COOS RIVER BASIN FISH MANAGEMENT PLAN

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INTRODUCTION

Purpose

The Coos River Basin Fish Management Plan was developed to guide management of fish and shellfish and their habitat in the Coos River Basin. This written plan identifies objectives and activities which will be implemented by ODFW within the Coos River Basin. This plan also ranks the important management activities. With a good understanding of stated direction within ODFW, priorities can be better and more easily assessed when developing biennial budgets, making routine work assignments, and making decisions in crisis situations. By stating objectives for managing fisheries, fish and shellfish populations, and habitat, the public and ODFW will have a better understanding of the direction being taken with these activities in the Coos River basin. The plan can also be used to inform other agencies of our objectives so that fishery considerations can be included when planning for other land and water use activities.

The Fish Management Policy of the Oregon Department of Fish and Wildlife (ODFW) directs that management plans will be prepared for each basin or management unit. The Coos River Basin Fish Management Plan (hereafter referred to as the Coos Basin Plan or the Plan) is just one part of the overall planning effort of ODFW. Individual species plans contain statewide policies, guidelines, and objectives, and provide general direction for writing basin plans. The Coos Basin Plan incorporates appropriate portions of the above plans, and will be the primary document used to guide fishery management of the public resources in this basin.

The Coos Basin Plan was developed through an advisory process that included ODFW staff and a citizen advisory committee representing a diversity of interests in the Coos Bay-North Bend area. This version of the management plan for fish and shellfish in the Coos River basin serves two purposes, 1) to record ongoing management, and 2) to guide future directions that deviate from traditional or historical perspectives. And finally, the plan expresses views of future fishery needs in the Coos River basin. This plan is not the final or definitive statement of fish management in the Coos River basin. The plan will be reviewed every two years by ODFW and members of the public to evaluate progress in achieving its objectives, to modify the plan where necessary, and to set priorities for carrying out the plan for the following two years.

The scope of this plan is very broad. In addition to including species because of their potential for recreational and commercial fisheries, the plan also addresses lesser-known species that are an important part of the Coos River basin fauna, including some which comprise the major food sources for the economically important species (APPENDIX A). Their well-being is important to the system as a whole, and they act as indicators of changes in the system. Mammals, birds, and amphibians, which also interact with the rest of the system, are beyond the scope of this plan; however, their role in fisheries management will not be ignored.

Organization

The plan is divided into sections that discuss current management philosophy and direction, habitat, individual fish and shellfish species, groups of species, angler access, and angling law enforcement. Each section contains the following:

1. Background--historical and current information and an assessment of the current status of the species or topic.

2. Operating Principles--overriding constraints or principles developed specifically for management activities in the basin relating to the species or topic.

3. Objectives--what is intended to be accomplished.

4. Assumptions and Rationale--justification and considerations used in arriving at the objective.

5. Problems--obstacles to achieving the objective.

6. Recommended Actions--solutions or methods for dealing with the problems.

General Policies

The Coos Plan must conform to established constraints. These include:

1. Legislation--Oregon Revised Statutes

2. Oregon Administrative Rules (OAR)--Goals and policies for commercial and sport fishing regulations, fish management, and salmon hatchery operation, including the Natural Production, Wild Fish Management and Threatened and Endangered Species policies. Portions of the Coos Basin Plan will also be adopted as Administrative Rules.

3. Procedures developed by ODFW--Manual for Fish Management (1977); A Department Guide for Introductions and Transfers of Finfish into Oregon Waters (1982)

4. Management plans--Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout (1981), The Coho Salmon Plan (1981), The Steelhead Plan (1986), The Trout Plan (1987), and The Warmwater Fish Plan (1987)

5. Agreements with other agencies--e.g., Bureau of Land Management (BLM) and U.S. Army Corps of Engineers (USACE)

6. Rules and regulations of other state and federal jurisdictions--e.g. Department of Environmental Quality (DEQ), Department of Forestry (ODF), Department of Land Conservation and Development (DLCD), and the Federal Threatened and Endangered Species Act.

PLAN REVIEW AND IMPLEMENTATION

This plan was completed as a result of staff and public interaction, general public review, and was adopted at a public hearing before the Commission on September 19, 1990. Oregon Administrative Rules (OAR's) were written to reflect the objectives of the plan. These OAR's will guide management until such time as those OAR's are changed. If plan objectives need revision at some later time, they can be taken back to the Commission for consideration. The problems and actions will also be reviewed on a biennial basis. The Department staff will report to the public what progress was made on each action in attempting to meet the plan's objectives. The public and staff will work together to review the actions and make necessary changes.

The Coos Plan discusses many more activities than could be completed with existing budgets. Some parts of this plan are already on-going activities of ODFW, are part of the base budget, and only need to be continued or modified in some way. Other parts of the plan are new and need to be continued or modified in some way. Other parts of the plan are new and need to be budgeted before they can be implemented. In order to achieve the objectives of this plan within ODFW's budgetary and staff limitations, priorities for funds and effort must be identified.

Priorities were identified for habitat and to identify better information for most species and species groups. These priorities reflect what ODFW and the citizens advisory committee believe are the most important issues that should be addressed in the Coos River basin (Table 1). One issue affects all species and will receive top priority: the need to protect, restore, and improve the quality of freshwater and estuarine habitat. The citizen advisory committee, members of the public, and ODFW believe that the long-term stability and health of fish and shellfish populations in the Coos River basin are closely related to the condition of the habitat within and surrounding the water. Another issue is reiterated for many species: the need for quality abundance and distribution data. Although the need for quality distribution and abundance data is discussed separately under each species or group, we recognize that many species or groups can be surveyed simultaneously. Furthermore, we believe that comprehensive distribution and abundance surveys coupled with physical-biological surveys will allow biologists to determine limiting factors for fish and shellfish in the Coos River basin. A major issue in this plan is compliance with the new Wild Fish Management Policy and the need for modifying some hatchery release strategies and developing acclimation ponds to assure that most hatchery fish home to areas away from the naturally spawning wild populations. Of the 18 issues identified in Table 1, the citizen advisory committee thought enhancement of striped bass and fall chinook were the two most important issues. They were mixed on the other issues.

After considering all species and species groups in the Coos River basin, we grouped and generalized the different types of problems and actions into the highest priority issues (Table 1). The current funding status is indicated. A "yes" in the currently funded column denotes that funding for that activity is presently budgeted at some level, but does not indicate the adequacy of the funding. If additional funds are needed, it is noted in the next column. A "no" in the currently funded column is followed with a statement of the plan for future funding. This table will be reviewed and updated by the ODFW staff and public every two years to determine the funding

and staffing priorities for the following biennium and to identify which problems will be approached through the budgeting process.

The Coos Basin Plan provides comprehensive, long-range direction for the management of fish and shellfish in the basin. As a result, the main body of the plan identifies the management objectives and actions to some extent without regard to funding and personnel constraints, which can vary from year to year. The Coos Basin Plan is not intended to be a short-term operational or work plan. Specific tasks to accomplish the objectives among all species or groups and habitat and the schedule for those tasks will be contained in specific proposals and implementation plans. Some of these plans may have to be modified according to budgets approved by the legislature and availability of funds from other sources. The Coos Basin Plan, therefore, is not intended to predict future funding, staffing, and unforeseen fisheries problems, or describe the specific mechanisms to respond to all possible scenarios. Rather, the plan lays out the goals and objectives that we feel are most important to managing the current and future fisheries in the basin. Other members of ODFW, federal and state agencies, and the public can refer to the Coos plan, and clearly understand the direction of ODFW fisheries management within the Coos River basin.

Table 1. Generalization of the highest priority issues in the Fish Management Plan for the Coos River basin based on policy and public interest. The funding status is identified.

Issues	Currently Funded	Remarks on Funding Status
Collect baseline information on the sensitive Millicoma Dace	No	Preliminary information would be collected during surveys with Restoration and Enhancement Funds. Detailed studies will need to be written in research proposals.
Collect baseline information on cutthroat trout	No	Preliminary information will be collected during surveys with Restoration and Enhancement Funds.
Protect existing freshwater and estuarine habitat	Yes	The base budget in each biennium includes time for habitat protection but additional biological help for field time is needed.
Improve the inventory base for all species in the freshwater and estuarine areas	Yes	Some ongoing trend data are being collected and limited funding is available through Restoration and Enhancement Funds to survey large areas.

Table 1. (Cont.)

Issues	Currently Funded	Remarks on Funding Status
Modify hatchery release strategies and construct acclimation ponds	Yes	Changes in release sites can be done within existing programs but construction of new facilities will require major funding through Restoration and Enhancement Funds. Several proposals have been written and approved.
Implement a striped bass management program	Yes	The enhancement portion of this work has been funded through Wallop-Breaux funds but the monitoring and evaluation of adult populations needs to be funded.
Improve angler access	No	Applications need to be made for Restoration and Enhancement funds and to the State Marine Board.
Implement a sturgeon enhancement program	No	Applications need to be made to special interest groups for sources of funds for this work.
Expand production of fall chinook salmon to utilize estuarine carrying capacity	Yes	This program is limited by rearing sites and availability of budgets for fish food. Increases in base budgets are needed.
Increase public relations and public awareness of programs and problems	Yes	A modest program is now being conducted within existing budgets.
Restore and Improve habitat for naturally produced wild populations of salmonids in freshwater areas	Yes	A small program mostly through the Salmon Trout Enhancement Program has been conducted. We need a major dedication of funds to this activity in the base budget and with Restoration and Enhancement funds

Table 1. (Cont.)

Issues	Currently Funded	Remarks on Funding Status
Monitor salmonid spawning populations for abundance of wild fish and strays from hatchery releases.	Yes	Some funding is now available but increases would improve the quality of information.
Collect locally adapted wild stock for hatchery programs	Yes	Existing programs have largely been conducted with STEP volunteers and base budget funding is needed.
Develop information and programs for underutilized fish species	No	Funds need to be sought from special interest groups or help from research operations.
Evaluate success of enhancement programs and habitat improve ment	Yes	Marking programs are now in place but additional groups will need to be funded through the same projects that include the habitat work.
Increase law enforce- ment	Yes	The number of personnel is now limited and needs to be increased with increased funding.
Improve interagency coordination for habi- tat protection and land-use planning	Yes	The base budget includes this work but additional time needs to be dedicated to this activity with increases in base budget for habitat protection.
Develop better data on the catch and angler use in re- creational fisheries	Yes	Some limited data are now being collected, but statis- tical creel surveys for specific fisheries should be funded by Wallop-Breaux and other funds.

BASIN DESCRIPTION

Physical Setting

The Coos River basin drains an area of approximately 730 square miles. The majority of this area is in Coos County with 147 square miles of the eastern portion in Douglas County. Major rivers within the basin are the Millicoma River, formed by the confluence of East Fork of the Millicoma and West Fork of the Millicoma rivers, and the South Coos River, formed by the confluence of the Williams River and Tioga Creek. The Millicoma and South Coos rivers join to form the five mile long Coos River. Additional tributaries flow directly into the sloughs of Coos Bay (Figure 1).

Stream flow follows rain patterns and is not influenced by snowmelt. High flow occurs in winter and is influenced by steep slopes and low infiltration rates, as well as by rainfall. Low groundwater storage capacity contributes to low summer flow. River flow data are limited, but available estimates of average flow for the Coos River range from 90 cfs in August and September to 5,500 cfs in February. Extremes range from 50 cfs in late summer to 100,000 cfs in winter during or immediately after heavy storms (Coos County Staff 1983).

Coos Bay is the largest estuary completely within Oregon. It is a complex bay with a surface area of approximately 10,000 acres (Percy et al. 1974) and about 30 direct tributaries, the largest being the Coos River, which enters 15 miles from the mouth of the bay. Tidal influence extends to river mile (RM) 34 on the Millicoma River and to RM 37 on the South Coos River as measured from the mouth of the estuary (Figure 1). Twelve other tidally influenced sloughs exist around the bay. Coos Bay is a well-mixed estuary during most of the year, but becomes partially stratified during periods of maximum fresh water runoff. Highest salinity occurs in summer.

Land Use and Ownership

Major land uses in the Coos River basin are timber production, agriculture, commercial and residential development, and industry, primarily shipping. Approximately 85% of the watershed is commercial forest. This includes much of the land drained by the Millicoma and South Coos systems, and smaller holdings scattered throughout the lower portion of the basin. Agricultural crop and pasture lands consist primarily of diked tidal marshes found along the sloughs of the bay and in the floodplains of the Coos, South Coos and Millicoma rivers. Industrial areas are concentrated along the northwest side of lower Coos Bay (North Spit) and the waterfront areas of North Bend, Coos Bay, and Eastside. Commercial and residential areas are concentrated around the south shoreline of the bay in the towns of Charleston, North Bend, Coos Bay, and Eastside. Scattered residential holdings exist in the Haynes Inlet area and along the sloughs and lower river reaches. Commercial oyster leases are also held on tidelands in South Slough, and mid- and upper Coos Bay.

The upper portion of South Slough was the first area in the United States to be designated as a National Estuarine Sanctuary. The sanctuary is

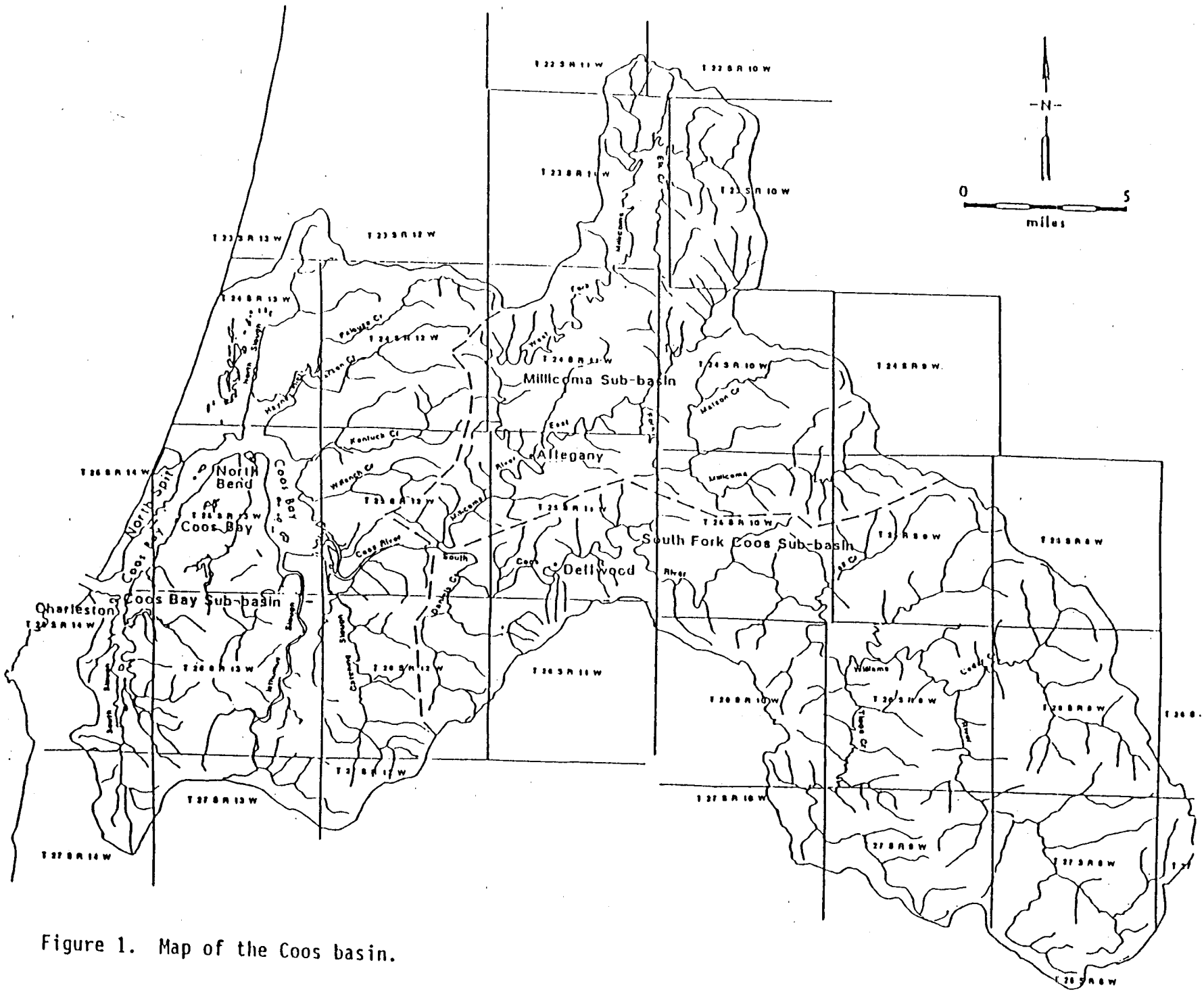

Figure 1. Map of the Coos basin.

managed as a natural system for research, education, and low intensity recreation.

