 acre-feet of uncontracted storage space from McKay Reservoir (assuming it fills) for release during critical spring and/or fall fish migration periods.

B. Provide increased instream flow in the upper Umatilla River (above McKay Creek).

1) Continue studies regarding headwater storage.

2) Pursue construction at sites feasible for enhancement of flows during critical fish migration periods. Most potential sites when last studied were South Fork Umatilla and North Fork Meacham Dam sites (BR Umatilla Basin Project Study, 1983).

ACTION III. Increase artificial production.

A. Use several existing or planned artificial production facilities to provide summer steelhead juveniles for release in the Umatilla River.

1) Continue use of state and federal hatcheries for producing fish to be released in the Umatilla Basin (Irrigon and Oak Springs).

2) Continue operations of Bonifer and Minthorn acclimation facilities and seek ways to operate at maximum efficiency.

3) Approve master plan and complete construction of the Umatilla Hatchery (ongoing project).

4) Secure annual O&M funding for all facilities above.

5) Monitor and evaluate artificial production programs (including oxygen supplementation at

Umatilla Hatchery) to assess the degree to which objectives are being met (ODFW/CTUIR 1989).

**Recommended Strategy**

The Umatilla Tribes and Oregon Department of Fish and Wildlife recommend that all action items in Strategy 2 be implemented. Strategy 2 provides a combination of habitat improvements, flow enhancement, and artificial production needed to achieve run size objectives for steelhead in the Umatilla River. Although system modeling indicates run size objectives can be met with Strategy 1 (Table 28a), planners do not recommend this strategy because it does not provide flows critical for fish passage in the lower Umatilla River. Strategy 2 contains action items that are already in a planning, design, construction, or operational and maintenance phase. Strategy 2 also includes headwater storage evaluation for the upper Umatilla River and feasibility studies for McKay and Butter Creek fish passage and habitat restoration. Strategy 3 includes headwater storage site construction and will be pursued pending the results from the evaluation.

The SMART analysis resulted in above-average to exceptional ratings with high confidence for all three strategies modeled (Appendix B). Strategies 1 and 2 had equally high ratings and confidence while Strategy 3 was slightly lower.

## FALL CHINOOK SALMON

### Fisheries Resource

#### Natural Production

History and Status

Although once abundant in the Umatilla River Subbasin, fall chinook have not been present for many years. Van Cleave and Ting (1960) report large numbers of fall chinook in the Umatilla River in 1914. Hydroelectric and irrigation diversion dams, dewatering of the mainstem Umatilla River, and degradation of headwater habitat exterminated Umatilla River fall chinook. The Oregon Department of Fish and Wildlife and Umatilla Tribes have implemented a major reintroduction program.

Potential distribution of fall chinook in the Umatilla Subbasin is shown in Figure 10. Initial returns of fall chinook will be monitored to determine actual spawning and rearing areas used.

An estimated 5,562 acres (100 stream miles) of fall chinook spawning and rearing habitat exist in the Umatilla Subbasin (NPPC 1988), including the mainstem Umatilla River to the Forks and Meacham Creek to the North Fork. An estimated 85 percent of the fall chinook spawning gravel in the mainstem Umatilla is above the city of Pendleton from about RM 55 to RM 88 (ODFW/CTUIR 1988).

Life History and Population Characteristics

Natural life history information will become known as the fall chinook run is reestablished.

The smolt density model's estimated fall chinook natural carrying capacity under existing conditions is 2,363,700 smolts. The Oregon Department of Fish and Wildlife (1986) estimated a similar natural smolt production potential using the "available spawning area method" (11,097 adults X 210 smolts per adult = 2,330,370 smolts).

Supplementation History

The Oregon Fish and Wildlife Department and Umatilla Tribes have embarked on a major hatchery supplementation program to reintroduce fall chinook into the Umatilla River Subbasin (Table 29). The purpose of the reintroduction program is to restore a naturally spawning population of fall chinook to the Umatilla River, provide brood stock for continuing and expanding hatchery

operations, provide tribal and non-tribal harvest, comply with the Umatilla Tribes treaty-reserved right to fish, and assist in meeting Columbia River Basin fish production goals established in the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program.

The Umatilla/Irrigon Hatchery complex will produce 5.94 million subyearling fall chinook for annual release into the Umatilla River system. An additional 1.06 million subyearlings from Bonneville Hatchery also will be released annually.

Fish Production Constraints

Low streamflow is the chief factor limiting natural production of fall chinook in the subbasin (ODFW 1985) (Table 11). Irrigation-depleted flows in the lower mainstem Umatilla River block adult migrants in September and, in below-average water years, well into October. Early arriving adult migrants and late-migrant juveniles are subject to high water temperatures. Low streamflows impede adult passage and increase juvenile mortalities at irrigation diversion dams.

Inadequate passage facilities and diversion screens presently severely inhibit the ongoing fall chinook supplementation and introduction program, chronically forcing juveniles to be released at less than optimum times and locations. This problem is scheduled for near-term resolution. Degraded riparian habitats, intensive cultivation of highly erosive soils and poor soil conservation practices yield large amounts of sediments that limit fall chinook spawning habitat in the lower 30 to 40 miles of the mainstem Umatilla River.

**Hatchery Production**

Description of Hatcheries

Hatchery facilities for fall chinook were discussed in the preceding sections. Reintroduction of fall chinook to the Umatilla Subbasin began in 1982. Table 29 contains 1982 through 1988 releases from the Bonifer and Minthorn facilities and releases into the mainstem Umatilla River. The Oregon Department of Fish and Wildlife Bonneville Hatchery provided brood stock for all releases.

The 1988 return of 1,553 fish was the largest run of fall chinook to the Umatilla River in more than a half-century. Fall chinook returns to Three Mile Dam from 1985 through 1988 are summarized in Table 30. Spawning has been observed in the lower mainstem Umatilla River.

# UMATILLA SUBBASIN

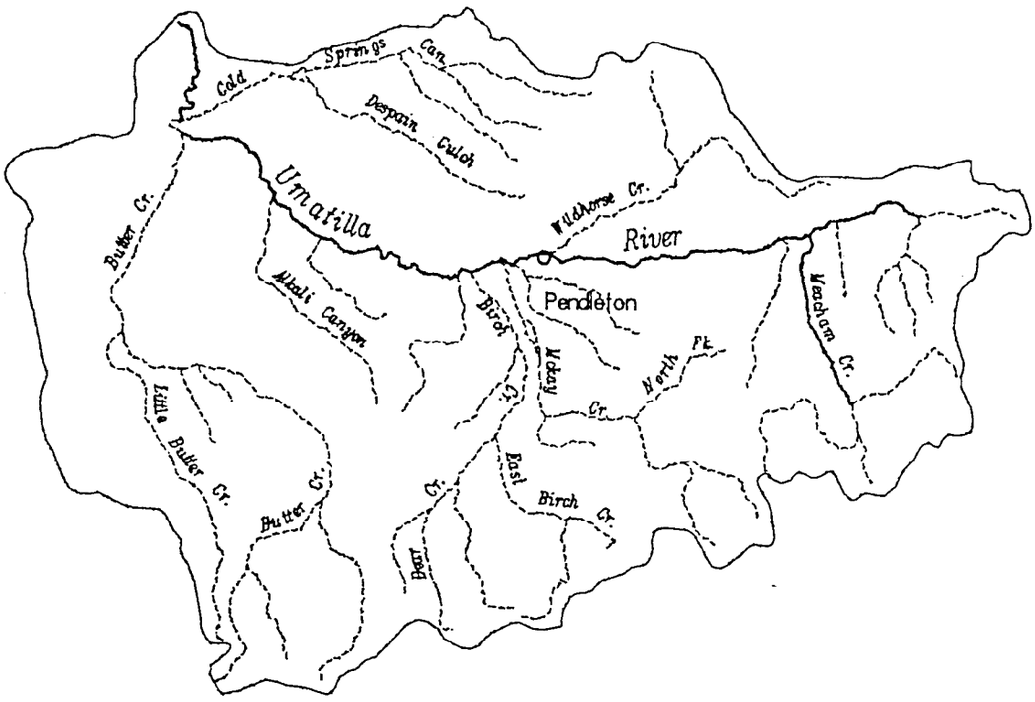
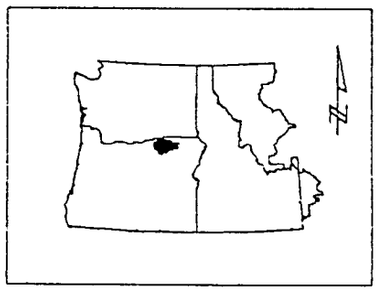



Figure 10.

## FALL CHINOOK DISTRIBUTION*

——————— PRESENT/POTENTIAL

---------- ABSENT



GIS GEOGRAPHIC INFORMATION SYSTEM

BONNEVILLE POWER ADMINISTRATION

* Due to the limitations of scale, all streams which support anadromous fish are not shown on this map.

Table 29. Releases of hatchery fall chinook in the Umatilla Subbasin.

| Release Year | Brood | Stock | Hatchery | Juvenile Releases | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Number | No/Lb | Location | Yes | No |
| 1982 | 1981 | Tule | Bonneville | 3,828,500 | 79-130 | Lower Umatilla | | X |
| 1983 | 1981 | Bright | Bonneville | 80,500 | 5.9 | Upper Umatilla | CWT | 80,500 |
| 1983 | 1981 | Bright | Bonneville | 20,000 | 5.9 | Bonifer Fac. | CWT | 20,000 |
| 1984 | 1983 | Bright | Bonneville | 636,759 | 86 | Lower Umatilla | CWT | 195,824 |
| 1984 | 1982 | Bright | Bonneville | 169,280 | 9.0 | Upper Umatilla | CWT | 94,610 |
| 1984 | 1982 | Bright | Bonneville | 53,300 | 8.9 | Bonifer Fac. | | X |
| 1985 | 1984 | Bright | Bonneville | 3,221,993 | 85 | Lower Umatilla | CWT | 228,475 |
| 1985 | 1983 | Bright | Bonneville | 60,490 | 7.5 | Upper Umatilla | CWT | 32,125 |
| 1985 | 1983 | Bright | Bonneville | 137,655 | 7.5 | Bonifer Fac. | CWT | 88,475 |
| 1985 | 1984 | Bright | Bonneville | 50,000 | 16 | Bonifer Fac. 1/ | | X |
| 1986 | 1985 | Bright | Irrigon | 2,030,000 | 86 | Lower Umatilla | CWT | 200,000 |
| 1986 | 1984 | Bright | Irrigon | 100,000 | 4.7 | Bonifer Fac. | | X |
| 1986 | 1984 | Bright | Irrigon | 90,841 | 5.0 | Minthorn Fac. | CWT | 90,841 |
| 1986 | 1985 | Bright | Irrigon | 35,574 | 11.6 | Minthorn Fac. 1/ | LV | 35,574 |
| 1987 | 1986 | Bright | Irrigon | 1,476,565 | 60 | Lower Umatilla | CWT | 160,000 |
| 1987 | 1985 | Bright | Irrigon | 108,657 | 7.9 | Minthorn Fac. | CWT | 49,982 |
| 1987 | 1985 | Bright | Irrigon | 102,280 | 8.0 | Bonifer Fac. | CWT | 51,140 |
| 1988 | 1987 | Bright | Irrigon | 3,316,000 | 68-93 | Lower Umatilla | CWT | 198,285 |
| 1988 | 1987 | Bright | Irrigon | 14,408 | 9.8 | Minthorn Fac. | CWT | 13,260 |
| 1988 | 1987 | Bright | Irrigon | 79,681 | 8.6 | Near Minthorn | CWT | 73,148 |
| 1988 | 1986 | Bright | Bonneville | 99,550 | 10.2 | Bonifer Fac. | CWT | 77,914 |
| 1988 | 1986 | Bright | Bonneville | 100,791 | 8.8 | Minthorn Fac. | CWT | 81,046 |
| 1989 | 1987 | Bright | Bonneville | 217,000 | 8.7 | Upper Umatilla | CWT | X |
| 1989 | 1988 | Bright | Irrigon | 3,000,000 | 65 | Lower Umatilla | CWT | 200,000 |
| 1989 | 1988 | Bright | Irrigon | 75,000 | 12 | Minthorn Fac. 1/ | CWT | 75,000 |
| 1989 | 1988 | Bright | Irrigon | 75,000 | 12 | Near Minthorn 1/ | CWT | 75,000 |

1/ Reared through summer and released from facilities in fall.
Revised: 01/26/90

Table 30. Upriver bright fall chinook returns to Umatilla River.

| | September | | | October | | | November | | | December | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Adult | Jack | Subjack | Adult | Jack | Subjack | Adult | Jack | Subjack | Adult | Jack | Subjack | Adult | Jack | Subjack |
| 1985 a/ | 0 | 0 | NA | 4 | 68 | NA | 2 | 11 | NA | 0 | 0 | NA | 6 | 79 | NA |
| 1986 b/ | 0 | 5 | NA | 6 | 176 | NA | 22 | 225 | NA | 0 | 1 | NA | 28 | 407 | NA |
| 1987 c/ | 0 | 0 | 0 | 3 | 2 | 40 | 49 | 45 | 245 | 73 | 14 | 2 | 125 | 61 | 287 |
| 1988 b/ | 0 | 1 | 6 | 6 | 40 | 399 | 88 | 135 | 877 | 0 | 0 | 1 | 94 | 176 | 1283 |

a/ Threemile Dam and Weir counts below Threemile Dam.
b/ Threemile Dam counts.
c/ Threemile Dam counts plus spawning surveys below Threemile Dam in December (63 adult and 11 jack carcasses and 9 live adults and 3 live jacks did not show at Threemile Dam).
NA Data not available. Subjacks are included in the Jack count.

filename:CHFYR 11/15/89

## Life History and Population Characteristics

Pending resolution of irrigation-depleted streamflow, fall chinook entry into the Umatilla River will depend on the seasonal quantity and temperature of available streamflow. Managers will consider selecting brood stock for late (October to November) returns to fit the optimum streamflow regime.