The majority of the land in the basin is privately owned, primarily by timber companies. The Bureau of Land Management (BLM) manages a significant amount of land in the Tioga drainage and the State Land Board manages a large portion of the West Fork Millicoma drainage.

Changes in the Basin

Activities leading to physical alterations of Coos Bay began in the late 1800s. From 1920 to 1970, diking of tidelands converted 2,000 acres to agricultural land, and filling created another 1,500 acres of new land (Bella et al. 1974). Combined, these activities have reduced the size of the estuary by more than 25%. Salt marshes, valuable for food production and as rearing areas for many fish species, have suffered the most with up to a 90% loss from diking and filling for urban development, expansion of agricultural land, and disposal of dredged material (Hoffnagle and Olson 1974).

Coos Bay has been developed as a deep water port with 35-foot channels and several turning basins maintained by dredging. Most landfills are the result of dredging done to create and maintain ship channels. Other structures in the bay include boat ramps, pilings, docks, bridges, and waste outfalls associated with industrial development.

Above tidal influence the Coos River watershed becomes steep, with heavily timbered and harvested slopes. Logging became a full time operation along the Coos River in the 1870s to 1890s. Early logging involved pulling cut timber by oxen to the Coos River where it was left to wash out with the winter and spring freshets. Logging operations became more efficient in the early 1900s with the use of "donkey" engines and railroads. The first splash dam was installed in the South Coos River in 1937. Splash dams were used to transport logs downstream and were installed in a number of locations along the South Coos and Millicoma rivers. The last splash dam was removed in 1957. Logging and associated road construction continue to be major activities in the basin. Timber is trucked to Dellwood or Allegany and floated down the river. Logs are stored as well as transported in tidewater areas.

HABITAT

Background

Freshwater Habitat

Flowing freshwater streams provide habitat for salmon, steelhead, and cutthroat trout, with cutthroat trout using smaller headwater streams than are used by other salmonids. Several other species of fish also live in the freshwater portion of the system. Small headwater streams play an important part in determining downstream water quality.

Freshwater habitat throughout the Coos River basin has been affected by logging and road building activities that began in the late 1800s. Splash dam activity removed much of the gravel and wood structure from stream channels. Removal of riparian vegetation during extensive streamside logging, combined with naturally low summer flow caused water temperature to increase in many streams. Logging debris created temporary, impassable barriers according to surveys done in the 1950s.

Currently, overall stream habitat ranges in quality from poor to good. In summer, streams are characterized by warm, naturally low flow. The system contains only modest amounts of gravel needed by salmonids for spawning. Spawning gravel is most likely a primary limiting factor for chinook salmon and other salmonids. Winter habitat is probably limiting for coho salmon, steelhead, and cutthroat trout. Freshwater habitat quality is expected to improve as large tracts of clearcut timberland regenerate and as modern day logging practices continue to improve.

Recent habitat improvement projects carried out by ODFW and other agencies include placement of structures in streams to increase spawning and rearing area to increase production potential.

Estuarine Habitat

Estuarine habitat in the basin has been altered by dredging, filling, and diking that have occurred since the late 1800s, with salt marshes suffering the most serious losses. Despite substantial changes, the Coos Bay estuary still provides important habitat for many fish and shellfish species including salmon, American shad, Pacific herring, surfperches, smelts, starry flounder, Dungeness crab, and clam species. The estuary can be divided into marine, lower and upper bay, slough, and riverine subsystems based on sediments, habitats, and geographic location (Roye 1979). All of these areas have been affected by human activities to varying degrees, but water quality remains adequate for fish life in most parts of the estuary.

The marine subsystem extends from the mouth of the bay up 2.5 miles. This area experiences vigorous wave action that creates unique habitats for marine fish. Sand, cobble, and boulder shores; sand and sand-mud flats; algal beds on bedrock and unconsolidated bottoms; eelgrass beds; and subtidal, unconsolidated bottoms all occur in this area.

The lower and upper bay subsystems encompass the entire estuary area, excluding the sloughs. The bay contains a diversity of bottom types and

habitats including the dredged ship channel, shallow seagrass beds, extensive intertidal flats, and undredged tidal channels. Most fish species occurring in Coos Bay use the intertidal flats at some time during the year. The dredged ship channel runs along the west side of the upper bay where industrial and port activity is centered.

The slough subsystems vary in the type of habitat they contain depending on their location and the amount of freshwater they receive. South Slough is relatively marine, whereas Catching Slough, located far up-bay near Coos River, is brackish. The sloughs have undergone intense alteration, primarily diking and log rafting. Sloughs provide habitat for a number of estuarine fishes, commercial shellfish, and other invertebrates and have the potential for greater use by salmonids.

The riverine subsystem includes Coos River, the South Coos to RM 37, and the Millicoma River to RM 34, measured from the estuary mouth. This subsystem is important to a number of fish species. Coho salmon and steelhead smolts migrate through these areas, and this subsystem is the major rearing area for juvenile chinook salmon. The subsystem provides critical spawning habitat and juvenile rearing habitat for American shad and striped bass in spring and summer, and in winter, habitat for adult striped bass. Other species that use this area include sculpins, starry flounder, shiner perch, redside shiner, and largescale sucker. Diking, dredging, and streambank protective measures including extensive riprapping, have significantly altered this area. Most of the riparian vegetation along the Coos River is gone, but small strips remain along much of the South Coos and Millicoma rivers.

Log dumping, handling, storing, and rafting occur in this subsystem and have had a major effect on the habitat. Substantial amounts of bark, wood, and other logging debris enter the water in the course of these activities. Small organic debris was detrimental to fish and shellfish production in Isthmus Slough by depleting oxygen in the water column to levels below DEQ standards (DEQ, unpublished data). Furthermore, published evidence from other northwest basins (Levy et al. 1979; Sibert and Harpham 1979) indicate direct, adverse effects from log storage in intertidal areas, and indirect effects of log storage and transportation in other areas. These activities cause increased sediment and turbidity loads, and toxic, sublethal chemical effects, thereby decreasing fish and shellfish production. Constant tugboat traffic keeps sediments suspended, which also increases the turbidity level.

Additional, detailed information on the Coos estuary is available in other sources (Coos County Staff 1983; Roye 1979).

Fish Production

Habitat factors that limit production have been tentatively identified for chinook salmon, coho salmon, steelhead, striped bass, and American shad for major areas in the basin (R. Bender, ODFW, Charleston, Oregon, unpublished data). In addition, information from available stream surveys has been transferred onto maps and summarized in tables along with salmonid distribution and points to the need for updating surveys (John Anderson, USBLM, Coos Bay, Oregon, unpublished data).

Habitat Management Goals

The following habitat management goals are identified as issues that need to be addressed in each basin plan (ODFW 1982):

1. Maintain habitat protection and improvement activities and promote cooperative programs with land managers to maintain and increase natural production.

2. Insure that guaranteed minimum flows are maintained in watersheds producing salmonids and increase efforts to establish such guarantees where presently none exist.

3. Encourage sound land-use planning actions by the Land Conservation and Development Commission, counties, and land management agencies to minimize habitat losses. Delineate critical habitat areas and potential threats from various land-use activities.

4. Identify fish passage problems, their locations, and corrective actions needed.

5. Improve water quality and reduce harmful fluctuations in flow from storage reservoirs. Identify problem areas, sources of degradation, and possible solutions.

6. Identify potential habitat improvement projects that would restore or enhance anadromous fish production.

Fish and Wildlife Habitat Protection Policy

Involvement in fish habitat management is guided by the Fish and Wildlife Habitat Protection Policy and the Habitat Management Goals of ODFWs Anadromous Fish Plan. District activities fall into both habitat protection and enhancement, and often involve coordinating with other agencies.

ODFW recognizes that attrition of habitat is a serious threat to maintenance of healthy and diversified populations of fish and wildlife. Implementation of State and Federal laws for conservation of fish and wildlife habitat, including those contained in the Wildlife and Commercial Fishing Codes, is essential to sustaining a strong habitat base. Therefore, ODFW will cooperate fully with other agencies at the federal and state level, as well as local level (e.g. Coos Bay North Bend Water Board, Oregon International Port of Coos Bay, and the cities of Coos Bay, North Bend, and Eastside) to implement laws and to develop coordinated resource management programs that protect fish and wildlife habitat. ODFW will also work with private organizations (e.g. Weyerhaeuser Corp. and NW Steelheaders) and individuals to achieve, where possible, mutually satisfactory solutions to conflicts between the objectives of other parties and the habitat protection policy of ODFW.

Habitat Management Agencies

A number of federal, state, and local agencies have regulatory responsibility for land and water management within the Coos River basin. The activities they regulate are of interest to ODFW because the activities affect

fish and shellfish habitat. ODFW does not have regulatory authority over most land and water use activities, but works with other agencies to identify potential threats to habitat, areas requiring protection, and habitat enhancement projects. The responsibilities of the major agencies operating within the basin are described below.

Bureau of Land Management

General goals have been developed by U.S. Bureau of Land Management (BLM) to accomplish management of public lands. These include:

> To provide and maintain habitat diversity for viable populations of all indigenous fish and wildlife. Special emphasis is to be placed on habitats for . . . threatened and endangered and commercially valuable species.
>
> To maintain and protect water resources through the wise management of watersheds and the water therein.

BLM lands in the Coos River basin are managed primarily for timber production. Logging is regulated by BLM policy as administered by the Coos Bay District. BLM minimum logging standards meet or exceed the rules of the state's Forest Practices Act and are found in BLMs Management Framework Plan (Anonymous undated). A timber management plan (Anonymous 1981) exists for the South Coast-Curry Management units. Fish habitat requirements, the effects of timber management activities on fish and their habitat, and protective measures are addressed.

U.S. Army Corps of Engineers

U.S. Army Corps of Engineers (USACE) water resource development responsibilities include maintaining harbor and river channels and providing assistance in flood control. The Corps maintains dredged deep-draft ship channels from the ocean to Isthmus Slough at Millington, as well as shallow-draft channels to Allegany on the Millicoma and to Dellwood on the South Coos River. It also maintains turning and anchorage basins in the bay. ODFW cooperates with the Corps in identifying potential problems within the Corps jurisdiction and reviews permits for proposed work in the Coos system.

Soil Conservation Service

The U.S. Soil Conservation Service assists landowners by administering small watershed projects including flood control, irrigation, recreation, and fish and wildlife enhancement.

Oregon Department of Forestry

The Oregon Department of Forestry, through its Forest Practices Act (FPA), is responsible for regulating commercial logging activities on private lands. Through forest practice rules it establishes minimum standards for forestry activities to encourage and enhance the growth and harvest of trees while giving consideration and protection to other environmental resources to the extent considered practical.

A set of Forest Practice Rules has been published to achieve the purpose of the FPA. These rules were modified in April of 1987 to improve protection of riparian habitat, to broaden the waters classified for fish production, and to provide additional protection to small tributaries important for maintaining cool water downstream during summer.

Division of State Lands

Division of State Lands (DSL) is responsible for issuing permits for removing or filling of materials in waterways. Permits are required when 50 cubic yards or more of material is moved.

> Oregon Revised Statutes (ORS) 541.610(1) recognizes public concern for protection, conservation, and best use of Oregon's water resources. It identifies fish habitat and spawning areas as:
>
> ". . . vital to the economy and well being of this state and its people." This policy further states that "Unregulated removal of material from the beds and banks of the waters of this state may create hazards to the health, safety, and welfare of the people of this state. Unregulated filling in the waters of this state may result in interfering with or injuring public navigation, fishery, and recreational uses of the waters."

Applications for fill-removal permits are forwarded by DSL to ODFW. After review of the application, ODFW may request waterway protective measures or denial of the permit because of the effects on fish resources. The final decision on any permit rests with DSL. All fish habitat enhancement projects that fall under the fill-removal law require either a permit or waiver before they are started.

South Slough National Estuarine Reserve

South Slough National Estuarine Reserve (SSNER) comprises the southern half of South Slough. SSNER is administered through Oregon Department of State Lands with National Oceanic and Atmospheric Administration funds. The goals of the reserve are to manage and protect the area for educational, research, and low-intensity recreational use.

Department of Environmental Quality

The Department of Environmental Quality (DEQ) is responsible for managing water quality standards by regulating activities that could cause violation of the set standards. They are responsible for administering regulations for log transport and storage in the Coos River system.

The Environmental Quality Commission, as part of its statewide management plan, has adopted a water quality management plan for the south coast basin, including Coos County. This is primarily a pollution prevention program that states beneficial water uses and quality standards to be protected and waste treatment criteria. OAR 340-41-325 (1) states that:

> ". . . the highest and best practical treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain

dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels."

Oregon Water Resources Department and Water Resources Commission

The Oregon Water Resources Department is responsible for developing programs for the use and control of water resources. A water resources program for the south coast basin was first adopted in 1964 and was most recently modified in 1981. In their findings and conclusions, the Water Resources Commission recognizes that (Thompson et al. 1972):

--The coastal streams support resident and anadromous species of fish.

--The fish resources of the south coast basin are significant to the State of Oregon.

--Adequate streamflow throughout the year is necessary for the maintenance of aquatic life in the coastal streams.

--Low summer streamflow in many basin streams is one factor limiting production of salmonids.

Specific uses adopted for waters in the Coos River basin other than (1) the West Fork Millicoma drainage above Stall's Falls and (2) Glenn Creek are domestic, livestock, municipal, industrial, fire control, irrigation, agricultural, mining, power development, recreation, and fish and wildlife.

Water from the West Fork Millicoma and tributaries above Stall's Falls is restricted to municipal, domestic and livestock, irrigation of lawn and noncommercial garden (half-acre maximum), recreation, and fish and wildlife uses. Waters of Glenn Creek (East Fork Millicoma tributary) are classified only for domestic and livestock, irrigation of lawns and noncommercial gardens, fire control, recreation, and fish and wildlife uses. Minimum streamflows for 10 sites in the Coos River basin have been adopted (Table 2).

Coos County Comprehensive Plan

Land use is regulated at the state level by the Land Conservation and Development Commission (LCDC). Coos County's land-use plan has been acknowledged by LCDC as complying with statewide land-use goals. ODFW fish biologists in the Coos District were involved in the development of the county plan to promote protection of critical habitat and recognition of fish habitat needs.

Operating Principle 1. **Habitat protection and enhancement activities shall be carried out within the guidelines of the Department's Fish and Wildlife Habitat Protection Policy and the Habitat Management Goals of the Department's Anadromous Fish Management Plan.**

Table 2. Minimum perennial streamflows (cfs) established for selected streams in Coos basin.