Planners expect that significant numbers of adults will arrive at the mouth of the river in mid-September. Pending improvement in irrigation-depleted streamflows, fish will not be able to enter the river until late October or early November in most years (Table 31).

Fish returning to Bonneville Hatchery in 1983 ranged from 3- to 5-year-old fish, predominately 4-year-olds (ODFW et al. 1985).

Four- and 5-year-old fish returning to Bonneville Hatchery in 1983 were approximately twice as many females as males. Four times as many males as females returned as 3-year-old fish (ODFW et al. 1985). Of 89 adult fall chinook sampled at Three Mile Dam in 1988, 56 were male and 31 were female.

One hundred fifteen adults sampled at and below Three Mile Dam in 1987 had an average fork length of 29.37 inches, with a minimum fork length of 24.01 inches and a maximum of 40.98 inches (Table 14 and Fig. 11). Biologists sampled 454 fall chinook for lengths in 1988 (Fig. 12).

Spawning likely will occur in November and December (Table 31).

Females spawned at Bonneville Hatchery 1977 through 1983 averaged approximately 4,500 eggs per female (ODFW et al. 1985). Egg and alevin incubation occurs November through March at Bonneville Hatchery (Table 31).

Managers have released yearling and subyearling fall chinook in upriver areas. Future releases will primarily be subyearlings in various middle to upriver locations (ODFW/CTUIR 1988).

Spring-released fish emigrate April through July; fall-released fish emigrate November and December (Table 31).

Egg-to-smolt survival is estimated to be 0.64 (ODFW/CTUIR 1988). Smolt-to-adult survival is unknown, but is estimated to be 0.003 for planning purposes (ODFW/CTUIR 1988). Smolt-to-adult survival from recent hatchery smolt releases has been less than 0.003.

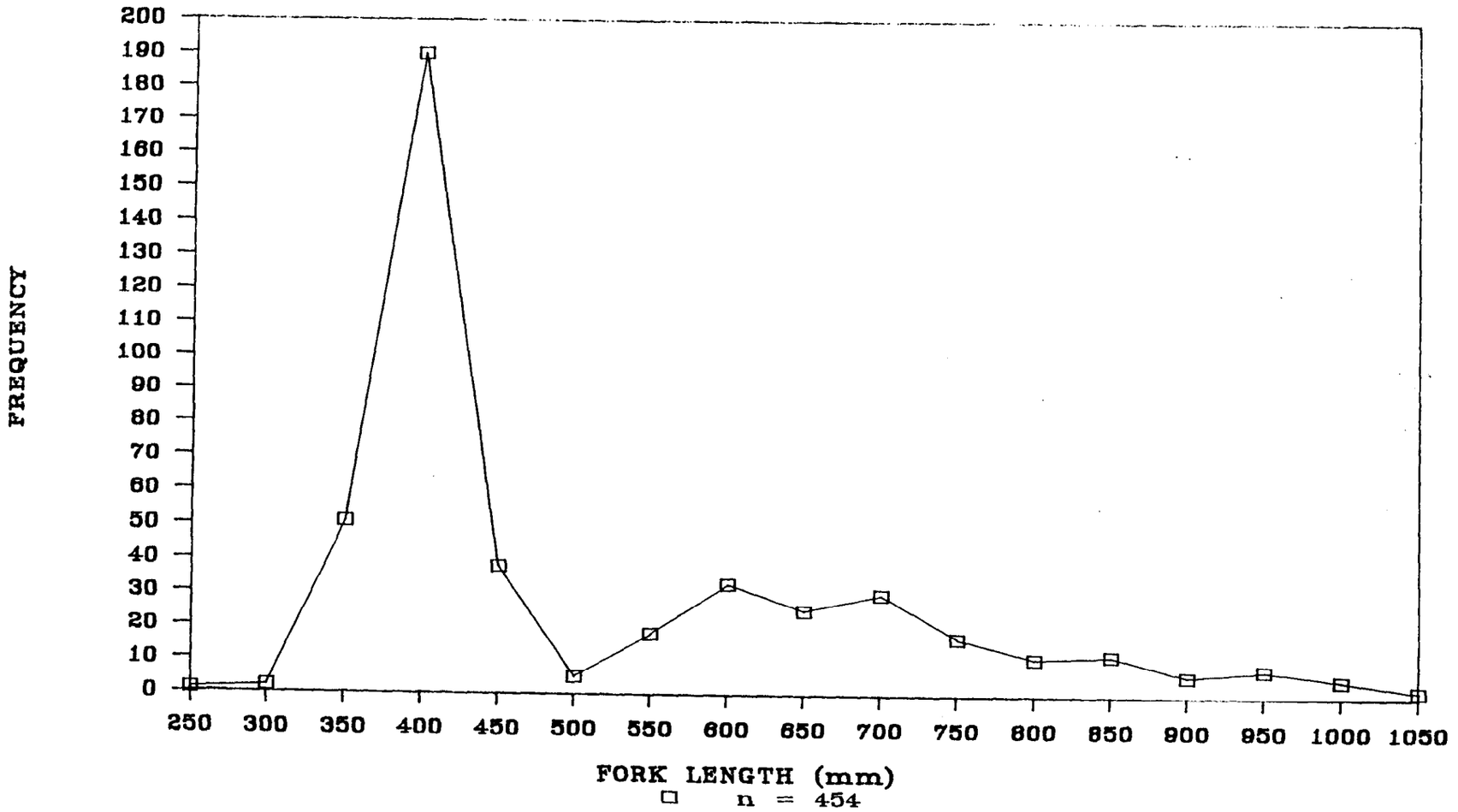



Figure 11. Length frequency of Umatilla River Fall Chinook, 1987 (fall chinook were sampled for lengths at three Mile Dam trap and during spawning ground surveys below three Mile Dam (454). The total return to the Umatilla River was 473 fish.)

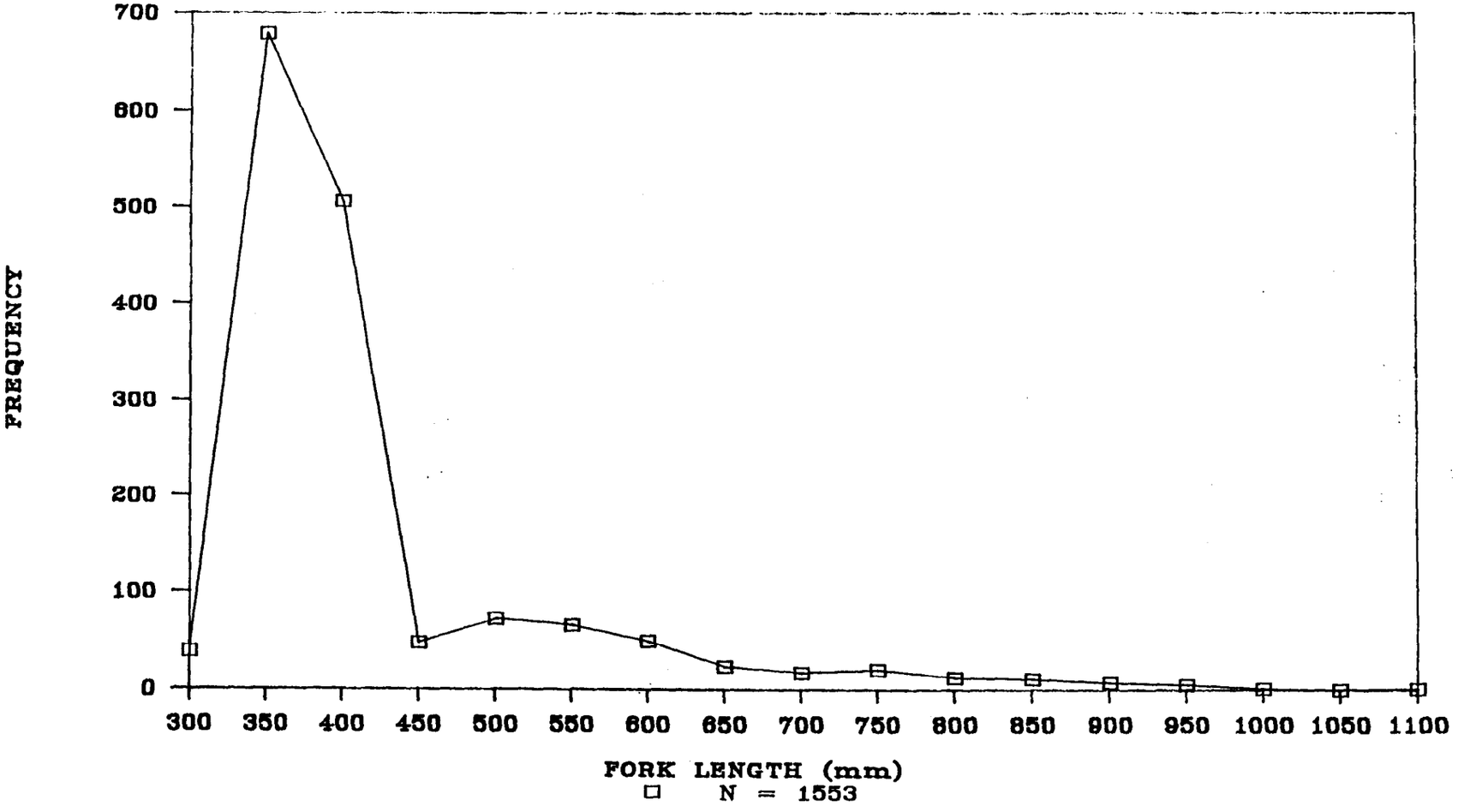
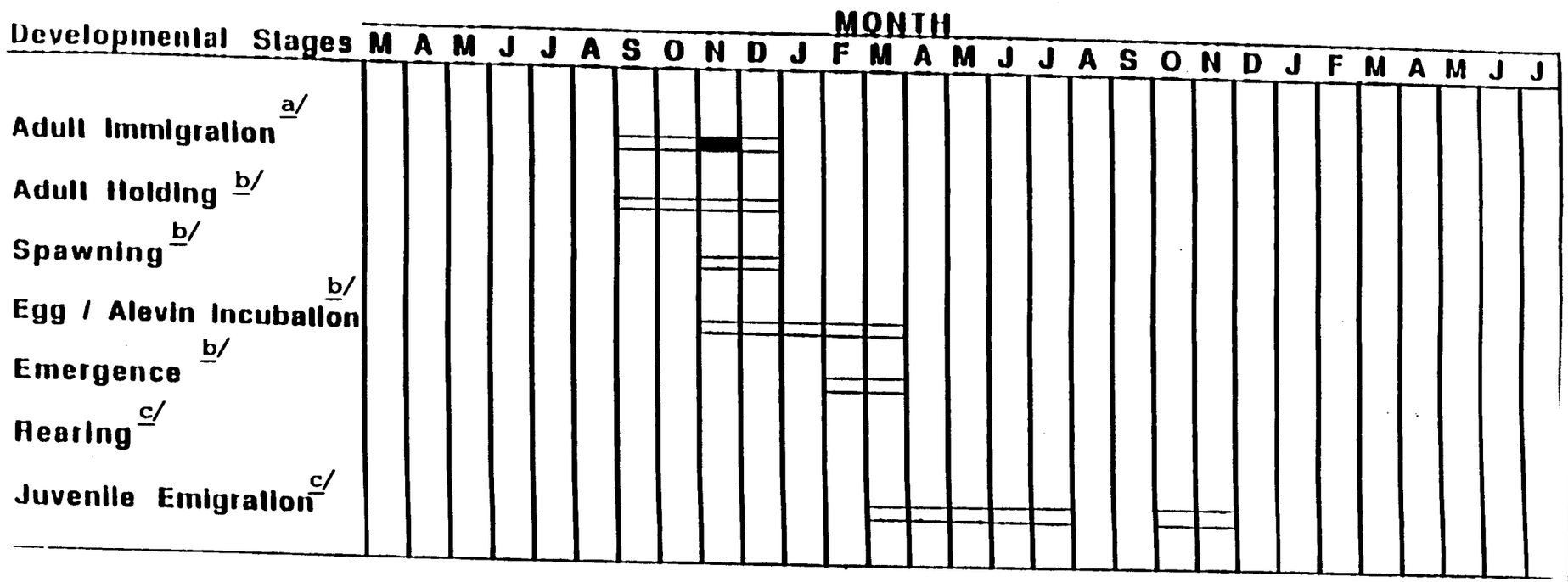



Figure 12. Length Frequency of Umatilla River Fall Chinook, 1988

(Fall chinook were sub-sampled at 3 Mile Dam trap: 431/1283 sub-jacks (< 46 cm), 153/176 Jacks (61< n > 46 cm), 90/94 Adults (> 61 cm). The above length frequency represents the total return to the trap.)

Table 31. Freshwater life history, Hatchery Fall Chinook; Upriver Bright Stock from Bonneville Hatchery




Notes:

1. The developmental stage timing represents basin-wide averages, local conditions may cause some variability.
2. Solid bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

a/ Umatilla River returns, 1986-88. Returns to Bonneville Hatchery are in late August-early November (Howell et al. '85)

b/ Bonneville Hatchery data (Ken Bourne, ODFW, Pers. Comm.)

c/ Umatilla River counts at Westland trap and observations at Brownell Diversion; yearling spring releases, subyearling spring and fall releases.

Anticipated Production Facilities

The Umatilla/Irrigon Hatchery has a total design capacity of 290,000 pounds of fish. Initially it will produce 5.94 million subyearling fall chinook smolts (81,000 pounds) for release into the Umatilla River Subbasin (ODFW/CTUIR 1988).

Managers will use upriver bright brood stock from the Bonneville Hatchery or Priest Rapids Hatchery in Washington. Eventually, managers will take brood stock from adult fish returning to the Umatilla River at Three Mile Dam and the Minthorn facility. Additional facilities also will be required to collect, hold and spawn brood stock (ODFW/CTUIR 1988).

Most subyearling fall chinook will be reared to at least 60 fish per pound for release in late spring. Managers will release the fish into the Minthorn facility for acclimation and release, and into natural spawning areas in the middle to upper mainstem Umatilla River (ODFW/CTUIR 1988).

Planners have selected release sites to support evaluation programs and to achieve adult production objectives including brood stock needs, harvest and natural spawning escapement.

In addition to fall chinook production from the Umatilla/Irrigon Hatchery, another 1.06 million subyearling upriver bright fall chinook from Bonneville Hatchery will be released into the middle to upper mainstem Umatilla River for brood stock, natural spawning and harvest.

Constraints to Hatchery Production

Constraints, problems and opportunities with existing or anticipated fall chinook hatchery programs are the same as those discussed previously for other species.

**Harvest**

"Thousands" of fall chinook were harvested in the Umatilla River in 1914 (Van Cleave and Ting 1960). Fall chinook subsequently were exterminated in the Umatilla Subbasin. A tribal test dip-net fishery on jack fall chinook began below Three Mile Dam in 1988. Harvest was estimated to be less than 50 fish.

The Oregon Department of Fish and Wildlife and Umatilla Tribes cooperate in setting subbasin harvest management goals and regulations. Harvest and allocation guidelines (Table 32) are part of the Umatilla/Irrigon Hatchery Master Plan.

Table 32. Harvest plan guidelines for fall chinook salmon[1] (ODFW/CTUIR 1989).

Broodstock Collection Goal = 4,600
Run Size Goal (to mouth) = 21,000 (11,000 natural, 10,000 hatchery)

Interim Spawning Escapement Goal = 5,200 existing flows

Optimum Spawning Escapement Goal = 11,200 enhanced flows

| Total Run Size[2] | Umatilla Hatchery Broodstock[3] | Spawning Escapement | Research Needs[5] | In-River Harvest[6] |
|---|---|---|---|---|
| 500 | 100 | 250 | 70 | |
| 1,000 | 500 | 250 | 140 | |
| 2,000 | 1,000 | 500 | 280 | Based on |
| 4,000 | 1,500 | 1,000 | 450 | available |
| 6,000 | 2,000 | 1,500 | 450 | surplus |
| 9,000 | 3,000 | 2,500 | 450 | |
| 12,000 | 4,000[7] | 3,500[8] | 450 | |
| 15,000 | 4,600[7] | 5,000[8] | 450 | |
| 18,000 | 4,600[7] | 5,200[8] | 450 | |
| 21,000 | 4,600[7] | 5,200[8] | 450 | |

[1] Schedule will be the basis for development of annual harvest plans.

[2] Includes hatchery and natural returns to the mouth of the Umatilla River.

[3] Broodstock requirement for the Umatilla Hatchery only; does not include broodstock requirements for other hatcheries.

[4] Spawning escapement at returns above 5,000 based upon natural production success, available habitat, and other considerations as agreed to by CTUIR and ODFW.

[5] Samples (tags) collected from harvest, spawning surveys, broodstock, and returns to acclimation facilities.

[6] Available surplus is fish available for harvest after broodstock (Umatilla returns or other stocks), spawning escapement, and research needs are met at the various total run sizes as evaluated and agreed to by CTUIR and ODFW.

[7] Broodstock collection goal achieved.

[8] Spawning escapement goal achieved (Interim).

The Umatilla Tribes and Oregon Department of Fish and Wildlife plan to provide tribal and sport opportunity to fully utilize the harvestable surplus portion of adult return objectives. Procedures to be included in a CTUIR/ODFW Umatilla Subbasin harvest program include:

A) Jointly design and implement annual harvest allocation plans that provide for increasing levels of harvest, brood stock, and natural production as the total run size increases (to be based on harvest guidelines, Table 32).

B) Implement angling regulations that will allow for meeting the required escapement levels of adults and smolts for natural production without limiting fishery objectives (regulations will be designed to allow a fishery as runs are rebuilding). Regulatory factors will include:

- Harvest numbers
- Harvest method
- Harvest locations and times
- Possible harvest restrictions (such as jacks only, marked hatchery fish only)

C) Monitor and enforce compliance with angling regulations and evaluate fisheries to assess the degree to which objectives are being met.

D) Determine what Columbia River and ocean harvest rates are on "Umatilla" fish, and the corresponding proportions of that harvest on the total Umatilla return.

**Specific Considerations**

Fall chinook, once abundant in the subbasin, were also exterminated. The subbasin provides opportunities for substantial natural production. Planners estimate that 5,562 acres of fall chinook spawning and rearing habitat exist in the subbasin. The natural production potential is estimated at 11,000 fish (ODFW 1986), which is the Umatilla Tribes and Oregon Department of Fish and Wildlife's natural run size goal.

In addition to the subbasin's natural production potential, the Umatilla Tribes and the Oregon Department of Fish and Wildlife have an annual goal of 10,000 returning adult hatchery fish. The Umatilla/Irrigon Hatchery complex will produce 5.94 million subyearling fall chinook for annual release in the

subbasin. Managers will also release an additional 1.06 million subyearlings from Bonneville Hatchery each year.

A total of 1,553 adult and jack fall chinook returned to the Umatilla River in the fall of 1988. This was the largest run in decades.

The key problem and constraint to production of all species or races in the subbasin is seasonal dewatering of the lower 30 or so miles of the mainstem Umatilla River by irrigation diversions. This impedes and, during low flow years, can block late spring and early summer juvenile migrants as well as early fall returning adults. Impending completion of improved juvenile bypass and adult passage facilities, and juvenile and adult collection and transportation facilities will significantly reduce this constraint to achieving optimum fish production. Instream flows necessary for fish passage will be restored with implementation of the Columbia River-Umatilla River water exchange project authorized by the 100th Congress.

The Umatilla River Subbasin:

- Lies above three mainstem Columbia River hydroelectric projects.

- Lies at the head of the Columbia River Zone 6 treaty fishing area.

- Lies within the most populous eastern Oregon county and in close proximity to southeastern Washington population centers; contains important tribal usual and accustomed fishing sites and the reservation of the Confederated Tribes of the Umatilla Indian Reservation, which has treaty-reserved rights to fish.

- Is easily accessible to fishermen and provides geographically extensive opportunities for a wide variety of tribal and non-tribal fisheries.

- Provides opportunities for major terminal, known-stock fisheries on hatchery fish.

- Provides opportunities for intensive management of mixed stocks of wild, natural and hatchery fish and for evaluation of the spectrum of fisheries and habitat management initiatives.

- Is the most likely northeast Oregon subbasin in which major, near-term tribal and non-tribal fisheries can be developed with hatchery outplants.

- Has in recent years been given high priority for restoration of salmon and steelhead runs and fisheries by tribal, state, regional and federal fisheries agencies; top priority by the Umatilla Tribes; and top priority in eastern Oregon by the Oregon Department of Fish and Wildlife.

**Critical Data Gaps**

Data necessary for management of fall chinook in the Umatilla Subbasin is nonexistent. Juvenile collection facilities at Westland Diversion Dam, and juvenile and adult collection and counting facilities at Three Mile Dam plus extensive monitoring and evaluation of passage facilities and hatchery operations eventually will fill the data gaps.

## Objectives

**Biological Objective**

Achieve an annual adult return of 21,000 (10,000 hatchery and 11,000 naturally produced) fall chinook salmon to the Umatilla Subbasin to 1) achieve full utilization of existing and potential habitat for natural production; 2) acquire brood stock necessary for Umatilla Basin artificial production program.

**Utilization Objective**

Accommodate adult recovery requirements for anticipated research as outlined in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989), and provide for a combined tribal and non-tribal annual harvest of 5,400 fall chinook.

These objectives are consistent with the goals stated in the Umatilla Hatchery Master Plan. The utilization component was derived by subtracting the natural production goal and anticipated future brood stock needs from the total run size goal. This interim harvest target may be adjusted as the Umatilla Tribes and Oregon Department of Fish and Wildlife evaluate both hatchery and natural production success in the subbasin.

## Alternative Strategies

Three alternative strategies were proposed that range from current hatchery and habitat programs, with no change, to programs that include increased hatchery production and habitat enhancement. Strategy 1 includes action items that are ongoing

(planning, design, construction, or operation and maintenance) and already included in the Columbia Basin Fish and Wildlife Program. Strategy 2 adds lower river flow enhancement action items that although already initiated, are not assured for implementation like Strategy 1 action items. The pumping cost associated with flow enhancement is already included in the Columbia River Basin Fish and Wildlife Program. Strategy 3 adds a headwater storage action item for additional flow enhancement. This action item is not ongoing and is not included (planning or implementation) in the current Columbia River Basin Fish and Wildlife Program. If all Umatilla Subbasin action items are carried out, the likely order of implementation would be those included in Strategy 1, then additional items in Strategy 2, and lastly, the additional action item in Strategy 3.

Modeling results for each strategy are presented in Table 32a as fish produced at "maximum sustainable yield" (MSY). The sustainable yield of a fish population refers to that portion of the population that exceeds the number of fish required to spawn and maintain the population over time. Sustainable yield can be "maximized," termed MSY, for each stock at a specific harvest level. The MSY is estimated using a formula (Beverton-Holt function) that analyzes a broad range of harvest rates. Subbasin planners have used MSY as a tool to standardize results so that decision makers can compare stocks and strategies.

In MSY management, managers set a spawning escapement level and the remaining fish (yield) could theoretically be harvested. In practice, a portion of the yield may be reserved as a buffer or to aid rebuilding. Thus, managers may raise the escapement level to meet a biological objective at the expense of a higher utilization objective.

The amount of buffer appropriate for each stock is a management question not addressed in the subbasin plans. For this reason, the utilization objective, which usually refers to harvest, may not be directly comparable to the MSY shown in Table 32a. At a minimum, a strategy should produce an estimated MSY equal to or greater than the utilization objective. A MSY substantially larger than the subbasin utilization objective may be needed to meet subbasin biological objectives.

Estimated costs of the alternative strategies below are summarized in Table 32b.