	Oct 1-15/ 16-31	Nov 1-15/ 16-30	Dec	Jan	Feb	Mar	Apr	May	June 1-15/ 16-30	July	Aug	Sept 1-15/ 16-30
South Fork Coos River: at tidewater	100/150	150	150	150	150	150	150	150	100/40	40	30	30/40
Williams River: below Bottom Creek and maintained to mouth	80	90	90	90	90	90	90	90	60/30	30	15	15/20
Tioga creek: below Shotgun Creek and maintained to mouth	20/50	60	70	60	60	60	60	60	20/10	10	5	5
East Fork Millicoma River: above Matson Creek	12	40/60	60	60	60	60	60	60	20/10	10	5	5
East Fork Millicoma River: at mouth	50/150	150	150	130	130	130	130	130	80/20	20	15	15
West Fork Millicoma River: below Deer Creek	15/50	60	60	60	60	60	60	60	25/10	10	5	5
West Fork Millicoma River: at mouth	35/100	100	90	90	90	90	90	90	60/20	20	10	10
Daniels Creek: below Morgan Creek	12	15	15	15	15	15	15	15	10	3	3	3
Larson Creek: at tidewater	10/15	15	15	15	15	15	15	15	10	2	2	2
Palouse Creek: at tidewater	10/15	15	15	15	15	15	15	15	10	2	2	2

Operating Principle 2. **Habitat degradation potentially leading to losses of fish production shall be minimized or prevented throughout the Coos River system.**

Operating Principle 3. **The Department shall coordinate with appropriate land- and water-use management agencies on habitat protection and enhancement activities, and shall continue to act in an advisory role to such agencies to promote habitat protection.**

Operating Principle 4. **Coos County has an Estuary Management Plan, acknowledged by the Land Conservation and Development Commission. The Department's habitat management programs shall be consistent with the Estuary Plan. The Department recognizes that the acknowledged Coos Bay Estuary Management Plan regulates aquaculture activities as required by the Land Conservation and Development Commission. Where the Department has jurisdiction, the Department, therefore, shall consider only those commercial aquaculture facilities which are consistent with the local plan after appropriate jurisdiction has made such a determination.**

Objectives

Objective 1. **Protect estuarine and freshwater habitat.**

Assumptions and Rationale

1. High quality, diverse habitat is essential for optimum fish and shellfish production.

2. Species addressed in this plan require a variety of habitats in the estuary and in freshwater to complete all or parts of their life cycles.

3. The Coos estuary has been altered, and available habitat has been diminished by diking, filling, and other land-use practices.

4. Freshwater habitat has been lost through logging, road building, and other land-use practices.

5. Adequate, quality habitat is necessary in order to meet the management and production objectives for fish and shellfish in this basin.

6. Rock quarries operating on Fall Creek, Kentuck Creek, and the East Fork of the Millicoma River without adequate settling basins can cause turbidity and sediment problems in streams.

Problems and Recommended Actions

Problem 1. The public is not always aware of the needs for and benefits of good quality habitat.

Action 1.1 Develop an awareness among landowners and appropriate agencies of the benefit and need for maintaining good fish and shellfish habitat.

Problem 2. Agencies other than ODFW are responsible for regulating activities potentially detrimental to habitat and for enforcing habitat protection laws.

Action 2.1 Work with appropriate agencies and jurisdictions to insure adequate protection from land-use activities, and seek strict enforcement of habitat protection laws.

Action 2.2 Continue to review permits, carry out on-site inspections, and perform other such activities in order to assist other agencies in protecting habitat.

Action 2.3 Promote land-use practices that, in ODFWs judgment, would not degrade habitat.

Objective 2. Enhance and restore estuarine and tidewater habitat to meet the fish production and shellfish objectives for the Coos River system.

Assumptions and Rationale

1. Estuarine restoration and enhancement will benefit and increase natural production.

2. Opportunities exist for restoration and enhancement within the estuary.

3. Restoration and enhancement projects are necessary in order to meet production objectives for fish and shellfish in the basin.

4. High water quality is essential to maintain fish and shellfish production.

Problems and Recommended Actions

Problem 1. Habitat has been lost or reduced in productivity through construction of tidegates and dikes, and through filling activities.

Action 1.1 Work with appropriate agencies and landowners to restore areas by breaching dikes or by excavating.

Action 1.2 Identify and investigate defective and nonfunctional tidegates, and eliminate unnecessary ones.

Action 1.3 Investigate tidegate and fish passage structures through required mitigation actions or through planned restoration and enhancement programs.

Problem 2. Residential and commercial shoreline development can reduce the quantity and quality of estuarine habitat.

Action 2.1 Work with appropriate agencies and landowners to obtain adequate mitigation to replace habitat lost through development.

Action 2.2 Develop an awareness among landowners and agencies of the value of shoreline habitat for fish and wildlife.

Action 2.3 Encourage landowners to protect and restore streamside habitat through the Riparian Tax Incentive Program.

Problem 3. Tidal sections of the Coos, South Coos, and Millicoma rivers contain substantial amounts of debris from log dumping, handling, and storage.

Action 3.1 Work with the forest industry in the use of tidewater areas for log storage and transport to minimize effects from these activities.

Action 3.2 Work to reduce the amount of organic material that enters the water as a result of human activities.

Action 3.3 Work to reduce or eliminate log storage from intertidal areas and limit the amount of time logs can be stored in the water.

Action 3.4 Work with DEQ and other agencies to bring dissolved oxygen levels up to at least minimum standards in Isthmus Slough by identifying operational methods that reduce or eliminate this problem, and by bringing logging operators into compliance with the methods.

Problem 4. Current surveys of estuarine habitat are not adequate to identify habitat factors that limit production of the many species that use the estuary.

Action 4.1 Identify factors that limit production of estuarine species through a research program or updated estuarine habitat surveys.

Action 4.2 Develop an improved habitat survey method, and update estuarine habitat surveys for all areas that have not been surveyed since 1970.

Action 4.3 In coordination with other agencies, private groups, and private landowners, survey previously unsurveyed areas within the estuary.

Action 4.4 Using new and updated surveys, identify critical estuarine habitat areas and opportunities for habitat improvement projects.

Action 4.5 As funds become available, develop and carry out habitat projects within the estuary.

Problem 5. Abandoned structures in tidewater areas add debris to the water, restrict access for boat and bank anglers, and are a danger to boat anglers and others that are not aware of their existence or of their unsafe condition.

Action 5.1 Negotiate with USACE, DEQ, DSL, and private owners of abandoned structures to have unsafe ones removed.

Problem 6. Contaminants such as tributyltin (TBT) interfere with production of oysters and possibly other shellfish species.

Action 6.1 Work with other agencies to determine causes of contaminant pollution in Coos Bay.

Action 6.2 Coordinate the monitoring and research efforts of agencies studying the contaminant pollution problem in Coos Bay.

Action 6.3 Coordinate the control measures being taken to correct the TBT pollution problem in Coos Bay and monitor their effectiveness.

Action 6.4 Recommend to National Marine Fisheries Service that Coos Bay be included in a federal estuarine monitoring program such as National Status and Trends Program.

Problem 7. Commercial harvesting of oysters, clams, and mussels is occasionally restricted because of high fecal coliform counts.

Action 7.1 Encourage DEQ and Department of Health to monitor water quality, identify pollution sources, and reduce input of pollutants.

Action 7.2 Recommend to National Marine Fisheries Service that Coos Bay be included in a federal estuarine monitoring program such as National Status and Trends Program.

Objective 3. Restore and enhance freshwater habitat to meet the production objectives for fish species in the basin.

Assumptions and Rationale

1. Freshwater habitat restoration and enhancement will benefit and increase natural production.

2. Habitat improvement projects can be undertaken by ODFW (through STEP, in part), BLM, and ODF.

3. Restoration and enhancement projects are necessary in order to meet the production objectives for fish in the basin.

4. Removal of natural barriers will be guided by the ODFW barrier removal policy (Oregon Fish and Wildlife Commission 1986)

Problems and Recommended Actions

Problem 1. Current physical stream surveys do not adequately identify habitat factors limiting production of salmonids to allow evaluation of freshwater habitat enhancement needs.

Action 1.1 In coordination with BLM, other agencies, private groups, and private landowners, survey previously unsurveyed streams.

Action 1.2 Using new and updated surveys, identify basin-wide habitat improvement priorities and opportunities for habitat enhancement projects.

Problem 2. Habitat quantity and quality are less than adequate to meet salmonid production objectives.

Action 2.1 As funds become available, develop and carry out habitat improvement projects to solve identified habitat problems.

Action 2.2 Continue to work with BLM to develop an anadromous salmonid habitat overview.

Action 2.3 Encourage ODF and BLM to fund or undertake stream habitat enhancement projects and to continue projects through STEP using volunteer labor and materials.

Problem 3. Barriers, both man-made (e.g., culverts and logjams) and natural ones (e.g., falls and cascades) hinder fish passage.

Action 3.1 Provide or improve fish passage to habitat areas above natural barriers that are approved by the Director or by the Fish and Wildlife Commission. Priority areas are:

Fall Creek (South Coos River)
Henry's Falls (West Fork of the Millicoma River)

Action 3.2 Correct fish passage problems where caused by human activities such as logging and road building.

FALL CHINOOK SALMON

Background

Large numbers of native fall chinook salmon spawned and reared in the Coos River system in past history. Hatchery-reared fall chinook salmon have been released into the Coos River basin since 1900 and introductions of non-native stocks first occurred in 1927 when eggs from Columbia River stocks were raised and released from the Coos River Hatchery (Table 3). The population of fall chinook salmon were most likely heavily affected by a gillnet fishery until 1946 and by splash dams until 1957 and remained at a very low level during the early 1960s as indicated by spawning ground survey counts (Table 4). The spawning population probably numbered only a few hundred fish at that time.

Spawning ground survey counts indicate that abundance increased dramatically from the early 1970s to the early 1980s (Table 4) and stabilized at a high level relative to the 1950s and 1960s. Sub-yearling fall chinook salmon released into the Coos River basin from 1973 to 1975 included Elk and Chetco river stocks, releases in 1977 and 1979 included Alsea, Nestucca, and Trask river stocks (Table 5). The current population is considered to be a locally adapted stock because only those fish adapted to the system would have survived.

Early tag recovery data suggested that nearly 70% of the Coos River fall chinook salmon contributed to British Columbia. Anadromous Inc. and Oregon Aqua Foods released fall chinook salmon from the Coos Bay facilities that were identified as Coos River fall chinook salmon. However, these tag recoveries have been discounted because North Coast fall chinook salmon stocks were mixed into their releases. Ocean tag recovery data for local stocks from the 1983 through 1985 brood years have supported that fall chinook salmon from the Coos River system may contribute reasonably well to Oregon ocean fisheries. These broods contributed an average of 60% to Oregon fisheries. The balance of the fall chinook salmon are caught in California, Washington, British Columbia, and Alaska. Unfortunately the number of tag recoveries from the three brood years were few due to poor survival and additional marking studies are needed.

The present spawning escapement of adult fall chinook salmon is estimated to be about 4,300. Spawning occurs throughout the system from approximately 20 October to 10 December (Figure 2) with the peak usually occurring on 7 November. Spawning time is influenced by river flow. Approximately 60% of the naturally spawning fall chinook salmon occur in the South Fork of the Coos River, 30% in the East Fork of the Millicoma River, and 10% in the West Fork of the Millicoma River.

Anglers do not consider the stock of fall chinook salmon currently in the Coos River to be as high in food quality as the imported spring chinook salmon stock, but it does contribute to the recreational fishery (Table 6). It was construed that the stock of fall chinook salmon were of poor quality upon entering the upper estuary.

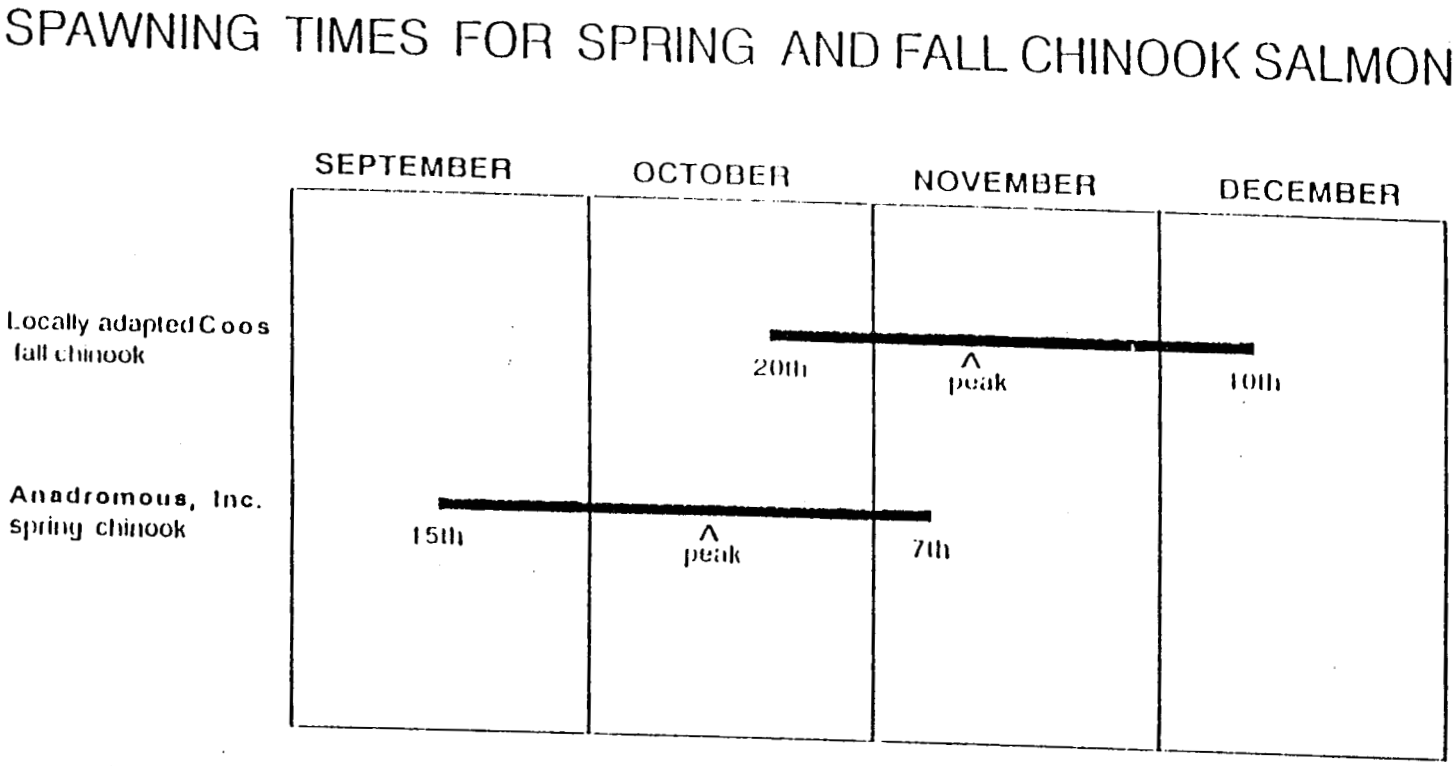

Figure 2. Spawning times of spring and fall chinook salmon in the Coos basin.

Table 3. Releases of fall chinook salmon into the Coos River basin from the Coos River Hatchery (includes fingerling and smolts), 1900-1958 brood years. All contributing stocks are local unless otherwise indicated.

Brood year	Release year	Number released	Brood year	Release year	Number released
1900	1901	470,000			
1901	1902	1,976,350	1931	1932	1,185,400
1902	1903	2,184,077	1932	1933	1,209,190
1903	1904	4,079,274	1933	1934	120,740
1904	1905	3,777,172	1934	1935	908,800
1905	1906	2,778,750	1935	1936	1,013,800
1906	1907	4,014,400	1936	1937	453,000
1907	1908	3,000,000	1937	1938	111,910
1908	1909	2,084,500	1938	1939	94,840
1909	1910	1,683,783	1939	1940	1,884,200
1910	1911	3,374,200	1940	1941	827,450
1911	1912	1,767,170	1941	1942	70,185
1912			1942	1943	101,760
1913			1943	1944	8,780
1914	1915	1,212,850	1944	1945	87,380
1915	1916	2,236,229	1945		
1916			1946		
1917	1918	1,208,840	1947[d]	1948	70,221
1918	1919	1,932,210	1948[d]	1949	292,356
1919	1920	976,600	1949[d]	1950	222,833
1920	1921	1,316,780	1950[d]	1951	131,031
1921	1922	2,174,290	1951[d]	1952	819,714
1922	1923	3,013,810	1952[d]	1953	503,753
1923	1924	5,913,050	1953[d]		
1924	1925	3,062,490	1954[d]		
1925	1926	3,065,800	1955[d]	1956	30,000
1926	1927	1,919,100	1956[d]	1957	70,319
1927[a]	1928	1,881,000	1957[d]	1958	98,995
1928[b]	1929	2,390,474	1958[e]	1959	106,650
1929[c]	1930	1,206,854			
1930	1931	468,400			

[a] local and Columbia River stocks
[b] local and U.S. stocks
[c] Bureau of Fisheries stocks
[d] Columbia River stocks
[e] Trask River stock

Table 4. Peak spawning ground counts of fall chinook salmon in portions of the Coos River system, 1961-89.

Year	South Coos River, Mainstem	South Coos River, Williams	West Fork Millicoma River
1961	2	0	6
1962	14	1	2
1963	4	3	2
1964	0	0	1
1965	4	0	2
1966	4	6	6
1967	3	0	7
1968	([a])	3	0
1969	3	5	8
1970	41	0	12
1971	23	0	43
1972	19	1	20
1973	([a])	0	22
1974	104	17	44
1975	39	52	26
1976	77	45	53
1977	94	78	27
1978	176	12	60
1979	129	94	59
1980	402	55	95
1981	147	59	8
1982	168	87	9
1983	([a])	([a])	9
1984[b]	29	18	1
1985	72	68	12
1986	134	50	7
1987	298	28	38
1988	160	68	28
1989	106	33	21

[a] Poor counting conditions--Water high and turbid during entire spawning period.
[b] Water too high for good counts during November.

Table 5. Releases of fall chinook salmon, 1972-88 brood years (includes fingerling and smolts).

Brood year	Release year	ODFW stock	ODFW releases	Private hatchery stock	Private hatchery releases
1972	1973	Elk & Chetco	844,760		
1973	1974	Elk & Chetco	1,094,143		
1974	1975	Elk & Chetco	536,350		
1977	1978			Alsea	160,000
1978	1979	local	25,476	local	19,319
1979	1980			Nestucca,Trask,Alsea	95,983
1980	1981	local	25,000	local, returns	216,812
1981	1982	local	25,000	local, returns	159,346
1982	1983	local	15,000	local, returns	311,261
1983	1984	local	67,426	local, returns	815,227
1984	1985	local	77,876	local, returns	1,029,000
1985	1986	local	153,031	local, returns	99,567
1986	1987	local	475,402	local, returns	0
1987	1988	local	1,800,000		
1988	1989	local			

Table 6. Recreational catch of fall chinook salmon in the Coos River basin[a], 1975-88.

Year	Estimated catch[b]
1975	199
1976	325
1977	387
1978	499
1979	369
1980	546
1981	421
1982	645
1983	307
1984	362
1985	628
1985	1944
1987	1541
1988	1936

[a] Includes Coos River and Bay, South Fork Coos, and Millicoma rivers.
[b] Catch estimates are derived from returned salmon-steelhead "tags", daily angler licenses, and ocean statistical creel sampling data.

Many in-river fisherman were fishing in October after some of the fall chinook salmon had been in the river for a period of two months. Good catches of high quality fall chinook salmon have been documented in recent years in September. In-river recreational fishing pressure has been increasing in recent years with the advent of a fall chinook salmon derby that is held each year.

Anadromous, Inc. released 20,000 to 1.03 million fall chinook salmon annually into the Coos River during 1978-86. Although Anadromous, Inc. used broodstock from the Coos, Nestucca, Alsea, and Trask river systems (Table 5), they were not able to harvest a high quality fall chinook salmon at return to their facility, and were discouraged with prospects of continuing with the current stock. Up until they discontinued their operation they wanted to incorporate a fall chinook salmon stock into their release program that entered their facility in a bright condition, and were interested in trying to find and develop a late-migrating, bright stock of fall chinook salmon to complement their spring chinook salmon program. Implementing a foreign stock would not be consistent with the new Wild Fish Management Policy unless they could assure that all of the fish would return to their facility.

Even though they have currently discontinued their operation, Anadromous Inc. has a permit to release up to 9.4 million spring and fall chinook salmon combined. Anadromous, Inc. considered developing and utilizing a bright segment of local fall chinook salmon stocks. These plans are now on hold since they are currently phasing out of ocean salmon ranching and are shifting their efforts to salmon farming. They were discouraged with the results of their operation and are planing to discontinue use of the facility at North Spit which is now up for sale. If the property and facility are purchased and the proprietors continue an ocean salmon ranching program, efforts must be taken to insure that the stock they utilize have a high degree of homing to minimize interaction with the local wild stock. If they are going to emphasize spring chinook salmon releases (as Anadromous, Inc. did) in the future, increased numbers of spring chinook salmon may stray upriver to spawn naturally, potentially changing the genetic character of locally adapted fall chinook salmon through interbreeding. Other possible effects of expanding the spring chinook salmon program are difficult to predict. Concerns include increased potential for diseases, competition for food and rearing areas, and attraction of predators to the system.

We believe that the Coos River basin has the potential to produce additional fall chinook salmon and is currently limited by spawning habitat rather than rearing habitat. The Coos River estuary is large and has been estimated to rear enough juveniles to produce as many as 38,000 returning spawners. In recent years effort has been put into developing a local broodstock of fall chinook salmon in the Coos River basin through the collection of wild adults and the release of hatchbox fry, presmolts, and smolts. All smolts have been released at Morgan Creek and Noble Creek in anticipation that they will return to provide future broodstock. However, 3-4 foot high gabions with traps incorporated are currently installed on the Coos River and the West Fork of the Millicoma River. These traps are used to collect broodstock for the fall chinook program. In addition, gravel-catching structures have been placed in streams to increase the amount of spawning habitat available to wild fall chinook salmon.

Management Considerations

We examined two management alternatives to achieve compliance with the Wild Fish Management Policy. Although historical programs with hatchery releases of foreign stocks and the strategy of widespread distribution of hatchery fish in recent programs would probably not be in compliance with the present Wild Fish Management Policy, we presented two alternatives that were in compliance with the present policy. Both alternatives called for modifications to the present operating program. Alternative 1 called for no hatchery influence and relied entirely on natural production and habitat enhancement to meet fishery needs. Under this alternative private, STEP, and ODFW fall chinook salmon hatcheries would have ceased production and releases.

Alternative 2 called for the same extensive natural production and habitat enhancement as Alternative 1 as well as an aggressive hatchery program conducted in such a way as to minimize the impact on the wild stock. The Commission adopted alternative 2 where the hatchery program would be conducted using the indigenous stock with regular infusion of wild stock into the program. Most releases of hatchery fish would be located in areas of the lower river to provide the highest levels of fishery benefits, and maintain a high degree of separation of natural spawning areas utilized by the wild stock.

Our intention with the direction of this plan is to enhance spawning areas for naturally spawning wild fish, increase summer habitat by increasing pool surface areas, and most importantly protecting and improving estuarine habitat. We will conduct this work in all areas accessible and suitable for production of wild fall chinook salmon.

Long-term hatchery programs with hatchbox fry, presmolts, and smolts will be modified and conducted only in selected lower river areas where natural production is now very low or non-existent. These programs will be maintained as direct supplementation to provide more fish for the ocean fisheries or target estuary or lower river fisheries with those fish escaping the fisheries homing to acclimation areas and not proceeding upstream in large numbers to natural spawning areas to compete with wild spawners. About 90% of the natural production occurs in the South Fork of the Coos River and the East Fork of the Millicoma River. These areas will be protected from hatchery releases of any kind. Areas where hatchery fish will be released include Noble Creek on Isthmus Slough, the Catching Slough area, Daniels Creek, and the West Fork of the Millicoma River. We will mark large numbers of hatchery fall chinook salmon as presmolts and smolts to measure homing and the level of straying to natural production areas on the South Fork of the Coos River and the East Fork of the Millicoma River. We will also investigate the possibility of developing acclimation ponds on other lower river streams to increase the number of hatchery fish available to ocean fisheries, bay fisheries, and lower estuary fisheries without adding more hatchery fish to natural spawning areas to mingle with the wild stock. Monitoring will be conducted of the benefits of these fish to fisheries and the ratio of wild to hatchery fish on the natural spawning areas. Programs that approach the limits of the Wild Fish Management Policy will be modified or reduced proportionately to maintain compliance with the policy.

Operating Principle 1. Fall chinook salmon in the Coos River basin shall be managed for wild fish. Hatchery releases shall be consistent with the Wild Fish Management Policy.

Operating Principle 2. Fall chinook salmon approved for the Coos River system is Coos River stock only.

Operating Principle 3. Wild stock will be incorporated in Department broodstock and rearing programs every year.

Operating Principle 4. Programs that approach the limits of the Wild Fish Management Policy shall be modified or reduced proportionately to maintain compliance with the policy.

Objectives

Objective 1. Maintain the existing estimated naturally produced spawning population of 4,500 to 9,000 locally adapted fall chinook salmon with a long-term target return of 38,000 adults back to the system from a combined program of wild and hatchery production.

Assumptions and Rationale

1. Wild fish will be protected by allowing in the South Fork of the Coos River and the East Fork of the Millicoma River the return of hatchery stocks to acclimation areas only with the upper river managed for wild fish only.

2. Interbreeding with indigenous and especially with non-indigenous hatchery stocks of fall chinook salmon may hold production of wild stocks below their potential, or alter the life history characteristics of the wild population.

3. The longer a fish is cultured, the less desirable it is to be naturally spawning with wild fish.

4. Rearing only naturally spawned fish for release as presmolts and smolts reduces problems of mating strategy, genetic drift, inbreeding, and selection for hatchery characteristics that may lead to competition and reduced productivity of wild stocks when they co-habit spawning grounds and rearing grounds.

5. Techniques of rearing must be well thought out and tested in trial programs to assure that they will be successful before committing large amounts of time, fish, and funds.

6. An enhancement program with presmolt and smolt releases of hatchery fall chinook salmon has the potential of producing impacts on the characteristics and productivity of the wild fall

chinook salmon and will be isolated at Nobel Creek, Isthmus slough, Catching slough area, Daniels Creek, the West Fork of the Millicoma River, and the aquaculture facility on North Spit.

7. The ocean exploitation rate may have a depressing effect on the spawning escapement of fall chinook salmon.

8. The Coos River estuary has the potential to produce substantially more fall chinook salmon.

9. Increased spawning habitat and stocking will increase use of estuarine rearing capacity.

10. Estimates of run size are based on spawning ground survey counts, information from returns of Salmon-Steelhead catch cards, and daily license returns. This may not provide accurate information on run size and catch estimates in the Coos River basin.

11. The production capacity of the Coos River system and overall habitat quality will remain at or above its present condition.

12. STEP volunteers shall play an essential role in maintaining the health and life history characteristics and in enhancing naturally produced fall chinook salmon in the system.

13. Maintenance of natural production will protect a wide range of life history characteristics.

14. Competition with introduced spring chinook salmon released at the Anadromous Inc. facility may be limiting fall chinook salmon.

15. Winter habitat may be limiting fall chinook salmon production in the basin.

Problems and Recommended Actions

Problem 1. The contribution to the Coos River recreational fishery as well as the ocean fishery contribution of Coos River fall chinook salmon stocks is not as large as desired.

Action 1.1 Increase hatchery production of fall chinook salmon utilizing Coos River stock.

Action 1.2 Utilize Morgan Creek, Daniels Creek, Noble Creek on Isthmus Slough, and the West Fork Millicoma River site as production facilities to increase the lower river fishery and to reduce the straying rates in upstream reaches.

Action 1.3 Mark sufficient numbers of hatchery fall chinook salmon to allow an evaluation of straying rates in this system and to allow assessment of the success of this programs contribution to the ocean fishery.

Action 1.4 Set up and implement spawning ground surveys to determine straying rates of hatchery stocks throughout the system.

Action 1.5 Set up and conduct creel surveys to evaluate the success of the fall chinook salmon hatchery releases in the lower river.

Problem 2. Survival rates of returning cultured fall chinook salmon are not as high as desired.

Action 2.1 Investigate such problems as: a) improper size at release, b) high harvest rates in the ocean, c) poor ocean conditions, d) poor general health of the fish, e) and genetic problems associated with the culturing of salmon.

Action 2.2 Continue efforts to reduce Bacterial Kidney Disease (BKD).

Action 2.3 Conduct annual infusions of wild fall chinook salmon stock into the hatchery programs.

Problem 3. Insufficient information is available on the abundance and distribution of fall chinook salmon in the Coos River basin.

Action 3.1 Improve and expand fall chinook salmon spawning ground surveys to obtain trends in escapement.

Action 3.2 Develop a method to accurately estimate escapement levels from spawning ground surveys.

Action 3.3 Work with the spawning survey coordinator to improve the spawning survey database.

Action 3.4 Expand the annual recruitment survey (juvenile seining) on the South fork of the Coos and Millicoma rivers to measure annual changes in the level of abundance of juvenile chinook salmon and long-term trends in natural production.

Action 3.5 Test the validity of procedures currently used to estimate recreational catch from catch cards, and if necessary, make improvements in the procedure.

Problem 4. The estuarine rearing capacity for fall chinook salmon has not been accurately assessed.

Action 4.1 Investigate methodology to determine the estuarine rearing capacity in Coos Bay for juvenile fall chinook salmon.

Problem 5. Insufficient information is available on the estuarine residence time of salmon released from the North Spit facility.

Action 5.1 Determine the residence time of hatchery salmonids in the Coos River estuary.

Problem 6. Spawning habitat is inadequate to seed rearing areas.

Action 6.1 Place structures in streams to collect gravel.

Problem 7. Natural production of fry from wild spawners is not expected to be adequate to fully seed rearing areas.

Action 7.1 Increase the production of juvenile fall chinook salmon through staged incremental releases of fry and presmolts, and evaluate increases in adults before moving to next higher increment.

Problem 8. Some stream areas need habitat improvement.

Action 8.1 All stream habitat shall be inventoried. Determine habitat problems and places for habitat improvement.

Action 8.2 Develop habitat projects in the river and its tributaries.

Action 8.3 Increase the amount of total rearing area available for the natural seeding of juvenile fall chinook salmon.

Action 8.4 Completed habitat improvement and enhancement projects shall be sampled to determine if juveniles from natural spawning begin to use these areas.

Action 8.5 Work with private groups and public agencies to protect freshwater fall chinook salmon habitat in the Coos River basin.

Objective 2. **Provide for an ocean harvest with a high contribution to Oregon and an in-river recreational harvest of up to 10% of the wild fall chinook salmon that return to the Coos River basin and provide for an increased ocean harvest with a high contribution to Oregon and a 25% in-river recreational harvest for the hatchery stocks in the basin.**

Assumptions and Rationale

1. Coos River stock contributes to ocean fisheries off Oregon but could be increased with the development of a local target fishery.

2. Harvest will be managed to provide adequate escapement for maximum sustained natural production.

3. We can estimate the run size based on spawning ground survey counts, information from returns of Salmon-Steelhead catch cards, and daily license returns. This may not provide accurate information on run size and catch estimates in the Coos River basin. These estimates are suspected of inflating the actual catch by 1.5 to 2.0 times.

Problems and Recommended Actions

Problem 1. Information on the contribution of hatchery fall chinook salmon to the Coos River recreational fishery is limited.

Action 1.1 Conduct creel surveys to estimate recreational catch, and use coded-wire-tag and scale analysis to evaluate private, STEP, ODFW, and wild contributions of fall chinook salmon to the system.

Problem 2. Over-harvesting of wild fall chinook salmon will be detrimental to the existence of this stock.