STRATEGY 1: Substantially increase the fall chinook salmon runs to the Umatilla River Subbasin. Strategy 1 includes adult and juvenile passage improvements (Action IA); holding, spawning and rearing improvements (Action IB); and hatchery production facilities (Action IIIA). All action items in Strategy 1 are

currently being implemented (habitat improvements) or are in the final stage prior to implementation (Umatilla Hatchery Master Plan).

Major Hypotheses: The action items in Strategy 1 will improve pre-spawning, smolt-to-smolt, egg-to-smolt and post-release survival and also increase both natural smolt capacity and hatchery production (Table 16).

Critical Assumptions: A critical assumption is that implementation of habitat improvements and increased hatchery production will be completed, and annual operation and maintenance will be carried out. Another critical assumption is that current natural production capacity is 1,100 adults (2,330,370 smolts) and current hatchery smolt releases will return 1,300 adults (smolt-to-adult survival at 0.3 percent) (ODFW 1986).

Potential Production using System Planning Models: After Strategy 1, fall chinook total return to the subbasin at MSY increased 283 percent from baseline (Table 32a).

STRATEGY 2: Implement Strategy 1 and enhance lower river flows (Action IIA). This will provide for improved juvenile and adult passage during critical spring and fall migration periods in the lower Umatilla River. Lower river flow enhancement (Umatilla Basin Project) is a U.S. Bureau of Reclamation Project and was authorized by Congress in 1988. Congress has appropriated monies for engineering cost and design for phase I (pumping to West Extension Canal). Phase 2 (pumping from Columbia River to Cold Springs Reservoir) will follow completion of Phase I. Both phases are anticipated to be complete by 1996. Strategy 2 also includes continuing studies of headwater storage in the upper Umatilla River (Action IIB1).

Major Hypotheses: Strategy 2 (Action IIA and Strategy 1) will further increase pre-spawning and smolt-to-smolt survival for both hatchery and natural production (Table 16) by increasing flows in the lower Umatilla River to established minimum instream flow levels.

Critical Assumptions: A critical assumption is that funding will be approved for the Umatilla Basin Project and construction will soon begin.

Potential Production using System Planning Models: After Strategy 2, total return to subbasin at MSY increased 6 percent from Strategy 1 (Table 32a).

STRATEGY 3: Implement Strategy 2 and add headwater storage (Action IIB2). In 1983, the Bureau of Reclamation completed a feasibility study on potential storage sites to provide increased instream flow in the upper Umatilla River.

Major Hypotheses: Strategy 3 (Action IIB2 and Strategy 2) will increase fall chinook pre-spawning survival (Table 16).

Critical Assumptions: A critical assumption is that the headwater storage site would provide at least 27,000 acre-feet of storage (based on North Fork Meacham Creek Dam study; BR 1983) for enhancement of flows during critical fish rearing and migration periods (probably summer through early fall).

Potential Production using System Planning Models: After Strategy 3, fall chinook total return to subbasin at MSY increased from Strategy 2 less than 1 percent (Table 32a).

Table 32a. System Planning Model results for fall chinook in the Umatilla Subbasin. Baseline value is for pre-mainstem implementation, all other values are post-implementation.

Biological Objective:
Achieve annual return to subbasin of 21,000 adults (10,000 hatchery, 11,000 natural) to 1)achieve full util. of existing and pot. habitat; 2) acquire brood stock for art. prod. program.

Utilization Objective :
Above return would also 3)accommodate adult recovery req. for research as outlined in Umatilla Hatchery Master Plan; and 4) provide for tribal and non-tribal harvest of 5,400 adults annually.

| Strategy[1] | Maximum[2] Sustainable Yield (MSY) | Total[3] Spawning Return | Total[4] Return to Subbasin | Out of[5] Subbasin Harvest | Contribution[6] To Council's Goal (Index) |
|---|---|---|---|---|---|
| Baseline | 22 -N | 1,105 | 2,232 | 12,878 | 0( 1.00) |
| All Nat | 3,174 -C | 2,467 | 5,771 | 33,297 | 25,535( 2.59) |
| 1 | 5,466 -C | 2,306 | 8,541 | 49,284 | 45,527( 3.83) |
| 2* | 6,247 -C | 2,526 | 9,053 | 52,237 | 49,220( 4.06) |
| 3 | 6,347 -C | 2,584 | 9,068 | 52,323 | 49,326( 4.06) |

*Recommended strategy.

[1]Strategy descriptions:

For comparison, an "all natural" strategy was modeled. It represents only the natural production (non-hatchery) components of the proposed strategies plus current management (which may include hatchery production). The all natural strategy may be equivalent to one of the alternative strategies below.

1. Adult and juvenile passage improvements; holding, spawning and rearing improvements; and hatchery production facilities. These actions are all being implemented or are in the final planning stages. Post Mainstem Implementation.
2. Strategy 1 plus enhance lower river flows. Post Mainstem Implementation.
3. Strategy 2 plus headwater storage. Post Mainstem Implementation.

[2]MSY is the number of fish in excess to those required to spawn and maintain the population size (see text). These yields should equal or exceed the utilization objective. C = the model projections where the sustainable yield is maximized for the natural and hatchery components combined and the natural spawning component exceeds 500 fish. N = the model projection where sustainable yield is maximized for the naturally spawning component and is shown when the combined MSY rate results in a natural spawning escapement of less than 500 fish.

[3]Total return to subbasin minus MSY minus pre-spawning mortality equals total spawning return.

[4]Total return to the mouth of the subbasin.

[5]Includes ocean, estuary, and mainstem Columbia harvest.

[6]The increase in the total return to the mouth of the Columbia plus prior ocean harvest (as defined by the Northwest Power Council's Fish and Wildlife Program), from the baseline scenario. The index () is the strategy's total production divided by the baseline's total production.

Table 32b. Estimated costs of alternative strategies for Umatilla fall chinook. Cost estimates represent new or additional costs to the 1987 Columbia River Basin Fish and Wildlife Program; they do not represent projects funded under other programs, such as the Lower Snake River Compensation Plan or a public utility district settlement agreement. (For itemized costs, see Appendix C.)

| | Proposed Strategies | | |
|---|---|---|---|
| | 1 | 2* | 3 |
| Hatchery Costs | | | |
| Capital[1] | 0 | 0 | 0 |
| O&M/yr[2] | 0 | 0 | 0 |
| Other Costs | | | |
| Capital[3] | 0 | 200,000 | 78,000,000 |
| O&M/yr[4] | 0 | 0 | 66,000 |
| Total Costs | | | |
| Capital | 0 | 200,000 | 78,000,000 |
| O&M/yr | 0 | 0 | 66,000 |

* Recommended strategy.

[1] Estimated capital costs of constructing a new, modern fish hatchery. In some subbasins, costs may be reduced by expanding existing facilities. For consistency, estimate is based on $23/pound of fish produced. Note that actual costs can vary greatly, especially depending on whether surface or well water is used and, if the latter, the number and depth of the wells.

[2] Estimated operation and maintenance costs per year directly associated with new hatchery production. Estimates are based on $2.50/pound of fish produced. For consistency, O&M costs are based on 50 years.

[3] Capital costs of projects (other than direct hatchery costs) proposed under a particular strategy, such as enhancing habitat, screening diversions, removing passage barriers, and installing net pens (see text for specific actions).

[4] Estimated operation and maintenance costs per year of projects other than those directly associated with new hatchery production. For consistency, O&M costs are based on 50 years.

**Actions**

A listing of 26 project action items for the Umatilla Subbasin are presented in Table 19 along with project status, anticipated funding source, and cost estimates for each. Various action items are contained in each of the four fisheries enhancement strategies. Estimated capital and annual costs for each strategy are presented in Table 20.

ACTION I. Improve habitat.

A. Improve juvenile and adult fish passage.

1) Provide adequate adult passage conditions at "problem areas:"

Three Mile Dam (complete construction of ladders and traps).

Partial barrier at Umatilla RM 1.8 (need additional weir to reduce height of drop at existing weir to be added to Cold Springs project contract).

Westland Dam (ongoing project - complete construction of ladder).

Cold Springs Dam (ongoing project - complete construction of ladder).

Stanfield Dam (ongoing project - complete construction of ladder).

Complete fine tuning "fix-ups" on all above projects following operational experience and/or evaluation to insure adequate adult passage.

Secure annual O&M funds for the above projects.

Secure annual BPA-funded adult trap and haul program for upstream passage.

Jim Boyd Hydro Project (monitor and evaluate operations).

2) Provide adequate juvenile passage conditions at "problems areas:"

Three Mile Dam (complete construction of fish screens in West Extension irrigation canal).

Brownell Dam (remove as part of the Bureau of Reclamation West Extension Irrigation District exchange project - Phase 1).

Maxwell diversion (ongoing project - complete construction of screens).

Westland diversions (ongoing project - complete construction of screens and juvenile trap).

Cold Springs diversion (ongoing project - complete construction of screens).

Stanfield diversion (ongoing project - complete constructions of screens).

Secure annual O&M funds for the above projects.

Complete fine tuning "fix-ups" on all above projects following operational experience and/or evaluation to ensure adequate juvenile passage.

Secure annual BPA-funded juvenile trap and haul program for downstream passage.

B. Improve juvenile and adult rearing, holding, and spawning areas.

1) Protect riparian zones from degradation by domestic livestock, forestry and agricultural practices, and by urban, suburban and commercial development.

Coordinate with the Soil Conservation Service, U.S. Forest Service, Oregon Department of Forestry, Division of State Lands Extension Service, Soil and Water Conservation District, Land Conservation and Development Commission, Corps of Engineers, Columbia/Blue Mountain Resource Conservation and Development Area, Inc., Eastern Central Oregon Community Action Program, Umatilla County, Oregon Department of Agriculture and other participating agencies.

Deal more with private landowners (education program and technical assistance).

2) Promote enhancement of degraded riparian and instream habitat.

Implement five-year plans of U.S. Forest Service, Oregon Department of Fish and Wildlife, and Umatilla Tribes, and develop and implement six- to 10-year plans for BPA-funded projects (Table 18).

Pursue Governor's Watershed Enhancement Board, OWRD or other potential funding sources for project implementation.

Pursue U.S. Forest Service Knutsen-Vandenburg funds for fish habitat enhancement.

Secure funds and implement O&M on above riparian instream projects for extended fisheries benefits.

ACTION II. Enhance instream flow.

A. Provide adequate instream flow conditions for passage of adult and juvenile migrating fish in the lower Umatilla River (below McKay Creek).

1) Pursue construction of Umatilla Basin, Bureau of Reclamation flow enhancement project.

2) Secure annual BPA-funded interim pumping program until entire Bureau of Reclamation project is on line (includes West Extension Irrigation System pumps and Makami pumps).

3) Establish minimum stream flows for all migration, spawning, and rearing habitats.

4) Promote water conservation through coordination with irrigators and the Oregon Department of Water Resources.

5) Purchase or lease water rights for instream flow enhancement during critical spring and/or fall fish migration periods.

6) Secure annual use of 6,000 acre-feet of uncontracted storage space from McKay Reservoir (assuming it fills) for release during critical spring and/or fall fish migration periods.

B. Provide increased instream flow in the upper Umatilla River (above McKay Creek).

1) Continue studies regarding headwater storage.

2) Pursue construction at sites feasible for enhancement of flows during critical fish migration periods. Most potential sites when last studied were South Fork Umatilla and North Fork Meacham Dam sites (BR Umatilla Basin Project Study, 1983).

ACTION III. Increase artificial production.

A. Use several existing or planned artificial production facilities to provide fall chinook juveniles for release in the Umatilla River.

1) Continue use of various state and federal hatcheries for producing fish to be released in the Umatilla Basin (Irrigon, Bonneville, Carson and Cascade, Oak Springs).

2) Continue operations of Bonifer and Minthorn acclimation facilities and seek ways to operate at maximum efficiency.

3) Approve master plan and complete construction of the Umatilla Hatchery (ongoing project).

4) Conduct site feasibility studies, and complete design and construction of the Umatilla satellite facilities for adult holding and spawning, and for extended rearing of fish from Umatilla Hatchery (ongoing project, to be on line when fall chinook brood stock holding or spawning needs are necessary in conjunction with Umatilla Hatchery).

5) Secure annual O&M funding for all facilities above.

6) Use the most suitable and available stocks for salmon introductions and eventually take brood stock from adult returns when runs increase.

7) Monitor and evaluate artificial production programs (including oxygen supplementation at Umatilla Hatchery) to assess the degree to which objectives are being met (ODFW/CTUIR 1988).