Action 2.1 If the in-river recreational harvest rate of wild fall chinook salmon becomes higher than 10% fishery restrictions will be considered.

Problem 3. Straying of hatchery fall chinook salmon is detrimental to the health of wild stocks.

Action 3.1 If straying rates in any of the major forks of the Coos River basin approach the limits of the Wild Fish Management Policy the hatchery program shall be modified to reduce the straying rates.

Action 3.2 If straying rates exceed the limits of the Wild Fish Management Policy reduce the hatchery production until adequate methods are found to reduce the hatchery influence in compliance with the Wild Fish Management Policy.

Objective 3. Assure that operation of the aquaculture facility on North Spit meets fishery management objectives and complies with Wild Fish Management Policy.

Assumptions and Rationale

1. A successful and compatible release program requires a high level of homing to assure compliance with Wild Fish Management Policy.

2. A successful release program for a private hatchery operation requires a late-migrating, bright stock for harvest.

3. Recreational anglers will harvest 10-20% of the fall chinook salmon adults that return to the North Spit facility in Coos Bay.

Problems and Recommended Actions

Problem 1. The private hatchery has been unable to obtain a high quality product on return to their facility.

Action 1.1 Investigate developing a broodstock of bright-returning fall chinook salmon from Coos River stock.

Problem 2. The private hatchery may have problems reaching a high rate of homing.

Action 2.1 Mark large numbers of juveniles that are released from the facility to evaluate homing and straying rates.

SPRING CHINOOK SALMON

Background

Spring chinook salmon may have been native to the Coos River basin based on hatchery records of chinook salmon broodstock (Table 7), but wild spring chinook have not been known to be present in recent years. However, some of the releases shown in Table 7 were non-native stock, especially the 1932 and 1934 broods. Furthermore, releases in other years may have been from early-returning fall chinook salmon.

Table 7. Releases of spring chinook salmon fingerlings from the Coos River Hatchery, 1925-34.

Brood year	Number released
1925	475,310
1926-29	0
1930	142,960
1931	269,128
1932	1,306,484
1933	0
1934	1,413,860

Rogue River spring chinook salmon were introduced to the Coos River basin starting with the 1978 brood year as transfers to private hatcheries on the North Spit (Anadromous, Inc. and Oregon Aqua-Foods). Since 1982, all releases of spring chinook salmon in Coos Bay have been with a stock from Rogue River and released by Anadromous, Inc. (Table 8).

Spring chinook salmon stray throughout the Coos River system and spawn naturally in some of the same areas as fall chinook salmon. A comparison of spawning times shows that there could be an overlap in spawning times of spring chinook salmon and locally adapted fall chinook salmon (Figure 2). However, spring chinook salmon may not survive to spawn in all years because of flow and temperature regimes during holding time in the Coos River system. Those spring chinook salmon that do stray upstream will be subjected to the natural selection process. Mortality of spawning adults and their offspring is expected to be high because they are not native to the Coos River system.

Anadromous, Inc. has a permit to release up to 9.4 million spring and fall chinook salmon combined. Until they decided to shift their operation to salmon farming and sell the North Spit facility, Anadromous, Inc. planned to continue their program with spring chinook salmon. However, they were somewhat discouraged with their return rates. If the property and facility are purchased and the proprietors continue an ocean salmon ranching program with spring chinook salmon, efforts must be taken to insure that their releases have a high degree of homing to minimize interaction with the local

wild stock of fall chinook salmon in the Coos River system and spring chinook salmon in the adjacent Coquille and Umpqua rivers.

Table 8. Releases of spring chinook salmon in Coos Bay by a private hatchery, brood years 1978-86.

Brood year	Contributing stock	Release year	Number released
1978[a]	Rogue	1979	510,000[b]
1979[a]	Rogue	1980	623,000[b]
1980	Rogue	1981	728,000
1981	Rogue and Anadromous, Inc. returns[c]	1982	93,000
1982	Rogue and Anadromous, Inc. returns[c]	1983	924,000
1983	Anadromous, Inc. returns	1984	1,159,000
1984	Anadromous, Inc. returns	1985	427,000[d]
1985	Anadromous, Inc. returns	1986	589,413[e]
1986	Anadromous, Inc. returns	1987	5,323,354[f]

[a] Eggs taken in brood years 1978 and 1979 were from later spawning fish. After 1979, eggs were taken over a longer period from all segments of the run.
[b] Figures combined for Oregon Aqua-Foods and Anadromous, Inc.
[c] Anadromous began collecting eggs from fish returning to their hatchery in 1981.
[d] This includes 57,908 fish liberated off-shore.
[e] This includes 236,296 fish liberated off-shore.
[f] This includes 28 ,753 fish liberated off-shore.

Management Considerations

Although historical programs with hatchery releases of foreign stocks and the strategy of widespread distribution of hatchery fish in recent programs would probably not be in compliance with the present Wild Fish Management Policy, we presented two alternatives that were in compliance with the present policy. Both alternatives called for modifications to the present operating program of the private hatchery facility on the North Spit. Alternative 1 called for ending the release program for spring chinook salmon. Alternative 2 called for a hatchery program with spring chinook salmon at the private hatchery facility on the North Spit to be conducted in such a way as to minimize straying and impacts on the wild stock of fall chinook salmon. The Commission adopted alternative 2 as long as the hatchery program can be conducted with a minimum of straying up the Coos River and to adjacent river basins. The private hatchery program would be maintained as direct supplementation to provide more fish for the ocean fisheries or a target recreational fishery in the Coos River estuary with those fish escaping the fisheries homing to the release site on North Spit and not proceeding upstream in large numbers to natural spawning areas to compete with fall chinook salmon. Monitoring must be conducted of the benefits of these fish to the

various fisheries and the ratio of wild to hatchery fish on the natural spawning areas. If the program approaches the limits of the Wild Fish Management Policy, it shall be modified or reduced proportionately to maintain compliance with the policy.

Operating Principle 1. **Spring chinook salmon shall be managed for hatchery fish consistent with the Wild Fish Management Policy.**

Operating Principle 2. **Releases from the private hatchery facility on North Spit shall be with a hatchery stock acceptable to the Department and consistent with the Department approved operating plan.**

Operating Principle 3. **Programs that approach the limits of the Wild Fish Management Policy shall be modified or reduced proportionately to maintain compliance with the policy.**

Objectives

Objective 1. **Assure that a spring chinook salmon program at the aquaculture facility on North Spit complies with Wild Fish Management Policy.**

Assumptions and Rationale

1. The private hatchery on North Spit may expand its program up to a release level of 5.0 million spring chinook salmon after an evaluation of straying is completed and then ultimately to a level of 9.4 million.

2. If straying occurs at an unacceptable level, the releases of hatchery spring chinook salmon will be reduced.

3. The large run of spring chinook salmon may change the ecological balance of the system and have impacts on other desirable species.

4. The spring chinook salmon released by a private hatchery on North Spit contribute to Oregon's ocean fisheries, and a desirable recreational fishery has developed along North Spit as a result of the program. We expect a 10 to 20% recreational harvest to continue.

Problems and Recommended Actions

Problem 1. The effects of a large population of spring chinook salmon in Coos Bay on other desirable species or races are unknown.

Action 1.1 Require funding from any operator of the private hatchery on the North Spit to fund, design, and implement a study approved by the ODFW to evaluate effects of releases of spring chinook salmon on other

desirable species or races in the Coos River basin as well as the Coquille and Umpqua river basins.

Action 1.2 Implement spring chinook salmon pool count surveys to determine the number of returning stray adults to this system.

Action 1.3 Investigate the feasibility of using the traps at the gabions on the Coos and West Fork of the Millicoma rivers to enumerate the number and timing of spring chinook salmon strays moving above tidewater into the tributaries.

Problem 2. Insufficient information exists on the extent of the fishery contribution of spring chinook salmon released by the private hatchery facility on North Spit.

Action 2.1 Require the operator of the private hatchery on North Spit to mark a large percentage of spring chinook salmon specified in the evaluation program to determine the contribution to in-river fisheries.

Problem 3. Returning adult spring chinook salmon that stray could interbreed with local Coquille and Umpqua river stocks of spring and fall chinook salmon which pose risks of negative effects of natural production.

Action 3.1 Require the private hatchery facility on the North Spit to mark a large percentage of spring chinook salmon specified in the evaluation program to allow identification of stray spawners out of the system.

Action 3.2 Enforce private aquaculture's compliance with the guidelines for the number of strays that will be acceptable in adjacent river systems and modify or reduce their releases of spring chinook salmon to reduce straying as necessary.

COHO SALMON

Background

The Coos River system has always supported a substantial population of wild coho salmon. The coho salmon population in the Coos River system was probably heavily affected by a gillnet fishery until 1946 and by splash dams until 1957. However, coho salmon were probably not as severely affected as chinook salmon by splash dams because of their widespread use of small tributary streams for spawning and rearing. Currently, the number of coho salmon is affected by habitat quality, annual variations in freshwater and ocean conditions, and by harvest regulations. The quality of habitat in the Coos River system varies from poor to excellent depending on land-use patterns. Factors such as summer streamflow, temperature, amount of cover, and water withdrawal have all influenced the natural production of coho salmon.

Spawning occurs throughout the system from mid-November through January. Peak spawning normally occurs in December with some fish spawning as late as February in years with low rainfall.

Spawning ground surveys have been conducted in the Coos River system since the 1950s. Counts on these surveys vary considerably, but a gradual decline in the counts is apparent (Table 9). This decline is similar to the decline in escapement of coho salmon that has occurred coastwide in Oregon (McGie 1985). The Statewide Coho Salmon Management Plan established an interim natural spawning escapement goal for coastal rivers of 29 adult fish per mile of stream. The 5-year average on Oregon Production Index (OPI) surveys in the Coos River system was 33 adults/mile with the 1985 counts at 42.3 adults/mile.

The current average population of naturally-produced coho salmon is estimated to be about 9,000 fish. We have no reasonable method to determine the historical population levels of coho salmon in the Coos River basin. An update and analysis of biological and physical stream inventories can best indicate the escapement needed to fully seed the habitat.

Although many different stocks of coho salmon have been released into the Coos River system, the current spawning population is considered to be composed of a high percentage of locally adapted stock. Scale analysis showed that approximately 82% of the spawners in the Coos River system were wild fish in 1985 (Mullarkey 1986), even though returns to Anadromous, Inc. were large that year. Maintenance of the wild stock is a biological necessity to insure long-term stability of both naturally and artificially produced runs.

Hatchery coho salmon have been released into the Coos River system in large numbers since the early 1900s. Introduction of non-native stocks of coho salmon first occurred in 1933 during operation of the Coos River Hatchery (Table 10). Private hatcheries (Oregon-Aqua Foods and Anadromous, Inc.) used non-local stocks to begin their release programs of coho salmon in Coos Bay starting in 1976 (Table 11). Stocks from Puget Sound dominated the releases until 1980 because eggs from local Oregon stocks were not available in large quantities.

Table 9. Summary of peak spawning ground counts for coho salmon in the Coos system.

Year	East Fork Millicoma		West Fork Millicoma		South Fork Coos				Coos Bay		
	Matsen	Marlow	Totton	Vaughn Mill	Big	Daniels	Morgan	Williams	Kentuck	Larson	Palouse
1958	3	0	3	3	14	5	2	--	5	19	30
1959	6	3	8	29	--	13	10	--	7	63	25
1960	1	4	5	10	7	4	10	--	29	47	70
1961	0	46	13	90	13	10	8	--	18	192	64
1962	13	27	8	37	15	21	25	4	14	129	56
1963	8	7	23	30	10	14	26	--	15	53	68
1964	130	43	35	43	0	20	26	30	17	52	39
1965	49	16	42	80	19	19	7	18	8	28	32
1966	38	6	25	37	16	20	7	12	10	50	62
1967	33	6	34	69	11	20	21	5	8	53	53
1968	24	6	43	63	21	13	16	3	2	26	29
1969	16	3	38	29	31	60	16	9	3	45	64
1970	83	4	20	39	7	4	16	--	2	35	37
1971	21	33	36	155	13	20	25	2	0	18	27
1972	7	19	12	65	19	6	18	0	2	53	34
1973	0	24	46	43	9	4	6	0	0	58	35
1974	8	22	9	47	3	12	15	0	4	103	84
1975	4	12	8	14	10	4	6	0	0	79	19
1976	--	1	10	--	--	--	24	--	--	82	31
1977	--	3	2	--	1	--	--	--	--	43	34
1978	--	12	36	8	2	4	5	10	--	29	27
1979	--	8	5	--	3	10	2	--	--	50	33
1980	--	7	0	--	5	12	10	0	--	92	46
1981	--	20	3	1	3	7	0	0	--	20	67
1982	--	42	--	--	--	18	8	--	--	95	--
1983	0	20	2	15	3	9	4	--	--	5	31
1984	30	40	3	25	4	21	--	--	--	11	41
1985	35	26	18	18	13	54	--	--	--	21	57
1986	15	11	6	14	8	28	--	--	--	28	85
1987	5	18	16	4	13	25	--	--	--	47	20
1988	--	13	--	--	--	24	--	--	--	91	27
1989	--	11	--	--	--	45	--	--	--	24	49

Table 10. Releases of coho salmon from the Coos River Hatchery (includes fingerling, fry and smolts), 1908-1958 brood years. Contributing stocks are local unless otherwise indicated.

Brood year	Release year	Number released
1908	--	1,032,000
1909		
1910		
1911	1912	2,317,370
1912		
1913		
1914	1915	1,551,645
1915	1916	2,492,217
1916	--	--
1917	1918	1,193,960
1918	1919	2,416,680
1919	--	--
1920	1921	2,423,530
1921	1922	1,636,420
1922	1923	2,869,610
1923	1924	1,237,950
1924	1925	1,736,600
1925	1926	3,237,854
1926	1927	2,193,320
1927	1928	1,467,200
1928	1929	2,597,520
1929	1930	774,500
1930	1931	1,849,575
1931	1932	1,529,495
1932	1933	1,631,520
1933[a]	1934	1,156,310
1934[b]	1935	1,479,600
1935	1936	4,162,525
1936	1937	3,194,035
1937	1938	8,855,400
1938	1939	1,278,410
1939	1940	2,921,460
1940	1941	4,226,285
1941	1942	2,993,410
1942	1943	565,538
1943	1944	2,059,310
1944	1945	1,358,925
1945[c]	1946	261,228
1946	Mar 1948	9,840
1947[d]	1948	551,119
1948[d]	1949	480,564
1949[d]	1950	185,504
1950	1951	451,770
1951	1952	518,359
1952	1953	146,416
1953	1954	229,304
1954	1955	213,788
1955	Feb 1957	136,216
1956	1957	587,707
1957	1958	1,027,496
1958[e]	Feb 1960	108,489

[a] Local and Necanicum stocks.
[b] Tenmile stock.
[c] Local, Coquille, and Klaskanine stocks.
[d] Local and Klaskanine stocks.
[e] Local and Alsea stocks.

Table 11. Releases of coho salmon by Anadromous, Inc. and Oregon Aqua-Foods, Inc. in Coos Bay, 1976-1989.

Release year	Contributing stock	Number released
1976	Puget Sound[a]	980,959
1977	Puget Sound, Oregon Coast[b], Anadromous returns	994,642
1978	Puget Sound, Anadromous returns	609,729
1979	Puget Sound, Anadromous returns	1,179,186
1980	Puget Sound, Wash. Coast[c], Oregon Coast, Anadromous, & Ore. Aqua returns	6,991,510
1981	Puget Sound, Wash. Coast, Oregon Coast, Anadromous & Ore. Aqua returns	11,769,369
1982	Rogue River, Anadromous, Ore. Aqua & Domsea returns	2,457,714
1983	Anadromous & Ore. Aqua returns	1,340,780
1984	Anadromous & Ore. Aqua returns	2,272,216
1985	Anadromous & Ore. Aqua returns	4,249,336
1986	returns	3,071,128
1987	returns	477,114
1988	returns	1,090,339
1989	returns	1,980,207

[a] Puget Sound stocks included Skagit River, Green River, Puyallup River, and Skykomish River.
[b] Included Fall Creek (Alsea River).
[c] Included the Elwha River.

Private hatchery stocks in Coos Bay have been gradually cross-bred with the local stock of coho salmon since 1980. ODFW used local stock for its smolt and presmolt programs in the Coos River basin (Table 12).

Table 12. Releases of coho salmon by ODFW in Coos River basin, 1983-89.

Brood year	Release year	Rearing site	Number released	Release site	Size
1981	1983	Alf Nelson's pond	15,000	Catching Slough	smolt
1982	1983	Morgan Creek	17,000	Fall Creek	presmolt
		Morgan Creek	17,000	Elk Creek	presmolt
		Morgan Creek	17,000	Tioga Creek	presmolt
		Morgan Creek	1,000	Willanch Creek	presmolt
1983	1985	Morgan Creek	17,000	Morgan Creek	smolt
		Alf Nelson's pond	7,000	Catching Slough	smolt
1984	1985	Morgan Creek	23,400	Elk Creek	presmolt
		Morgan Creek	30,600	Fall Creek	presmolt
		Morgan Creek	5,000	Winchester Creek	presmolt
		Morgan Creek	25,000	Tioga Creek	presmolt
	1986	Butte Falls Hatchery	67,718	Morgan Creek	smolt
1985	1986	Morgan Creek	5,500	Fall Creek	presmolt
	1987	Butte Falls Hatchery	11,398	Morgan Creek	smolt
1986	1987	Morgan Creek	124,843	Fall Creek	presmolt
	1988	Morgan Creek	3,000	Morgan Creek	smolt
	1988	Butte Falls Hatchery	32,101	Morgan Creek	smolt
	1988	OIMB	3,933	OIMB	smolt
1987	1989	Butte Falls Hatchery	85,083	Morgan Creek	smolt
	1989	OIMB	3,642	OIMB	smolt
	1989	Morgan Creek	0	Morgan Creek	---

Local coho salmon stocks for all releases from hatcheries in the Coos River system will be utilized now that approved local stocks are available. Anadromous, Inc. considered utilizing local stocks, though currently they are phasing out of ocean salmon ranching and are shifting their efforts to salmon farming. They are discouraged with their results and are planing to discontinue use of the facility at North Spit which is up for sale. If the property and facility are purchased and the proprietors continue an ocean salmon ranching program, efforts must be taken to insure that the stock they utilize have a high degree of homing to minimize interaction with the local stock.

A limited recreational fishery for coho salmon has occurred in the tidal portions of the South Coos, Coos, and Millicoma rivers for many years. The catch has ranged from fewer than 10 to more than 500 fish in the years prior to large returns of private hatchery coho salmon (Table 13). A large recreational fishery developed in 1982 in lower Coos Bay in the vicinity of the private hatchery ladders on North Spit. The recreational catch of 2,438 coho salmon (over 24 inches) in 1982 for the Coos River system was nearly 10

times the average catch of 274 fish for the previous 7-year period. The lower bay fishery for coho salmon will continue to occur as long as the facility on the North Spit is in operation and releasing coho salmon. The magnitude of the fishery will vary considerably from year to year depending on the magnitude of returns.

Table 13. Estimated recreational catch of coho salmon in the Coos basin[a], 1975-88.

Year	Catch[b]
1975	424
1976	622
1977	180
1978	146
1979	21
1980	232
1981	290
1982	2,438
1983	578
1984	709
1985	2158
1986	6885
1987	1067
1988	421

[a] Includes Coos River and Bay, South Fork Coos, and Millicoma rivers.
[b] Catch estimates are derived from returned salmon-steelhead tags, daily angler licenses, and ocean statistical creel sampling data.

Management Considerations

We examined two management alternatives to achieve compliance with the Wild Fish Management Policy. Although historical programs with hatchery releases of foreign stocks and the strategy of widespread distribution of hatchery fish in recent programs would probably not be in compliance with the present Wild Fish Management Policy, we presented two alternatives that were in compliance with the present policy. Both alternatives called for modifications to the present operating program and use of local stock. Alternative 1 called for no hatchery influence and relied entirely on natural production and habitat enhancement to meet fishery needs. Under this alternative private, STEP, and ODFW coho salmon hatcheries would have ceased production. Alternative 2 called for the same extensive natural production and habitat enhancement as Alternative 1 as well as an aggressive hatchery program conducted in such a way as to minimize the impact on the wild stock. The Commission adopted alternative 2 where the hatchery program would be

conducted using the indigenous stock with regular infusion of wild stock into the program. Most releases of hatchery fish will be located in areas of the lower river to provide the highest levels of fishery benefits, and maintain a high degree of separation of natural spawning areas utilized by the wild stock.

Our intention with the direction of this plan is to enhance spawning areas for naturally spawning wild fish, increase summer habitat by increasing pool surface areas, and most importantly increase the amount of winter habitat to increase the number of over-wintering juveniles available to become smolts by providing structural complexity in pool areas. We will conduct this work in all stream areas accessible and suitable for production of wild coho salmon. Long-term hatchery programs with hatchbox fry, presmolts, and smolts will be modified and conducted only in selected lower river areas where natural production is now very low or non-existent. These programs will be maintained as direct supplementation to provide more fish for the ocean fisheries or target estuary or lower river fisheries with those fish escaping the fisheries homing to acclimation areas and not proceeding upstream in large numbers to natural spawning areas to compete with wild spawners. Areas where this would occur are Noble Creek on Isthmus Slough, Catching Slough area, and other areas where acclimation pond sites might be developed in the estuarine area. All are within several miles of the mouth of the Coos River and long distances from upstream wild spawning areas. We will also investigate the possibility of developing acclimation ponds on other lower river streams to increase the number of hatchery fish available to ocean fisheries, bay fisheries, and lower estuary fisheries without adding more hatchery fish to natural spawning areas. Monitoring will be conducted of the benefits of these fish to fisheries and the ratio of wild to hatchery fish on the natural spawning areas. Programs that approach the limits of the Wild Fish Management Policy will be modified or reduced proportionately to maintain compliance with the policy.

Operating Principle 1. **The Coos River basin shall be managed for wild fish with hatchery releases consistent with the Wild Fish Management Policy.**

Operating Principle 2. **Coho salmon approved for the Coos River system are Coos River Stock only.**

Operating Principle 3. **Programs that approach the limits of the Wild Fish Management Policy shall be modified or reduced proportionately to maintain compliance with the policy.**

Operating Principle 4. **Wild stock shall be incorporated in broodstock and rearing programs every year.**

Objectives

Objective 1. **Increase the existing estimated natural spawning population of 9,000 locally-adapted coho salmon to a minimum return level of 11,256 adult coho salmon and increase the population above this level where the production capacity of present or enhanced habitat allows in the Coos River basin with a long-term goal of 20,000 adults back to the system from a continued program of wild and hatchery production.**

Assumptions and Rationale

1. A major private hatchery program exists and will persist in the Coos River system, but they will only be permitted to use local stock.

2. The proportion of hatchery strays in the spawning population is currently 15-20%.

3. Wild fish will be protected by allowing the return of hatchery stocks to the lower river only, with the upper river managed for wild fish only.

4. Coos River stock contributes to ocean fisheries off Oregon.

5. Interbreeding with indigenous and especially with non-indigenous hatchery stocks of coho salmon may hold production of wild stocks below their potential, or alter the life history characteristics of the wild population.

6. The longer a fish is cultured, the less desirable it is to be naturally spawning with wild fish.

7. Rearing only naturally spawned fish for release as presmolts and smolts reduces problems of mating strategy, genetic drift, inbreeding, and selection for hatchery characteristics that may lead to competition and reduced productivity of wild stocks when they co-habitat spawning grounds and rearing areas.

8. Techniques of rearing must be well thought out and tested in trial programs to assure that they will be successful before committing large amounts of time, fish, and funds.

9. An enhancement program with presmolt and smolt releases of hatchery coho salmon has the potential of producing impacts on the characteristics and productivity of the wild coho salmon and shall be isolated at Nobel Creek on Isthmus Slough, the Catching Slough area, and the aquaculture facility on North Spit. We are uncertain about homing and straying levels to the aquaculture facility located on North Spit.

10. The run size of coho salmon in the Coos River basin is lower than the level specified in the Statewide Coho Salmon Management Plan.

11. Ocean exploitation rate may having a depressing effect on the spawning escapement of coho salmon.

12. Estimates of run size are based on spawning ground survey counts, information from returns of Salmon-Steelhead catch cards, and daily license returns. This may not provide accurate information on run size and catch estimates in the Coos River basin.

13. The production capacity of the Coos River system and overall habitat quality will remain at or above its present condition.

14. STEP volunteers shall play an essential role in maintaining the health and life history characteristics and in enhancing naturally produced fall chinook salmon in the system.

15. Maintenance of natural production will protect a wide range of life history characteristics.

16. Winter habitat may be limiting coho salmon production in the basin.

Problems and Recommended Actions

Problem 1. Private hatchery strays could reduce the natural production of the local Coos River stock through competition or interbreeding.

Action 1.1 Encourage private aquaculture to continue their coho program in Coos Bay with releases that comply with the Wild Fish Management Policy under the condition that they use only the locally adapted stock.

Action 1.2 Require any operator of the private hatchery on North Spit to mark a large percentage of their coho salmon to allow identification of strays.

Action 1.3 Improve and expand spawning fish surveys for coho salmon to determine potential impacts of stray hatchery fish.

Problem 2. Insufficient information is available on the abundance and distribution of coho salmon in the Coos River basin.

Action 2.1 Improve and expand coho salmon spawning ground surveys to obtain trends in escapement.

Action 2.2 Develop a method to accurately estimate escapement levels from spawning ground surveys.

Action 2.3 Work with the spawning survey coordinator to improve the spawning survey database.

Action 2.4 Test the validity of procedures currently used to estimate recreational catch from catch cards, and if necessary, make improvements in the procedure.

Problem 3. The production capacity of the Coos River system for coho salmon and factors that limit production have not been determined.

Action 3.1 Conduct biological and physical surveys to identify coho salmon limiting factors.

Action 3.2 Combine physical-biological survey information and limiting factors analysis developed by ODFW Research Section and USFWS.

Action 3.3 Determine the production capacity of current coho salmon habitat.

Action 3.4 Design habitat projects and fish stocking programs based on the physical-biological surveys, limiting factor analysis, and production capacity assessment of habitat in the Coos River basin.

Problem 4. Escapement goals for coho salmon are not being consistently met in the Coos River basin.

Action 4.1 Implement a large scale inventory program to determine coho salmon habitat parameters.

Action 4.2 Initiate a habitat improvement project to increase the natural production in the basin.

Action 4.3 Investigate methodology to determine the rearing capacity in the Coos River system for juvenile coho salmon.

Action 4.4 Develop methods to accurately estimate adult escapement levels form spawning ground surveys.

Action 4.5 Conduct creel surveys to estimate the recreational catch. Utilize adipose fin clips, coded-wire-tags, and scale analysis to evaluate coho salmon contributions to the fishery.

Action 4.6 Continued escapement is inadequate therefor we recommend actions to increase escapement i.e., reductions in the in river fishery.

Problem 5. Some stream areas need habitat improvement.

Action 5.1 All stream habitat shall be inventoried. Determine habitat problems and places for habitat improvement.

Action 5.2 Develop habitat projects in the river and its tributaries.

Action 5.3 Increase the amount of rearing area available for the natural seeding of juvenile coho salmon.

Action 5.4 Completed habitat improvement and enhancement projects shall be sampled to determine if juveniles from natural spawning begin to use these areas.

Action 5.5 Work with private groups and public agencies to protect freshwater coho salmon habitat in the Coos River basin.

Objective 2. Provide for an ocean harvest with a high contribution to Oregon and an in-river recreational harvest of 10% of the wild coho salmon that return to the Coos River basin and provide for an ocean harvest with a high contribution to Oregon and an in-river recreational harvest of 30% of the hatchery coho salmon that return to the Coos River basin.

Assumptions and Rationale

1. Harvest will be managed to insure adequate escapement for maximum sustained natural production.

2. We can estimate the run size based on spawning ground survey counts, information from returns of Salmon-Steelhead catch cards, and daily license returns. This may not provide accurate information on run size and catch estimates in the Coos River basin. These estimates are suspected of inflating the actual catch by 1.5 to 2.0 times.

Problems and Recommended Actions

Problem 1. Information on the contribution of hatchery coho salmon to the Coos River recreational fishery is limited.

Action 1.1 Conduct creel surveys to estimate recreational catch, and use coded-wire-tag and scale analysis to evaluate private, STEP, ODFW, and wild contributions of coho salmon to the system.

Problem 2. Over-harvesting of the wild coho salmon will be detrimental to the existence of this stock.

Action 2.1 If the in-river recreational harvest rate of coho salmon becomes higher then 10% fishery restrictions should be considered.

Problem 3. Straying of hatchery coho salmon is detrimental to the health of wild stocks.

Action 3.1 If straying rates in any of the major forks of the Coos River basin approach the limits of the Wild Fish Management Policy the hatchery program shall be modified to reduce the straying rates.

Action 3.2 If straying rates exceed the limits of the Wild Fish Management Policy curtail the hatchery production until adequate methods are found to reduce the hatchery influence in compliance with the Wild Fish Management Policy.

Objective 3. Assure that operation of the aquaculture facility on North Spit meets fishery management objectives and complies with Wild Fish Management Policy.

Assumptions and Rationale

1. The proportion of hatchery strays in the spawning population is 15-20%.

2. Past releases of coho salmon by Anadromous, Inc. have resulted in the development of a desirable recreational fishery on North Spit.

3. Recreational anglers will harvest 10-20% of the coho salmon adults that return to the North Spit facility in Coos Bay.

4. A study in the Alsea River documented a harvest rate of 11.4% (Tolmsoff 1971).

Problems and Recommended Actions

Problem 1. The proportion of hatchery strays from the private hatchery facility on North Spit may become too large if the number of fish released increases.

Action 1.1 Reduce the number of smolts released from the North Spit aquaculture facility.

Action 1.2 A large number of coho salmon released at the North Spit aquaculture facility shall be adipose fin clipped and coded-wire-tagged to facilitate straying rate studies.

Action 1.3 Improve and expand spawning fish surveys for coho salmon to determine potential impacts of stray hatchery fish.

CHUM SALMON

Background

The Coos River basin is on the extreme southern range of the distribution for chum salmon, and because of unknown limiting factors, chum salmon may never be more than a remnant population in the basin. In the period 1928 to 1945, commercial catch of chum salmon fluctuated widely, but ranged from a high of 5,894 pounds (approximately 556 fish) in 1928 to a low of 7 pounds (1 fish) in 1945 (Cleaver 1951). At the same time, and even until the 1950s, the chum salmon catch was high in streams of the north coast of Oregon, particularly Tillamook Bay.

No chum salmon were ever raised or released from the Coos River Hatchery. Currently, two private hatcheries in the Coos River basin have permits to release chum salmon (Anadromous, Inc., 20.4 million and Cal Heckard, 5.0 million). Release programs so far have been mostly unsuccessful (Table 14). For example, the large release in 1979 by Oregon Aqua-foods yielded a return of fewer than 10 fish. Eighteen fish returned to Cal Heckard's facility in 1986.

Table 14. Releases of chum salmon from Oregon Aqua-foods (1979) and Cal Heckard (1983-1985) in the Coos River basin.

Brood year	Stock	Release year	Number released
1978	Sahkalin (Russian)	1979	8,212,354
1982	Whiskey Creek	1983	350,000
1983	Whiskey Creek	1984	140,000
1984	Coos River	1985	4,000

Juveniles rear for a very short time (1 to 4 weeks) in fresh and estuarine water before migrating to the ocean in the spring. In the ocean chum salmon feed on planktonic food sources. They have a wider ranging ocean distribution than other Pacific salmon.