**Recommended Strategy**

Although system modeling indicates run size objectives cannot be met with any strategy (Table 32a), the Umatilla Tribes and Oregon Department of Fish and Wildlife recommend that all action items in Strategy 2 be implemented for fall chinook. Strategy 2 provides a combination of habitat improvements, flow enhancement, and artificial production. Smolt-to-adult survival rates used in the Umatilla Hatchery Master Plan (ODFW/CTUIR 1989) indicate run size objectives can be met with Strategy 2. Planners do not recommend Strategy 1 because it does not provide flows critical for fish passage in the lower Umatilla River.

The Umatilla Subbasin is unique in that most action items are already under way as a part of the existing fisheries enhancement program. Strategies 1 and 2 contain action items that are already in a planning, design, construction, or operational and maintenance phase. Strategy 2 also includes headwater storage evaluation. Strategy 3 includes headwater storage site construction and will be pursued pending the results from the evaluation.

The SMART analysis resulted in exceptional ratings with high confidence for Strategies 1 and 2 while Strategy 3 produced above-average rating with high confidence (Appendix B).

Fall Chinook - 126

## COHO SALMON

### Fisheries Resource

#### Natural Production

Coho salmon (reported as silverside salmon) formerly existed in the Umatilla Subbasin (Oregon Department of Fisheries 1902). Biologists believe that the same factors that exterminated spring and fall chinook (discussed earlier) also impacted coho.

Habitat carrying capacity is unknown. Potential spawning and rearing areas are shown in Figure 13. Natural life history information is expected to become known following evaluation of initial adult returns.

From 1966 through 1969, managers released a relatively small amount of fry to introduce coho to the Umatilla River system. In 1987 through 1989, the Umatilla Tribes and Oregon Department of Fish and Wildlife initiated a more aggressive introduction program by releasing yearling smolts. These releases are primarily designed to provide a Umatilla tribal terminal harvest, to enhance multi-tribal harvest in the mainstem Columbia River, and to reestablish a currently undetermined level of natural production.

Subsequently, beginning in the spring of 1987, under terms of the United States vs. Oregon agreement, managers are releasing 1 million early coho smolts annually within the boundaries of the Umatilla Indian Reservation from hatcheries outside the Umatilla Subbasin. The purpose of these releases is to provide a directed tribal harvest within the Umatilla River system. Brood stock required to maintain the program is obtained from hatchery facilities located in the lower Columbia River. The effectiveness of this program will be reviewed after five years (Columbia River Fish Management Plan 1987).

Constraints to coho production are the same as those discussed previously for other species, such as low streamflows, inadequate passage facilities and diversion screens, degraded riparian habitat, and poor instream habitat.

Information necessary to manage coho in the subbasin is nonexistent. Juvenile and adult counting facilities at mainstem irrigation diversions and monitoring and evaluation of passage facilities, hatchery releases, and harvest eventually will fill data gaps. Availability of natural production habitat and potential for competition with other species for rearing habitat are unknown; the latter is a subject of professional controversy.

# UMATILLA SUBBASIN

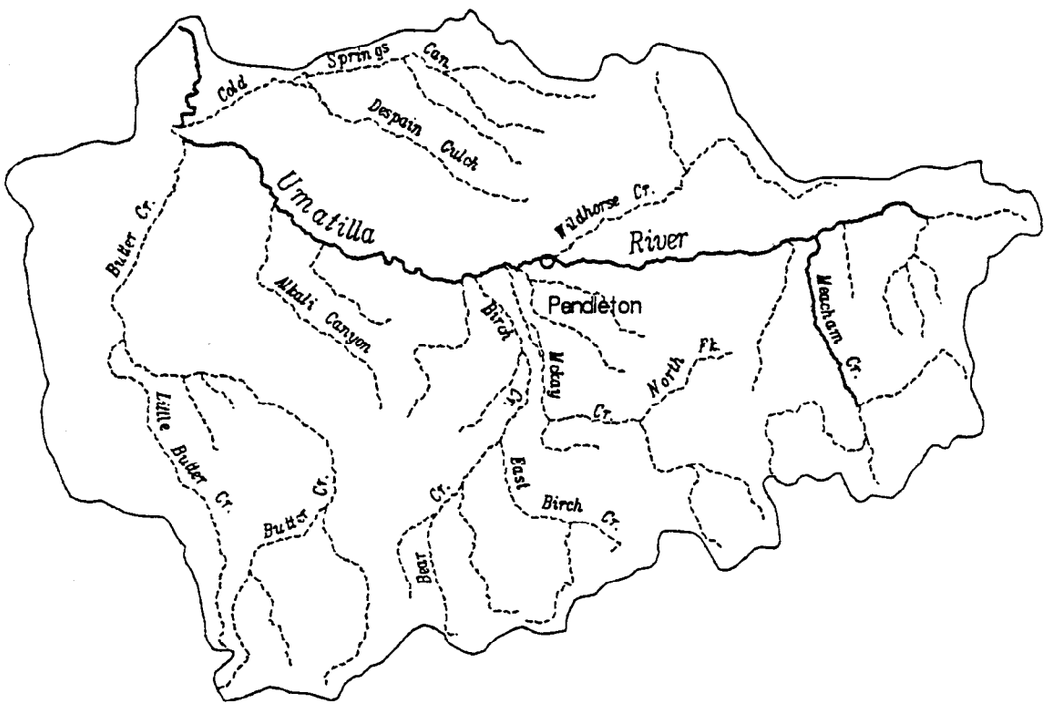
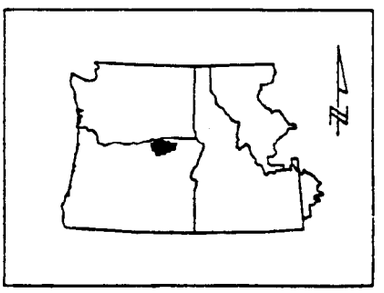



Figure 13.

## COHO DISTRIBUTION*

——————— PRESENT/POTENTIAL

---------- ABSENT



GIS GEOGRAPHIC INFORMATION SYSTEM
BONNEVILLE POWER ADMINISTRATION

* Due to the limitations of scale, all streams which support anadromous fish are not shown on this map.

Table 33. Release of coho salmon in the Umatilla River Basin.

| Release year | Brood | Stock | Hatchery | Number | no/lb | Location | In Facility | In River | Fish marked Yes | Fish marked No |
|---|---|---|---|---|---|---|---|---|---|---|
| 1987 | 85 | Toutle | Cascade | 161,889 | 13.5 | Minthorn | Apr 1-3 | Apr 24-29 | CWT | 60,059 |
| 1987 | 85 | Toutle | Cascade | 786,660 | 14.0 | RM 24 | ------- | Apr 14-21 | | X |
| 1988 | 86 | Toutle | Cascade | 996,433 | 16.6 | Lower Uma | ------- | Mar 28-Apr 4 | CWT | 60,000 |
| 1989 | 87 | Toutle | Cascade | 754,000 | 12-14 | RM 55 to 70 | ------- | Mar 14-22 | | X |
| 1989 | 87 | Toutle | Cascade | 157,000 | 15-17 | Minthorn | Mar 7-8 | Mar 31 | CWT | 50,000 |
| 1989 | 87 | Toutle | Cascade | 76,000 | 15-17 | Nr Minthorn | ------- | Mar 31 | CWT | 25,000 |

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**Hatchery Production**

From 1987 through 1989, managers released 1 million yearling coho annually into the subbasin (Table 33). Most coho were released into the lower mainstem Umatilla River and some from the Minthorn facility. All releases were early coho (Toutle stock) from the Oregon Department of Fish and Wildlife's Cascade Hatchery.

Twenty-nine jacks returned to Three Mile Dam on the Umatilla River in the fall of 1987 (Table 14). In fall 1988, 927 adults and 763 jacks returned to Three Mile Dam.

Pending resolution of irrigation-depleted streamflow, coho entry into the Umatilla River will depend upon seasonal quantity and temperature of available streamflow. Biologists expect fish to enter the river in October and November (Table 34).

Coho returning to the Umatilla River will consist of 2-year-old jacks and 3-year-old mature adults. Coho returning to Cascade Hatchery from 1978 through 1983 averaged approximately one male to one female. Of 490 adult sampled at Three Mile Dam in 1988, the male-female ratio was 1.3-to-1.

Of the 29 jacks returning in 1987, average fork length was 16.06 inches, with a minimum length of 13.70 inches and a maximum of 22.16 inches (Table 14 and Fig. 14).

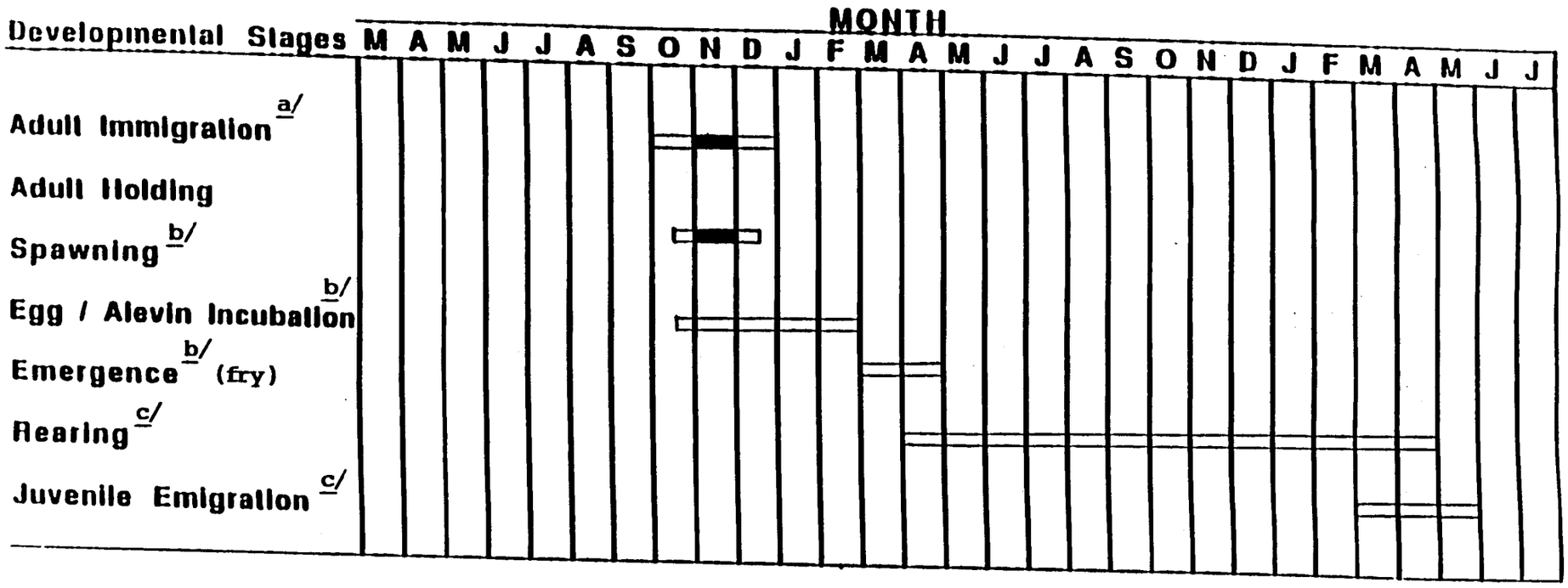
Toutle stock early coho at Cascade Hatchery were spawned from mid-October to mid-December in 1978 through 1983 (Howell et al. 1985) (Table 34). During that same period, females spawned at Cascade Hatchery averaged 2,595 eggs per fish.

Egg and alevin incubation at Cascade Hatchery occurs from mid-October through February (Table 34).

Only yearling coho will be released. They will emigrate March through May (Table 34). Smolt-to-adult survival is unknown, but is estimated to be 0.006 for planning purposes (ODFW/CTUIR 1988).

Constraints, problems and opportunities with existing or anticipated hatchery programs for coho are the same as those previously discussed for other species. In addition, the potential for interspecies competition for limited rearing area, particularly between coho and native steelhead, is the subject of professional controversy and will be investigated in the coming years.

Table 34. Freshwater life history, Hatchery Coho; Toutle Stock from Cascade Hatchery




Notes:

1. The developmental stage timing represents basin-wide averages, local conditions may cause some variability.
2. Solid bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

a/ Jack returns to Umatilla River in 1987; Adults and Jacks in 1988.

b/ Cascade Hatchery data (Wayne Stedronsky, ODFW, Pers. Comm.)

c/ Fish released as yearlings in spring.