Chum salmon return to spawn primarily as 3- and 4-year-old fish and occasionally as 5-year-old fish. Chum salmon return to the Coos River basin from October through January (Cleaver 1951). The spawning distribution of chum salmon includes tidewater areas. A small, natural run of a few pairs of fish appear in Marlow Creek in most years, and an occasional chum salmon appears in Morgan and Daniels creeks. We do not know if these fish represent a small, self-sustaining run or are strays.

Management Considerations

We examined only one management strategy which will be implemented to achieve compliance with the Wild Fish Management Policy. This management strategy calls for no hatchery influence and relies entirely on natural production and habitat enhancement. Under this alternative private, STEP, and ODFW hatcheries will not produce any chum salmon.

Our intention with the direction of this plan is to enhance spawning areas for naturally spawning wild fish in any lower river tributaries where chum salmon occur. We will conduct this work in all stream areas accessible and suitable for production of wild chum salmon.

Operating Principle 1. Chum salmon shall be managed for wild fish consistent with the Wild Fish Management Policy. Hatchery fish shall not be released within the basin.

Objectives

Objective 1. Manage chum salmon through habitat restoration for a target return level of 500 wild adults.

Assumptions and Rationale

1. Information on abundance, distribution, behavior, and life history patterns of chum salmon in the Coos River basin are limited.

2. The run size of chum salmon in the Coos River basin is very low.

3. Habitat enhancement and restoration is needed in order to increase the population of chum salmon.

4. The chum salmon present in the Coos River system are assumed to be local stock.

5. Efforts to enhance the local wild stock through habitat protection and improvement, if undertaken and if successful, would not have adverse effects on other desired species by creating competition for food or estuarine rearing space, or from competition for spawning area.

6. No artificial supplementation shall occur.

Problems and Recommended Actions

Problem 1. Information on spawning, distribution, and abundance of adult and juvenile chum salmon is limited.

Action 1.1 Continue to monitor chum salmon spawning in lower Marlow Creek and other tidewater tributaries where they may be found.

Action 1.2 Monitor juvenile populations in tidewater portions of the Coos River to determine annual recruitment.

Problem 2. Restoration possibilities exist, but the chum salmon population is so low that abundant natural spawning populations may never be regained.

Action 2.1 Implement a comprehensive program to identify and restore all spawning areas that chum salmon currently use.

Action 2.2 Place structures in streams to collect gravel.

Problem 3. The estuarine rearing capacity for chum salmon has not been accurately assessed.

Action 3.1 Investigate methodology to determine the use of the Coos River estuary by juvenile chum salmon.

WINTER STEELHEAD

Background

Winter steelhead are native to the Coos River system. Steelhead exhibit a broad range of life history types, spending 1 to 4 years in fresh water and an additional 1 to 4 years in the ocean. Spawning occurs throughout the system, from late December to June. A small portion of the run (3% to 10%) makes a second and occasionally a third spawning migration. The only knowledge of steelhead spawning habitat in the basin has been the observation of steelhead in coho salmon spawning survey areas. Maintenance of the wild stock is a biological necessity to insure long-term stability of both naturally and artificially produced runs.

As is the case with salmon, steelhead were affected by a gillnet fishery until 1946 (Cleaver 1951) and splash dams until the 1957. The commercial gillnet fishery took an estimated average of 4,400 adult steelhead annually in the 1920s and 1930s. Splash dams created barriers to migration to spawning areas. Steelhead were also subjected to the secondary results of the splash dams--sluicing of gravel and stream structure and a general degradation of rearing habitat.

The Coos River basin is currently thought to be capable of producing a wild winter steelhead run of 5,000 to 6,000 fish. The wild steelhead stock has been supplemented with hatchery releases since 1925. Between 1924 and 1958, the Coos River steelhead stock was propagated at the hatchery on South Coos River and released as fingerling (2 to 4 inches) into the South Coos River. Numbers released ranged between 10,000 and nearly 2.2 million (Table 15). Beginning in 1970, Alsea River stock steelhead were reared to full-term smolt (1+ age) at the Alsea River Hatchery for release in the Coos River. Since 1976, releases have totaled more than 100,000 fish annually at a size of about 6 fish/lb. Since 1976, smolt allocation for Coos River basin has been divided among the South Coos River and the East and West forks of the Millicoma River and, since 1980, Palouse and Larson creeks (Table 15). In addition, STEP has released Alsea stock steelhead fry from hatchboxes since 1981 and has also released native and backcrossed (hatchery x wild parents) presmolts above barriers.

Adult wild and hatchery steelhead are caught primarily in a freshwater recreational fishery. Recreational catch (estimated from salmon-steelhead "tags") has ranged from 300 to 3,300 annually (Table 16). We have no estimate of angler effort on steelhead. Although the steelhead population has been supplemented for the last 15 years with releases of hatchery smolts, records show no increase in recreational catch in the South Coos River. No information is available to document whether this is due to a limited fishery, decline in water quality, or replacement of wild fish with hatchery fish. The Millicoma River appears to have responded to stocking with increased catch (Table 16).

Access on the South Coos River is limited because much of the river is behind a locked gate on private land. However, it is generally open to the public on weekends and holidays when Weyerhaeuser is not hauling logs. When open, 25 miles of river are available for fishing. Although the South Coos River is often not fishable because of high levels of turbidity, it does

Table 15. Releases of winter steelhead into the Coos Basin (includes presmolts and smolts).

Contributing stock	Release year	Release site (river)	Number released	Size
Coos	1925	S. Coos	490,800	--
"	1926	"	252,800	--
"	1927	"	209,000	--
"	1928	"	258,900	--
"	1929	"	612,400	3.0 in.
"	1930	"	665,400	2.5 in.
"	1931	"	707,500	2.0 in.
"	1932	"	656,700	4.0 in.
"	1933	"	854,100	3.0 in.
"	1934	"	892,900	2.0 in.
"	1936	"	1,839,800	2.0 in.
"	1937	"	2,117,800	2.0 in.
"	1938	"	108,800	3.0 in.
"	1939	"	1,751,000	2.5 in.
"	1940	"	1,852,800	3.0 in.
"	1941	"	2,165,600	2.0 in.
"	1942	"	1,640,200	2.0 in.
Coos-Coquille	1943	"	219,800	2.0 in.
Coos	1944	"	219,800	2.5 in.
"	1945	"	847,800	2.0 in.
"	1946	"	218,200	2.0 in.
"	1948	"	155,000	33/lb.
"	1956	"	29,500	19.0/lb.
"	1957	"	26,000	172.0/lb.
Alsea	1958	"	20,980	81.0/lb.
Coos	1958	"	10,000	684.0/lb.
Siletz	1959	"	21,932	6.9/lb.
N. Umpqua	1960	"	17,490	15.8/lb.
"	1961	"	20,620	28.8/lb.
Alsea	1970	W.F. Millicoma (tr. Coos)	39,954	7.1/lb.
"	1971	"	49,746	6.6/lb.
"	1972	"	64,910	7.0/lb.
"	1973	"	75,863	6.9/lb.
"	1974	"	85,897	9.1/lb.
"	1975	"	96,124	6.3/lb.
"	1976	"	50,028	6.2/lb.
"	1976	S. Coos	58,951	4.1-4.9/lb.
	1976 Total		108,979	

Table 15. Continued.

Contributing stock	Release year	Release site (river)	Number released	Size
Alsea	1977	W.F. Millicoma	54,812	6.2-6.9/lb.
"	1977	S. Coos	47,918	6.0/lb.
	1977 Total		102,730	
"	1978	W.F. Millicoma	51,930	5.5/lb.
"	1978	S. Coos	56,872	5.3/lb.
	1978 Total		108,802	
"	1979	W.F. Millicoma	51,532	7.3-7.6/lb.
"	1979	S. Coos	53,994	7.1-7.3/lb.
	1979 Total		105,526	
"	1980	E.F. Millicoma	25,058	6.5/lb.
"	1980	Larson Cr.	12,542	6.4/lb.
"	1980	Palouse Cr.	12,539	6.5/lb.
"	1980	W.F. Millicoma	35,153	6.5-6.7/lb.
"	1980	S. Coos	33,065	6.6/lb.
	1980 Total		118,357	
"	1981	Larson Cr.	12,466	6.4-6.9/lb.
"	1981	Palouse Cr.	12,490	6.4-6.b/lb.
"	1981	E.F. Millicoma	24,983	6.6/lb.
"	1981	W.F. Millicoma	25,322	5.6/lb.
"	1981	Cox Cr. (S. Coos)	49,903	5.9/lb.
	1981 Total		125,164	
"	1982	Palouse Cr.	10,232	5.3.lb.
"	1982	Larson Cr.	10,229	5.3/lb.
"	1982	W.F. Millicoma	24,795	5.3/lb.
"	1982	E.F. Millicoma	25,089	5.1/lb.
"	1982	S. Coos	39,556	5.1/lb.
	1982 Total		109,901	
"	1983	W.F. Millicoma	24,597	5.8/lb.
"	1983	E.F. Millicoma	8,903	5.9/lb.
"	1983	S. Coos	49,911	4.9-6.0/lb.
"	1983	Larson Cr.	11,928	5.5/lb.
"	1983	Palouse Cr.	11,879	5.5/lb.
	1983 Total		107,578	

Table 15. Continued.

Contributing stock	Release year	Release site (river)	Number released	Size
Alsea	1984	S. Coos	39,440	5.4/lb.
"	1984	W.F. Millicoma	34,774	5.3-5.9/lb.
"	1984	Larson Cr.	7,496	5.2/lb.
"	1984	Palouse Cr.	7,470	5.2/lb.
"	1984	E.F. Millicoma	24,974	5.4/lb.
	1984 Total		114,154	
"	1985	S. Coos	40,090	5.7-6.2/lb.
"	1985	W.F. Millicoma	34,751	6.0-6.2/lb.
"	1985	E.F. Millicoma	25,127	6.1-6.2/lb.
"	1985	Larson Cr.	7,444	5.7/lb.
"	1985	Palouse Cr.	7,522	5.7/lb.
	1985 Total		114,934	
"	1986	S. Coos	36,849	5.7-6.2/lb.
"	1986	W.F. Millicoma	43,373	4.9-5.0/lb.
"	1986	E.F. Millicoma	25,001	5.3/lb.
"	1986	Larson Cr.	7,500	5.3/lb.
"	1986	Palouse Cr.	7,500	5.3/lb.
	1986 Total		120,223	
"	1987	S. Coos	35,000	5.9-6.1/lb.
"	1987	W.F. Millicoma	40,268	5.9/lb.
"	1987	E.F. Millicoma	24,750	5.9-6.0/lb.
"	1987	Larson Cr.	7,625	6.1/lb.
"	1987	Palouse Cr.	7,381	6.1/lb.
	1987 Total		115,024	
Alsea/Coquille	1988	S. Coos	37,278	
Coquille	1988	W.F. Millicoma	39,728	
Coquille	1988	E.F. Millicoma	24,916	
Alsea	1988	Larson Cr.	7,530	
Alsea	1988	Palouse Cr.	7,508	
	1988 Total		116,960	

Table 15. Continued.

Contributing stock	Release year	Release site (river)	Number released	Size
Alsea/Coquille	1989	S. Coos	40,484	
Coquille	1989	W.F. Millicoma	34,359	
Coquille	1989	E.F. Millicoma	24,929	
Alsea	1989	Larson Cr.	5,155	
Alsea	1989	Palouse Cr.	4,878	
Coos	1989	Morgan Cr.	4,500	
	1989		114,309	

Table 16. Releases and catch of winter steelhead in the Coos Basin[a].

Number of smolts stocked (2 years prior to year of catch)[b]	Year of catch	Catch (punchcard estimate) S. Coos	Millicoma	Both	Adult catch[c] / Smolt released (X 100)
	1964	1,000	500	1,500	
	1965	700	600	1,300	
	1966	1,600	600	2,200	
	1967	700	400	1,100	
	1968	600	200	800	
	1969	600	400	1,000	
	1970	400	200	600	
	1971	800	600	1,400	
39,954	1972	1,000	1,000	2,000	5.0
49,746	1973	500	1,200	1,700	3.4
64,910	1974	600	1,600	2,200	3.4
75,863	1975	1,200	1,200	2,400	3.2
85,897	1976	700	900	1,600	1.9
96,124	1977	600	400	1,000	1.0
108,979	1978	1,400	1,900	3,300	3.0
102,669	1979	1,000	1,300	2,300	2.2
108,802	1980	1,400	1,100	2,500	2.3
105,526	1981	1,000	1,100	2,100	2.0
93,276	1982	300	600	900	1.0
110,208	1983	100	200	300	0.3
89,440	1984	500	500	1,000	1.1
83,771	1985	2,800	2,200	5,000	6.0
99,188	1986	900	1,000	1,900	1.9
99,968	1987	900	800	1,700	1.7
105,223	1988	600	800	1,400	1.3

[a] Except Palouse and Larson creeks.
[b] Assumes the majority of the run each year are 2-salt fish.
[c] Indicates percent return to the fishermen, assuming the majority of fish caught were from the hatchery release.

provide excellent fishing when conditions are favorable. Sections of the West Fork of the Millicoma River are accessible at any time, but private land ownership along the East Fork of the Millicoma River restricts fishing opportunities. The West Fork of the Millicoma River as good water quality and is fishable a large portion of the time. Water quality in the East Fork of the Millicoma River is not as good as that in the West Fork of the Millicoma River is, but it is considerably better than that in the South Coos River. Releases were made in Palouse and Larson creeks because these systems have good water quality and are closer to Coos Bay and North Bend than other steelhead streams in this area. Access was good when the program was started, but could become limited if private landowners choose to close off their lands.

Management Considerations

We examined two management alternatives to achieve compliance with the Wild Fish Management Policy. Although historical programs with hatchery releases of foreign stocks and the strategy of widespread distribution of hatchery fish in recent programs were probably not in compliance with the present Wild Fish Management Policy, we presented two alternatives that were in compliance with the present policy. Both alternatives called for modifications to the present operating program. Alternative 1 called for no hatchery influence and relied entirely on natural production and habitat enhancement to meet fishery needs. Under this alternative private, STEP, and ODFW steelhead hatchery releases would be ended. Alternative 2 called for the same extensive natural production and habitat enhancement as Alternative 1 as well as an aggressive hatchery program conducted in such a way as to minimize the impact on the wild stock. The Commission adopted alternative 2 where the hatchery program will be conducted using the indigenous stock with regular infusion of wild stock into the program. Most releases of hatchery fish will be located in freshwater areas of the lower parts of the three main rivers to provide the highest levels of fishery benefits and maintain a high degree of separation of natural spawning areas utilized by the wild stock. This will be achieved with acclimation ponds with hatchery fish contributing to the recreational fishery in the river below the release site, and then turning into the acclimation area rather than proceeding upstream to mingle with the wild fish on natural spawning areas.

Our intention with the direction of this plan is to enhance spawning areas for naturally spawning wild fish, increase summer habitat by increasing pool surface areas, and most importantly increase the amount of winter habitat to increase the number of over-wintering juveniles available to become smolts by providing structural complexity in pool areas. We will conduct this work in all stream areas accessible and suitable for production of wild steelhead. Long-term hatchery programs with hatchbox fry, presmolts, and smolts will be modified with releases only at acclimation sites in selected lower river areas where natural production is now very low or non-existent. These programs will be maintained as direct supplementation to provide more fish for target tidewater and lower river fisheries. This program relies on a high degree of homing. Areas where acclimation ponds could be constructed include the Scout Cabin on the West Fork Millicoma River, Nesika Park on the East Fork Millicoma River, Big Creek on the South Fork of the Coos River, and Bolin Creek a tributary of Palouse Creek in tidewater. All are within several miles of the mouth of the Coos River and long distances from upstream wild spawning areas.