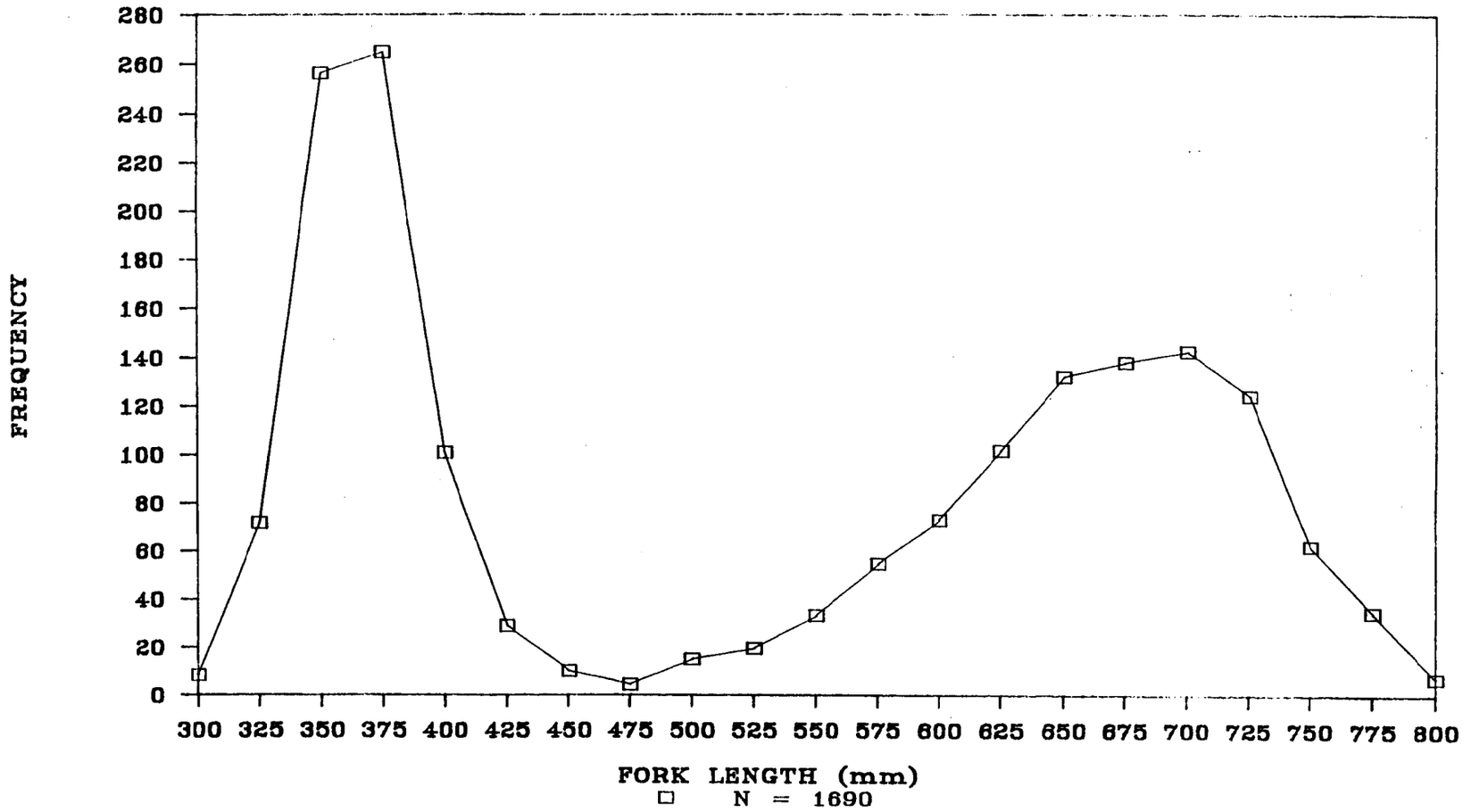



Figure 14. Length frequency of Umatilla River Coho, 1988 (coho were sub-sampled at Three Mile Dam trap: 447/763 Jacks (<46 cm) and 610/927 adults (>46 cm). The above length frequency represents the total return to the trap.

Actions that could improve coho production are the same as those previously discussed for other species.

**Harvest**

Past harvest, if any, is unknown. A tribal test dip-net fishery on coho began below Three Mile Dam in 1988. Harvest was estimated to be less than 50 fish.

The Oregon Department of Fish and Wildlife and Umatilla Tribes cooperate in setting subbasin harvest management goals and regulations. The Oregon Department of Fish and Wildlife and Umatilla Tribes are currently developing coho harvest management procedures, including coordination, regulation, monitoring and enforcement. The procedures will be similar to those previously discussed for other species.

## Specific Considerations

The subbasin may provide opportunity for natural production of coho. There is substantial opportunity for developing a hatchery-supported run and productive known-stock fishery. One million yearling coho annually are being released into the subbasin. The Umatilla Tribes and Oregon Department of Fish and Wildlife adult return goal from these releases is 6,000 fish. The first adult returned in the fall of 1988. The Umatilla Tribes and Oregon Department of Fish and Wildlife plan to evaluate the initial adult returns to determine migration timing and success, spawning location and success, and potential juvenile rearing competition with other species.

The key problem and constraint to production of all species or races in the subbasin is seasonal dewatering of the lower 30 or so miles of the mainstem River by irrigation diversions. This impedes and, during low flow years, can block late spring and early summer juvenile migrants and early fall returning adults. Impending completion of improved juvenile bypass and adult passage facilities, and juvenile and adult collection and transportation facilities will significantly reduce this constraint to achieving optimum fish production. Instream flows necessary for fish passage will be restored with implementation of the Columbia River-Umatilla River water exchange project authorized by the 100th Congress.

The Umatilla River Subbasin:

- Lies above only three mainstem Columbia River hydroelectric projects.

- Lies at the head of the Columbia River Zone 6 treaty fishing area.

- Lies within the most populous eastern Oregon county and in close proximity to southeastern Washington population centers; contains important tribal usual and accustomed fishing sites and the reservation of the Confederated Tribes of the Umatilla Indian Reservation, which have treaty-reserved rights to fish.

- Is easily accessible to fishermen and provides geographically extensive opportunities for a wide variety of tribal and non-tribal fisheries.

- Provides opportunities for major terminal, known-stock fisheries on hatchery fish.

- Provides opportunities for intensive management of mixed stocks of wild, natural and hatchery fish and for evaluation of the spectrum of fisheries and habitat management initiatives.

- Is the most likely northeast Oregon subbasin in which major, near-term tribal and non-tribal fisheries can be developed with hatchery outplants.

- Has in recent years been given high priority for restoration of salmon and steelhead runs and fisheries by tribal, state, regional and federal fisheries agencies; top priority by the Umatilla Tribes; and top priority in eastern Oregon by the Oregon Department of Fish and Wildlife.

**Objectives**

Achieve an annual adult return of 6,000 (6,000 hatchery and undetermined number of naturally produced) coho salmon to the Umatilla Subbasin to 1) provide for tribal and non-tribal fisheries and 2) accommodate natural production research that will be the basis for eventually determining a natural goal.

**Alternative Strategies**

Coho cannot be modeled at this time because of the limited data base available on juvenile rearing densities. Other species modeled indicated substantial increases in MSY run size and yield as a result of implementing various strategies. Similar results are expected with coho.

Only one strategy is proposed for coho salmon in the Umatilla Subbasin. This strategy has already been initiated under the United States vs. Oregon agreement.

STRATEGY 1: ACTIONS 1-2

1. Continue annual releases of 1 million coho smolts into the Umatilla Subbasin.

2. Evaluate adult return success and natural production capacity for coho in the Umatilla Subbasin.

   A) Monitor adult returns to Three Mile Dam to determine smolt-to-adult survival (currently being done by Umatilla Tribes and ODFW).

   B) Conduct life history studies to determine the success of adult migration, spawning, egg incubation, juvenile rearing, and smolt outmigration (to be initiated under existing Umatilla Tribe and Oregon Department of Fish and Wildlife programs for one to two years, when a funding source at about $100,000 per year would be needed to complete the life history studies in two to three years).

Evaluation results will be the basis for any changes that may occur in the current juvenile release program (stock or numbers) and development of a CTUIR/ODFW natural production goal.

**Recommended Strategy**

Planners have identified only one strategy, which has already been initiated under the United States vs. Oregon agreement.

**CHUM SALMON**

During subbasin planning public meetings, tribal members reported elders harvesting "chum" salmon in the Umatilla River during mid-December prior to the 1900s. Tribal members also expressed interest in reestablishing chum salmon to the Umatilla River. The feasibility of reestablishing chum salmon to the Umatilla River has never been explored.

Population run size and life history information for Umatilla River chum salmon is scarce to nonexistent. Reduced populations of wild and hatchery produced chum salmon are currently found in the lower Columbia River and are described by ODFW et al. 1984.

Umatilla Tribe planners recommend further investigation of the historical presence of chum salmon in the Umatilla River Basin and the feasibility for restoration.

## PART V. SUMMARY AND IMPLEMENTATION

### Objectives and Recommended Strategies

#### Spring Chinook

The objective is to achieve an annual adult return of 11,000 (10,000 hatchery and 1,000 naturally produced) spring chinook salmon to the Umatilla Subbasin. The above return would provide an inbasin harvest of 8,800 adults for sport and tribal fisheries.

Planners recommend Strategy 3. Strategy 3 includes habitat and passage improvements, instream flow enhancement, and hatchery production of 2,340,000 smolts.

#### Summer Steelhead

The objective calls for achieving an annual adult return of 9,670 (5,670 hatchery and 4,000 naturally produced) summer steelhead to the Umatilla Subbasin. The above return would provide an inbasin harvest of 5,460 adults for sport and tribal fisheries.

Planners recommend Strategy 2, which includes habitat and passage improvements, instream flow enhancement, and hatchery production of 210,000 smolts.

#### Fall Chinook

The fall chinook objective is to achieve an annual adult return of 21,000 (10,000 hatchery and 11,000 naturally produced) fall chinook salmon to the Umatilla Subbasin. The above return would provide an inbasin harvest of 5,400 adults for sport and tribal fisheries.

Planners recommend Strategy 2. Strategy 2 includes habitat and passage improvements, instream flow enhancement, and hatchery production of 7 million smolts.

#### Coho

The objective calls for achieving an annual adult return of 6,000 (6,000 hatchery and an undetermined number of naturally produced) coho salmon to the Umatilla Subbasin. Planners have identified only one strategy, which has already begun under the United States vs. Oregon agreement. The strategy involves continuing annual releases of 1 million coho smolts in the subbasin and evaluating adult return success and natural production capacity in the Umatilla Subbasin.

**Chum**

Planners call for further investigation of the historical presence and the feasibility of restoration to the Umatilla Subbasin.

## Implementation

In the summer of 1990, the Columbia Basin Fish and Wildlife Authority submitted to the Northwest Power Planning Council the Integrated System Plan for salmon and steelhead in the Columbia Basin, which includes all 31 subbasin plans. The system plan attempts to integrate this subbasin plan with the 30 others in the Columbia River Basin, prioritizing fish enhancement projects and critical uncertainties that need to be addressed.

From here, the Northwest Power Planning Council will begin its own public review process, which will eventually lead to amending its Columbia River Basin Fish and Wildlife Program. The actual implementation schedule of specific projects or measures proposed in the system plan will materialize as the council's adoption process unfolds.

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**APPENDIX A**
**NORTHWEST POWER PLANNING COUNCIL**
**SYSTEM POLICIES**

In Section 204 of the 1987 Columbia River Basin Fish and Wildlife Program, the Northwest Power Planning Council describes seven policies to guide the systemwide effort in doubling the salmon and steelhead runs. Pursuant to the council's plan, the basin's fisheries agencies and Indian tribes have used these policies, and others of their own, to guide the system planning process. The seven policies are paraphrased below.

1) The area above Bonneville Dam is accorded priority.

Efforts to increase salmon and steelhead runs above Bonneville Dam will take precedence over those in subbasins below Bonneville Dam. In the past, most of the mitigation for fish losses has taken the form of hatcheries in the lower Columbia Basin. According to the council's fish and wildlife program, however, the vast majority of salmon and steelhead losses have occurred in the upper Columbia and Snake river areas. System planners turned their attention first to the 22 major subbasins above Bonneville Dam, and then to the nine below.

2) Genetic risks must be assessed.

Because of the importance of maintaining genetic diversity among the various salmon and steelhead populations in the Columbia River Basin, each project or strategy designed to increase fish numbers must be evaluated for its risks to genetic diversity. Over millions of years, each fish run has evolved a set of characteristics that makes it the best suited run for that particular stream, the key to surviving and reproducing year after year. System planners were to exercise caution in their selection of production strategies so that the genetic integrity of existing fish populations is not jeopardized.

3) Mainstem survival must be improved expeditiously.

Ensuring safe passage through the reservoirs and past the dams on the Columbia and Snake River mainstems is crucial to the success of many efforts that will increase fish numbers, particularly the upriver runs. Juvenile fish mortality in the reservoirs and at the dams is a major cause of salmon and steelhead losses. According to estimates, an average of 15 percent to 30 percent of downstream migrants perish at each dam, while 5 percent to 10 percent of the adult fish traveling upstream perish. Projects to rebuild runs in the tributaries have and will represent major expenditures by the region's ratepayers -- expenditures and long-term projects that should be protected in the mainstem.

4) Increased production will result from a mix of methods.

To rebuild the basin's salmon and steelhead runs, fisheries managers are to use a mixture of wild, natural and hatchery production. Because many questions still exist as to whether wild and natural stocks can coexist with significant numbers of hatchery fish, no one method of production will be solely responsible for increasing fish numbers. System planners were to take extra precaution when considering outplanting hatchery fish into natural areas that still produce wild fish. The council is relying on the fish and wildlife agencies and tribes to balance artificial production with wild and natural production.

5) Harvest management must support rebuilding.

Like improved mainstem passage, effective harvest management is critical to the success of rebuilding efforts. A variety of fisheries management entities from Alaska to California manage harvest of the Columbia Basin's salmon and steelhead runs. The council is calling on those entities to regulate harvest, especially in mixed-stock fisheries, in ways that support the basin's efforts to double its runs.

6) System integration will be necessary to assure consistency.

The Northwest Power Planning Council intends to evaluate efforts to protect and rebuild Columbia River Basin salmon and steelhead from a systemwide perspective. Doubling the runs will require improvements in mainstem passage, fish production and harvest management -- three extremely interdependent components. System planners from all parts of the basin are to coordinate their efforts so, for example, activities in the lower Columbia are consistent with and complement the activities 800 miles upstream in Idaho's Salmon River. The fisheries management organizations and their plans vary from subbasin to subbasin, but the council is calling upon the agencies and tribes to help resolve conflicts that arise.

7) Adaptive management should guide action and improve knowledge.

System planners were to design projects so that information can be collected to improve future management decisions. By designing projects that test quantitative hypotheses and lend themselves to monitoring and evaluation, managers can learn from their efforts. This learning by doing is called "adaptive management." Using such an approach, managers can move ahead with plans to rebuild the Columbia Basin's salmon and steelhead runs, despite many unanswered questions about how best to accomplish their goal. With time, the useful information revealed by these "experiments" can guide future projects.

**APPENDIX B**
**SMART ANALYSIS**

To help select the preferred strategies for each subbasin, planners used a decision-making tool known as Simple Multi-Attribute Rating Technique (SMART). SMART examined each proposed strategy according to the following five criteria. In all cases, SMART assumed that all of the Columbia River mainstem passage improvements would be implemented on schedule.

1) Extent the subbasin objectives were met

2) Change in maximum sustainable yield

3) Impact on genetics

4) Technological and biological feasibility

5) Public support

Once SMART assigned a rating for each criteria, it multiplied each rating by a specific weight applied to each criteria to get the "utility" value (see following tables). Because the criteria were given equal weights, utility values were proportional to ratings. The confidence in assigning the ratings was taken into consideration by adjusting the weighted values, (multiplying the utility value by the confidence level) to get the "discount utility." SMART then totaled the utility values and discount utility values for all five criteria, obtaining a "total value" and a "discount value" for each strategy.

System planners used these utility and discount values to determine which strategy for a particular fish stock rated highest across all five criteria. If more than one of the proposed strategies shared the same or similar discount value, system planners considered other factors, such as cost, in the selection process. Some special cases arose where the planners' preferred strategy did not correspond with the SMART results. In those cases, the planners provide the rationale for their selection.

SUBBASIN: Umatilla

STOCK: Coho

STRATEGY: 1

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 7 | 0.6 | 22 | 154 | 92.4 |
| 2 | 7 | 0.6 | 18 | 126 | 75.6 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 4 | 0.6 | 12 | 48 | 28.8 |

TOTAL VALUE 748

DISCOUNT VALUE 532.8

CONFIDENCE VALUE 0.71229946

SUBBASIN: Umatilla

STOCK: Coho

STRATEGY: 2

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 7 | 0.6 | 22 | 154 | 92.4 |
| 2 | 7 | 0.6 | 18 | 126 | 75.6 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 4 | 0.6 | 12 | 48 | 28.8 |

TOTAL VALUE 748

DISCOUNT VALUE 532.8

CONFIDENCE VALUE 0.71229946

SUBBASIN: Umatilla

STOCK: Coho

STRATEGY: 3

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 7 | 0.6 | 22 | 154 | 92.4 |
| 2 | 7 | 0.6 | 18 | 126 | 75.6 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 4 | 0.6 | 12 | 48 | 28.8 |

TOTAL VALUE 748

DISCOUNT VALUE 532.8

CONFIDENCE VALUE 0.71229946

SUBBASIN: Umatilla

STOCK: Spring Chinook

STRATEGY: 1

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 9 | 0.6 | 20 | 180 | 108 |
| 5 | 9 | 0.9 | 12 | 108 | 97.2 |

TOTAL VALUE 946

DISCOUNT VALUE 684

CONFIDENCE VALUE 0.72304439

SUBBASIN: Umatilla

STOCK: Spring Chinook

STRATEGY: 2

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 9 | 0.6 | 20 | 180 | 108 |
| 5 | 7 | 0.9 | 12 | 84 | 75.6 |

TOTAL VALUE 922

DISCOUNT VALUE 662.4

CONFIDENCE VALUE 0.71843817

SUBBASIN: Umatilla

STOCK: Spring Chinook

STRATEGY: 3

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 10 | 0.6 | 22 | 220 | 132 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 7 | 0.9 | 12 | 84 | 75.6 |

TOTAL VALUE 904

DISCOUNT VALUE 651.6

CONFIDENCE VALUE 0.72079646

SUBBASIN: Umatilla

STOCK: Spring Chinook

STRATEGY: 4

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 10 | 0.6 | 22 | 220 | 132 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 7 | 0.9 | 12 | 84 | 75.6 |

TOTAL VALUE 904

DISCOUNT VALUE 651.6

CONFIDENCE VALUE 0.72079646

SUBBASIN: Umatilla

STOCK: Summer Steelhead

STRATEGY: 3

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 9 | 0.6 | 18 | 162 | 97.2 |
| 3 | 7 | 0.6 | 28 | 196 | 117.6 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 7 | 0.9 | 12 | 84 | 75.6 |

TOTAL VALUE 780

DISCOUNT VALUE 493.2

CONFIDENCE VALUE 0.63230769

SUBBASIN: Umatilla

STOCK: Summer Steelhead

STRATEGY: 1

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 9 | 0.6 | 18 | 162 | 97.2 |
| 3 | 7 | 0.6 | 28 | 196 | 117.6 |
| 4 | 9 | 0.6 | 20 | 180 | 108 |
| 5 | 9 | 0.9 | 12 | 108 | 97.2 |

TOTAL VALUE 844

DISCOUNT VALUE 538.8

CONFIDENCE VALUE 0.63838862

SUBBASIN: Umatilla

STOCK: Summer Steelhead

STRATEGY: 2

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 9 | 0.6 | 18 | 162 | 97.2 |
| 3 | 7 | 0.6 | 28 | 196 | 117.6 |
| 4 | 9 | 0.6 | 20 | 180 | 108 |
| 5 | 7 | 0.9 | 12 | 84 | 75.6 |

TOTAL VALUE 820

DISCOUNT VALUE 517.2

CONFIDENCE VALUE 0.63073170

SUBBASIN: Umatilla

STOCK: Fall Chinook

STRATEGY: 1

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 9 | 0.6 | 20 | 180 | 108 |
| 5 | 8 | 0.9 | 12 | 96 | 86.4 |

| | | |
|---|---|---|
| TOTAL VALUE | 934 | |
| DISCOUNT VALUE | | 673.2 |
| CONFIDENCE VALUE | | 0.72077087 |

SUBBASIN: Umatilla

STOCK: Fall Chinook

STRATEGY: 2

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 9 | 0.6 | 20 | 180 | 108 |
| 5 | 8 | 0.9 | 12 | 96 | 86.4 |

| | | |
|---|---|---|
| TOTAL VALUE | 934 | |
| DISCOUNT VALUE | | 673.2 |
| CONFIDENCE VALUE | | 0.72077087 |

SUBBASIN: Umatilla

STOCK: Fall Chinook

STRATEGY: 3

| CRITERIA | RATING | CONFIDENCE | WEIGHT | UTILITY | DISCOUNT UT |
|---|---|---|---|---|---|
| 1 | 9 | 0.6 | 22 | 198 | 118.8 |
| 2 | 10 | 0.6 | 18 | 180 | 108 |
| 3 | 10 | 0.9 | 28 | 280 | 252 |
| 4 | 7 | 0.6 | 20 | 140 | 84 |
| 5 | 7 | 0.9 | 12 | 84 | 75.6 |

TOTAL VALUE 882

DISCOUNT VALUE 638.4

CONFIDENCE VALUE 0.72380952

**APPENDIX C**
**SUMMARY OF COST ESTIMATES**

The cost estimates provided in the following summary tables represent new or additional costs necessary to implement the alternative strategies. Although many strategies involve projects already planned or being implemented under the Columbia River Basin Fish and Wildlife Program or other programs, such as the Lower Snake River Compensation Plan, the associated costs and hatchery production do not appear in the following tables.

In many cases, the following costs are no more than approximations based on familiarity with general costs of similar projects constructed elsewhere. Although the costs are very general, they can be used to evaluate relative, rather than absolute, costs of alternative strategies within a subbasin.

Particular actions are frequently included in strategies for more than one species or race of anadromous fish. In these cases, the same costs appear in several tables, but would only be incurred once, to the benefit of some, if not all, of the species and races of salmon and steelhead in the subbasin.

Subbasin planners used standardized costs for actions "universal" to the Columbia River system, such as costs for installing instream structures, improving riparian areas, and screening water diversions (see the Preliminary System Analysis Report, March 1989). For other actions, including the removal of instream barriers, subbasin planners developed their own cost estimates in consultation with resident experts.

Planners also standardized costs for all new hatchery production basinwide. To account for the variability in fish stocking sizes, estimates were based upon the cost per pound of fish produced. For consistency, estimated capital costs of constructing a new, modern fish hatchery were based on $23 per pound of fish produced. Estimated operation and maintenance costs per year were based on $2.50 per pound of fish produced.

All actions have a life expectancy, a period of time in which benefits are realized. Because of the variation in life expectancy among actions, total costs were standardized to a 50-year period. Some actions had life expectancies of 50 years or greater and thus costs were added as shown. Other actions (such as instream habitat enhancements) are expected to be long term, but may only have life expectancies of 25 years. Thus the action would have to be repeated (and its cost doubled) to meet the 50-year standard. Still other actions (such as a study or a short-term supplementation program) may have life expectancies of 10 years after which no further action would be taken. In this case, operation and maintenance costs were amortized over 50

years to develop the total O&M per year estimate. Capital costs, being up-front, one-time expenditures, were added directly.

Subbasin planners have estimated all direct costs of alternative strategies except for the purchase of water rights. No cost estimates have been or will be made for actions that involve purchasing water. Indirect costs, such as changes in water flows or changes in hydroelectric system operations, are not addressed.

ESTIMATED COSTS FOR ALTERNATIVE STRATEGIES

Subbasin: Umatilla River
Stock: Spring Chinook

| Action | Cost Categories* | Proposed Strategies 1 | 2 | 3** | 4 |
|---|---|---|---|---|---|
| Habitat Enhancement | Capital: | | | | |
| | O&M/yr: | | | | |
| | Life: | | | | |
| Screening | Capital: | | | | |
| | O&M/yr: | | | | |
| | Life: | | | | |
| Umatilla Headwater Storage | Capital: | | | 200,000 | 78,000,000 |
| | O&M/yr: | | | 0 | 66,000 |
| | Life: | | | 1 | 50 |
| Misc. Projects | Capital: | | | 0 | 0 |
| | O&M/yr: | | | 33,000 | 33,000 |
| | Life: | | | 3 | 3 |
| Hatchery Production | Capital: | | | | |
| | O&M/yr: | | | | |
| | Life: | | | | |
| TOTAL COSTS | Capital: | 0 | 0 | 200,000 | 78,000,000 |
| | O&M/yr: | 0 | 0 | 2,000 | 68,000 |
| | Years: | | | 50 | 50 |
| Water Acquisition | | N | Y | Y | Y |
| Fish to Stock | Number/yr: | | | | |
| | Size: | | | | |
| | Years: | | | | |

* Life expectancy of the project is defined in years. Water acquisition is defined as either Y = yes, the strategy includes water acquisition; N = no, water acquisition is not part of the strategy. The size of fish to stock is defined as E = eggs; F = fry; J = juvenile, fingerling, parr, subsmolt; S = smolt; A = adult.

** Recommended strategy.

ESTIMATED COSTS FOR ALTERNATIVE STRATEGIES

Subbasin: Umatilla River
Stock: Summer Steelhead

| Action | Cost Categories* | Proposed Strategies 1 | 2** | 3 |
|---|---|---|---|---|
| Habitat Enhancement | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| Screening | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| Umatilla Headwater Storage | Capital: | | 200,000 | 78,000,000 |
| | O&M/yr: | | 0 | 66,000 |
| | Life: | | 1 | 50 |
| Misc. Projects | Capital: | | 0 | 0 |
| | O&M/yr: | | 66,000 | 66,000 |
| | Life: | | 3 | 3 |
| Hatchery Production | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| TOTAL COSTS | Capital: | 0 | 200,000 | 78,000,000 |
| | O&M/yr: | 0 | 4,000 | 70,000 |
| | Years: | | 50 | 50 |
| Water Acquisition | | N | Y | Y |
| Fish to Stock | Number/yr: | | | |
| | Size: | | | |
| | Years: | | | |

* Life expectancy of the project is defined in years. Water acquisition is defined as either Y = yes, the strategy includes water acquisition; N = no, water acquisition is not part of the strategy. The size of fish to stock is defined as E = eggs; F = fry; J = juvenile, fingerling, parr, subsmolt; S = smolt; A = adult.

** Recommended strategy.

ESTIMATED COSTS FOR ALTERNATIVE STRATEGIES

Subbasin: Umatilla River
Stock: Fall Chinook

| Action | Cost Categories* | Proposed Strategies 1 | 2** | 3 |
|---|---|---|---|---|
| Habitat Enhancement | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| Screening | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| Barrier Removal | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| Umatilla Headwater Storage | Capital: | | 200,000 | 78,000,000 |
| | O&M/yr: | | 0 | 66,000 |
| | Life: | | 1 | 50 |
| Hatchery Production | Capital: | | | |
| | O&M/yr: | | | |
| | Life: | | | |
| TOTAL COSTS | Capital: | 0 | 200,000 | 78,000,000 |
| | O&M/yr: | 0 | 0 | 66,000 |
| | Years: | | 50 | 50 |
| Water Acquisition | | N | Y | Y |
| Fish to Stock | Number/yr: | | | |
| | Size: | | | |
| | Years: | | | |

* Life expectancy of the project is defined in years. Water acquisition is defined as either Y = yes, the strategy includes water acquisition; N = no, water acquisition is not part of the strategy. The size of fish to stock is defined as E = eggs; F = fry; J = juvenile, fingerling, parr, subsmolt; S = smolt; A = adult.

** Recommended strategy.

**APPENDIX D**
**SUMMARY OF THE TREATY OF 1855**
**AND RELATED FEDERAL AND TRIBAL LAWS**

**Treaty of June 9, 1855, 12 Stat. 945**

The Treaty of 1855 between the United States and the Walla Walla, Cayuse, and Umatilla tribes (hereinafter "Confederated Tribes") is the basis for tribal involvement in the fisheries management activities in this Subbasin Plan. The treaty is a legal document that was negotiated by the parties. Through the treaty, the Confederated Tribes gave up ownership of a vast territory of land extending from the lower Yakima River and along the mid-Columbia River to beyond the Blue Mountains into the Grande Ronde River drainage, south to the Powder River, west into the John Day River, and north into the Willow Creek drainage. Included within this territory are parts of the Snake, Imnaha, Tucannon, Burnt, and Malheur River drainages. In return, the Confederated Tribes reserved the following things:

- The Umatilla Indian Reservation as a permanent homeland;

- The right to maintain their own form of government and the right to make and enforce laws within their territorial jurisdiction; and

- The exclusive right of taking fish in the streams running through and bordering the reservation as well as the right to fish at all other usual and accustomed stations in common with citizens of the United States.

The Treaty of 1855 does not expressly mention the reservation of water rights by the Confederated Tribes. However, in a case decided by the U.S. Supreme Court in 1908 (Winters vs. United States, 207 U.S. 564) involving the right of a tribe in Montana to use water for agricultural purposes from a stream running through the reservation, it was decided that the tribe's right to use the water was impliedly reserved in the 1888 agreement between the United States and the tribes which established the Montana reservation. Further, the implicit reserved right to water was for a sufficient amount of water to fulfill the purposes of the reservation and the priority date for the water was the date the reservation was created.

## Federal Case Law Interpreting Treaty Fishing Rights

1) United States vs. Brookfield Fisheries, Inc., 24 F. Supp. 712 (D. Ore. 1938).

This case was brought by the United States on behalf of several tribes, including the Confederated Tribes of the Umatilla Indian Reservation and interprets the treaty language "the right to fish at all other usual and accustomed stations:" to mean:

- Tribal members are extended the right to fish at places where they had always fished and gave to tribal members an easement of ingress to and egress from such usual and accustomed stations; and

- That a fishery in a gross was attached to all real property in and around the usual and accustomed stations, and was reserved like an easement by the United States in the grants of such land to non-Indians as if written in the grant of land itself;

2) Confederated Tribes of the Umatilla Indian Reservation vs. H.B. Maison, 186 F.Supp. 519 (D. Oreg. 1960).

This case decided whether and under what conditions state fishing regulations may be imposed upon off-reservation treaty fishing activity by tribal members. The court ruled that while the state does have authority to impose regulations on off-reservation treaty fishing activity, the state must show that such regulatory restrictions are necessary for conservation of the fish. The court held further that where alternative methods of achieving state conservation objectives are available, such methods should be implemented first before the state tries to curtail the treaty fishing rights of tribal members.

3) H.G. Maison vs. Confederated Tribes of the Umatilla Indian Reservation, 314 F.2d 169 (9th Cir. 1963).

This case involved the appeal of thee foregoing case. On appeal the court ruled that restriction of treaty fishing by tribal members is justifiable only if necessary conservation cannot be accomplished by restriction of fishing of others. The court based its ruling on an earlier opinion by the United States Supreme Court in Tulee vs. Washington, 315 U.S. 681, 62 S.Ct. 862 L.Ed. 1115 (1942), in which it was determined that in order for a state regulation to be "necessary", it must be indispensable to the effectiveness of a state conservation program.

4) Sohappy vs. Smith (United States v. Oregon), 302 F.Supp. 899 (D.Ore. 1969).

The United States and several tribes, including the Confederated Tribes of the Umatilla Indian Reservation are parties to this case involving a challenge to state regulation of off-reservation treaty fishing activity along the Columbia River. The court ruled that:

- Indian treaties entered into by the United States are part of the supreme law of the land which the states and their officials are bound to observe;

- There are limitations on a state's power to regulate the exercise of treaty fishing activities. The regulation must be necessary for conservation of the fish and the state restrictions on treaty fishing must not discriminate against Indians;

- The state regulation must not subordinate treaty fishing right to some other state objective or policy and state regulation of treaty fishing rights may be allowed only when necessary to prevent the exercise of that right in a manner that will imperil continued existence of the fish resource;

- The state cannot so manage the fishery that little or no harvestable portion of the run remains to reach the upper portions of the stream where the historic Indian fishing places are mostly located;

- In the case of state regulations affecting Indian treaty fishing rights, the protection of the treaty right to take fish at the usual and accustomed places must be an objective of the state's regulatory policy coequal with the conservation of fish runs for other users; and

- agreements with tribes of deference to tribal preference of regulation on specific aspects pertaining to the exercise of treaty fishing rights are means which the state may adopt in the exercise of its jurisdiction over such fishing rights. The court stressed that the state and the tribes should be encouraged to pursue such a cooperative approach.

5) Sohappy vs. Smith (United States v. Oregon and Washington), 529 F.2d 570 (9th Cir. 1976).

This case is the appeal of some issues in the ongoing and continuation of the foregoing case. On appeal the court ruled that:

- The states are not permitted to regulate off-reservation treaty fishing activity unless the states establish that the particular regulation is reasonable and necessary to conserve the fish resources, and does not discriminate against Indians; and

- Treaty fisherman are entitled to take a fair share of the fish run and a 50/50 allocation is not an unreasonable allocation.

6) Confederated Tribes of the Umatilla Indian Reservation vs. Alexander, 440 F.Supp. 553 (D.Ore. 1977).

In this case the Confederated Tribes objected to the construction of a dam in a tributary of the Grande Ronde River which would flood and destroy usual and accustomed fishing stations. The court held that the flooding and destruction of usual and accustomed fishing stations would be a nullification of treaty rights and Congress had to act expressly and specifically in order to so nullify treaty fishing rights. The court refused to agree that nullification of treaty fishing rights could be inferred from general legislation authorizing the construction of the dam.

7) Confederated Tribes of the Umatilla Indian Reservation vs. Calloway, Civ. No. 72-211 slip op. (d.Ore. August 17, 1973).

This case involved the threat to fishing sites posed by the Corp of Engineers' manipulation of water in the pools behind The Dalles and John Day Dams to achieve greater generation of power (commonly referred to as a "peaking" proposal). The Corps proposal would impact the use of treaty fishing sites. The court held that the Corps could not implement its proposal until it had adequately protected the Indian fishing sites.

8) Settler vs. Lameer, 507 F.2d 231 (9th Cir. 1973).

This case involved a challenge to laws promulgated by the Yakima Indian Nation regulating off-reservation fishing activity by tribal members. The Yakima Treaty was negotiated at the same time as the Treaty for the Walla Walla, Cayuse and Umatilla, and Settler involved an interpretation of a treaty provision common

to both treaties. Settler stands for the proposition that the treaty reserved to the tribe the right to regulate and enforce

tribal laws at off-reservation usual and accustomed fishing grounds against tribal members. This right includes the ability to arrest tribal members off-reservation from tribal fishing violations and does not infringe upon state sovereignty.

**Tribal Laws**

1) Wildlife Code of the Confederated Tribes of the Umatilla Indian Reservation (applicable to all CTUIR subbasins).

The Tribal Wildlife code delegates to the Fish and Wildlife Committee the authority to set seasons and establish other management restrictions, issue permits and engage in programs or actions that will protect, promote, or enhance the wildlife resources the Confederated Tribes have an interest pursuant to the Treaty of 1855.

2) Land Development Code of the Confederated Tribes of the Umatilla Indian Reservation (applicable to only the Umatilla Indian Reservation).

This is a land use and zoning code that is designed to 1) promote orderly land development on the reservation; and 2) conserve and enhance vegetation, soils, air, water, and fish and wildlife resources. Pursuant to the code, the board has approved an official Master Land Use Map of the Umatilla Indian Reservation establishing the various land use zones for the reservation, such as exclusive farm use, small farm, agri-business, rural residential, industrial, commercial, big game winter grazing, and flood hazard.

3) Interim Water Code and Stream Zone Alteration Regulations of the Confederated Tribes of the Umatilla Indian Reservation (applicable to only the Umatilla Indian Reservation).

The purpose of the Interim Water Code is to provide an orderly system for the use of water resources on the reservation; to insure that all residents of the reservation have adequate water for domestic purposes; and to protect the water resources of the reservation from overappropriation, pollution, and contamination.

The Stream Zone Alteration Regulations establish policies and procedures and prescribe regulations that will protect and conserve the quality and quantity of the natural and cultural resources in the stream zones of the reservation. The intent of

the regulations is to 1) promote activities in the stream zones that will improve water quality and quantity; 2) prevent the degradation of wildlife and fish habitat; 3) prevent the destabilization of soils and streambanks; and 4) prevent the contamination or pollution of ground and surface waters.

**Summary**

The Treaty of 1855 entitles the tribe and its members to engage in fishing activities both on and off the reservation throughout all or parts of the mainstem Columbia River, the Umatilla, Grande Ronde, Walla Walla, Tucannon, Yakima, Imnaha, Powder, Burnt, Malheur, Willow Creek, and John Day drainages.

The Treaty of 1855 authorizes the tribe to adopt and enforce laws that regulate treaty fishing activity of tribal members; to participate in the management of the fishery resources; and to implement management practices to protect the fishery resources.

The Treaty of 1855 allows the tribe to engage in fishing activities free from state regulation except to the extent that the state can show that state regulation is necessary and reasonable for conservation of the resource.

The Treaty of 1855 impliedly reserves to the tribe the right to a sufficient quantity of water of adequate quality to fulfill the purposes for which the reservation was created -- agriculture, fisheries, wildlife, and permanent homeland.

The Treaty of 1855 provides the basis for tribal co-management of treaty fishery resources off-reservation in the affected drainages.