We will also investigate the possibility of developing acclimation ponds on other lower river streams to increase the number of hatchery fish available to fisheries without adding more hatchery fish to natural spawning areas. Monitoring will be conducted of the benefits of these fish to fisheries and the ratio of wild to hatchery fish on the natural spawning areas. Programs that approach the limits of the Wild Fish Management Policy shall be modified or reduced proportionately to maintain compliance with the policy.

Operating Principle 1. **Steelhead in the Coos River basin shall be managed for wild fish. Hatchery releases shall be consistent with the Wild Fish Management Policy.**

Operating Principle 2. **Only the locally adapted stocks will be used for enhancement. Alsea stock and the Coos-Coquille "regional" stock shall be phased out.**

Operating Principle 3. **Wild stock shall be incorporated in Department broodstock and rearing programs every year.**

Operation Principle 4. **Programs that approach the limits of the Wild Fish Management Policy shall be modified or reduced proportionately to maintain compliance with the policy.**

Objectives

Objective 1. **Increase the existing estimated natural spawning population of locally-adapted steelhead to a minimum return level of 6,000 adults and increase the population above this level where the production capacity of present or enhanced habitat allows in the Coos River basin. Utilize supplementation with hatchery releases of locally adapted stock to increase the in-river sport fishery.**

Assumptions and Rationale

1. Wild fish will be protected by allowing the return of hatchery stocks to the lower river only, with upper river areas managed for wild fish only.

2. Life history characteristics are heritable and the potential exists for hatchery programs to change these characteristics.

3. Interbreeding with indigenous and especially with non-indigenous hatchery stocks of steelhead may hold production of wild stocks below their potential, or alter the life history characteristics of the wild population.

4. The longer a fish is cultured, the less desirable it is to be naturally spawning with wild fish.

5. Rearing only naturally spawned fish for release as presmolts and smolts reduces problems of mating strategy, genetic drift, inbreeding, and selection for hatchery characteristics that may lead to competition and reduced productivity of wild stocks when they co-habit spawning grounds and rearing grounds.

6. Techniques of rearing must be well thought out and tested in trial programs to assure that they will be successful before committing large amounts of time, fish, and funds.

7. An enhancement program with presmolt and smolt releases of hatchery steelhead has the potential of producing impacts on the characteristics and productivity of the wild steelhead when they mingle.

8. The run size of steelhead in the Coos River basin is less than capacity.

9. The current habitat of the Coos River system has the capacity to produce 5,000-6,000 adult winter steelhead.

10. Estimates of run size are based on spawning ground survey counts, information from returns of Salmon-Steelhead catch cards, and daily license returns. This may not provide accurate information on steelhead run size and catch estimates in the Coos River basin.

11. The production capacity of the Coos River system and overall habitat quality will remain at or above its present condition.

12. Competition between hatchery and wild juveniles has the potential to reduce productivity or alter the life history characteristics of the wild population.

13. STEP volunteers shall play an essential role in maintaining the health and life history characteristics and in enhancing naturally produced fall chinook salmon in the system.

14. Maintenance of natural production will protect a wide range of life history characteristics.

15. Winter habitat may be limiting steelhead production in the basin.

Problems and Recommended Actions

Problem 1. The demand for improved fishing and increased catches in the Coos River basin is large.

Action 1.1 Increase hatchery production of steelhead utilizing approved stocks.

Action 1.2 Develop acclimation and release sites in the lower parts of the three main rivers as production facilities to increase the lower river fishery and to reduce the straying rates in upstream reaches.

Action 1.3 Mark all hatchery steelhead to allow an evaluation of straying rates in this system and to allow assessment of the success of this programs contribution to the fishery.

Action 1.4 Monitor the hatchery and wild origin of steelhead in lower and upper river areas to determine straying rates of hatchery stocks throughout the system.

Action 1.5 Set up and conduct creel surveys to evaluate the success of the steelhead hatchery releases in the lower river.

Problem 2. Survival rates of returning cultured steelhead need to be increased.

Action 2.1 Investigate such problems as: a) improper size at release, b) poor ocean conditions, c) poor general health of the fish, d) and genetic problems associated with the culturing of steelhead.

Action 2.2 Continue efforts to reduce Bacterial Kidney Disease (BKD).

Action 2.3 Conduct annual infusions of wild steelhead stock into the hatchery programs.

Problem 3. The life history characteristics of steelhead in the Coos River basin are not well documented.

Action 3.1 Determine the age-specific patterns of rearing and migration of juvenile steelhead, including smolts.

Action 3.2 Continue to collect and interpret scale samples from the fishery and adults.

Action 3.3 Determine the timing of river entry, in-river holding patterns, and distribution and timing of spawning

Problem 4. Insufficient information is available on the abundance and distribution of steelhead in the Coos River basin.

Action 4.1 Improve and expand steelhead spawning ground surveys to obtain trends in escapement.

Action 4.2 Develop a method to accurately estimate escapement levels of spawning steelhead.

Action 4.3 Expand the annual recruitment survey (juvenile seining) on the South Coos and Millicoma rivers to measure annual changes in the level of abundance of juvenile steelhead and long-term trends in natural production.

Action 4.4 Test the validity of procedures currently used to estimate recreational catch from catch cards, and if necessary, make improvements in the procedure.

Problem 5. The capacity of the Coos River system to produce steelhead has not been quantified, and factors that limit production have not been assessed.

Action 5.1 Encourage research on a method for estimating the carrying capacity for, and the abundance of juvenile steelhead in the Coos River system.

Action 5.2 Encourage research on factors that limit production of steelhead in freshwater.

Action 5.3 Conduct physical stream inventories to identify limiting factors and estimate carrying capacity.

Problem 6. Some stream areas need habitat improvement.

Action 6.1 All stream habitat shall be inventoried. Determine habitat problems and places for habitat improvement.

Action 6.2 Develop habitat projects in the river and its Management tributaries.

Action 6.3 Increase the amount of total rearing area available for the natural seeding of juvenile steelhead.

Action 6.4 Completed habitat improvement and enhancement projects shall be sampled to determine if juveniles from natural spawning begin to use these areas.

Action 6.5 Work with private groups and public agencies to protect freshwater steelhead habitat in the Coos River basin.

Objective 2. Maintain an average harvest of 2,000 adult winter steelhead in the Coos River basin as measured by analysis of the salmon-steelhead catch card data.

Assumptions and Rationale

1. Harvest will be managed to adequate escapement for maximum sustained natural production.

2. We can estimate the run size based on spawning ground survey counts, information from returns of Salmon-Steelhead catch cards, and daily license returns. This may not provide accurate information on run size and catch estimates in the Coos River basin. These estimates are suspected of inflating the actual catch by 1.5 to 2.0 times.

3. Harvest over the past 10 years has averaged 2,000 with a range of 300-3,300 fish. An average harvest of 2,000 with a range of 1,500-2,500 or 1,000-3,000 would produce a more stable success rate for the fishery.

4. In recent years the wild steelhead population has contributed an average of 560 fish to the harvest. This leaves a harvest of 1,440 fish to be made up with a hatchery program. Given a 6% survival rate and a 24% exploitation rate, a release program of 100,000 smolts should achieve the objective.

5. Development of sufficient locally adapted broodstock to fill the smolt allocation to the Coos River is restricted by availability of wild stock for capture and the space available to rear the smolts as a separate stock group at existing hatcheries.

6. Increased harvest may occur from increased survival of the 100,000 smolts, from increased wild stock production, from increased access to the river, or from improved water quality.

Problems and Recommended Actions

Problem 1. The fishery on the South Coos River has not responded to hatchery supplementation as well as it has responded on other district streams.

Action 1.1 Further evaluate the South Coos River fishery to determine why catch is so low in most years.

Action 1.2 Continue to monitor the hatchery and wild components of catch in each stream in order to evaluate the catch relative to supplementation.

Problem 2. No effort data or angler preference and satisfaction information exists for the recreational fishery on steelhead.

Action 2.1 Determine angler origin, preference for different steelhead recreational opportunities, and preferred attributes of local streams, and use this information to develop quantifiable recreational fishery objectives for each local stream.

Problem 3. Information on the contribution of hatchery steelhead to the Coos River recreational fishery is limited.

Action 3.1 Conduct creel surveys to estimate recreational catch, and use coded-wire-tag and scale analysis to evaluate private, STEP, ODFW, and wild contributions of steelhead to the system.

Problem 4. Over-harvesting of the wild steelhead will be detrimental to the existence of this stock.

Action 4.1 If the harvest rate of wild steelhead becomes higher than 15% the fishery will be restricted.

Problem 5. Straying of hatchery steelhead is detrimental to the health of wild stocks.

Action 5.1 If straying rates in any of the major forks of the Coos River basin approach the limits of the Wild Fish Management Policy, the hatchery program shall be modified to reduce the straying rates.

Action 5.2 If straying rates exceed the limits of the Wild Fish Management Policy curtail the hatchery production until adequate methods are found to reduce the hatchery influence in compliance with the Wild Fish Management Policy.

CUTTHROAT TROUT

Background

Resident and anadromous cutthroat trout are native to the Coos River system. Cutthroat trout are widely distributed throughout the freshwater and estuarine portions of the drainage and also occur above natural barriers to migration. Cutthroat trout in the Coos River drainage may exhibit three life history patterns: a) anadromous behavior; b) potamodrous - same migration behavior as anadromous cutthroat trout - except these cutthroat trout do not enter the sea; c) populations which are non-migratory (some of which are isolated) resident populations of cutthroat trout in the headwaters (Trotter, 1989). Anadromous cutthroat trout spend 1 to 4 years in fresh water and an additional 1 to 3 years in movement to and from the ocean. Spawning occurs from late December to June, and a portion of the population makes a second, third, and occasionally a fourth spawning migration.

Cutthroat trout were not affected by the historical gillnet fishery. Anadromous cutthroat trout occurred where the gill nets were fished but their small size allowed them to pass through the nets. Splash dams undoubtedly created barriers to upstream migration. Cutthroat trout were also subjected to loss of habitat from the sluicing of gravel and loss of rearing habitat associated with logging and splash dam activity.

The information base for cutthroat trout in the Coos River basin is extremely poor. The Coos River basin is currently thought to be capable of producing 4,000 to 5,000 wild anadromous cutthroat trout. The estimated population of the resident population is 1,000 to 2,000 fish. Spawning is assumed to occur throughout the drainage, but specific spawning areas are not well known because spawning adults are rarely observed. We know that both anadromous and resident cutthroat trout usually use smaller streams for spawning and rearing than those used by salmon or steelhead. In addition, cutthroat trout occur in all salmon and steelhead streams. Maintaining the health of the wild population requires protecting the genetic diversity and adaptiveness of the subpopulations within the basin, avoiding reduction in the distribution of the species within the basin and maintaining the multiple age distribution of the stock.

Wild cutthroat trout have been supplemented with hatchery releases. Beginning in the 1950s, cutthroat trout from Coquille River stock were released in the Coos River system. Fishery biologists at that time increased the distribution of cutthroat trout by releasing fingerlings above barriers. From 1975 to 1984 legal-sized Alsea River cutthroat trout were planted in the Coos River system. All stocking of trout in streams in the basin ended in 1985.

The historical release of legal-sized cutthroat trout generated short-term fisheries in the spring of the year and also contributed to a fishery for sea-run cutthroat trout in the upper estuary and in the lower Coos and Millicoma rivers. The fishery for searun cutthroat trout occurs from July through October. We do not know what contribution these releases made to this fishery because hatchery-to-wild ratios were not determined.

Management Considerations

We examined only one management strategy for cutthroat trout. At the present time we believe cutthroat trout are best managed as a wild population with no hatchery influence. We will rely entirely on natural production and habitat enhancement to meet fishery needs. Our intentions with the direction of this plan is to enhance spawning and rearing areas for naturally produced wild fish. This will be done by improving the structural complexity in pool areas, increasing summer habitat by enlarging pool surface areas, and increasing the amount of winter habitat available for juveniles. We will conduct this work in all stream areas suitable for production of wild cutthroat trout. In addition to the lower river areas, we will set aside some streams expressly for cutthroat trout and protect them from enhancement of other species.

Operating Principle 1. **Cutthroat trout shall be managed for wild fish consistent with the Wild Fish Management Policy. Hatchery fish shall not be released within the basin.**

Objectives

Objective 1. **Maintain a return level that will allow a self sustaining population of 4,000 to 5,000 cutthroat trout and continue to provide angling opportunity for sea-run and resident cutthroat trout while attempting to increase the wild population through habitat improvement.**

Assumptions and Rationale

1. Information on abundance, distribution, and life history patterns of cutthroat trout is limited.

2. Habitat protection is essential for small streams in the basin to protect the various subpopulations which may or may not be isolated.

3. No artificial supplementation of the population will occur.

4. There are resident cutthroat trout populations isolated above barriers to migration that may be genetically distinct.

5. Habitat enhancement for cutthroat trout is needed in order to increase the wild population.

Problems and Recommended Actions

Problem 1. Populations of native resident cutthroat trout may be adversely affected if other species, especially anadromous salmonids, are introduced or enhanced where the cutthroat trout occur.

Action 1.1 Do not release anadromous salmonids above barriers where resident cutthroat trout populations occur with the exception of fall creek on the South Fork of the

Coos River where native cutthroat did not exist or were eliminated by some natural event such as a forest fire.

Action 1.2 Set aside and protect certain native wild cutthroat trout areas from enhancement and introductions of other species, especially certain tributaries of the estuary that may be suitable for sea-run cutthroat trout.

Problem 2. Information on the life histories, ecology, habitat, genetics, abundance, limiting factors, location of catch, homing abilities, and other aspects of cutthroat trout are limited.

Action 2.1 Encourage research on the genetics, life history, ecology, and behavior of the native cutthroat trout.

Action 2.2 Set up and conduct sampling programs to determine population parameter of the cutthroat trout population (i.e., electroshocking, creel checks, and surveys).

Action 2.3 Develop and implement a program to study the genetic characteristics of isolated populations of resident cutthroat trout, especially those above barriers, to determine the genetic relationships to stocks in other rivers.

Problem 3. Some stream areas need habitat improvement.

Action 3.1 Inventory all stream habitat to determine problems with habitat and to determine areas to perform habitat improvement projects.

Action 3.2 Determine and map habitat types utilized by cutthroat trout.

Action 3.3 Develop habitat improvement projects in the river and tributaries.

Action 3.4 Evaluate habitat improvement projects to determine if naturally spawning juveniles begin to use these areas.

Problem 4. The extent of the cutthroat trout fishery is unknown.

Action 4.1 Collect information concerning the resident cutthroat trout fishery during the beginning of trout season in the spring.

Action 4.2 Collect information concerning anadromous cutthroat trout during the late summer and fall periods.

Problem 5. Resident cutthroat trout populations tend to have lower numbers of catchable sized fish compared to historical populations.

Action 5.1 Investigate the effectiveness of various regulation changes and the structural complexity of stream habitat as factors in altering the size distribution of the trout.

Objective 2. Increase our understanding of cutthroat trout populations.

Assumptions and Rationale

1. Information on abundance, distribution, and life history patterns of cutthroat trout are limited.

Problems and Recommended Actions

Problem 1. Information on the life histories, ecology, habitat, genetics, abundance, limiting factors, location of catch, homing abilities, and other aspects of cutthroat trout are not adequate to conduct a management programs.

Action 1.1 Encourage research on the genetics, life history, ecology, and behavior of the native cutthroat trout.

Action 1.2 Set up and conduct sampling programs to determine population parameter of the cutthroat trout population (i.e., electroshocking, creel checks, and surveys).

Action 1.3 Develop and implement a program to study the genetic characteristics of isolated populations of resident cutthroat trout, especially those above barriers, to determine the genetic relationships to stocks in other rivers.

BROOK TROUT

Background

The only known population of brook trout in the Coos River system is in the Matson Creek drainage above Hewett Falls. Historic information on the introduction of brook trout into the Coos River system was not found in annual reports that date back to 1955. We know, however, that brook trout were introduced in the Matson Creek drainage prior to 1959. Although these fish have not been supplemented by artificial propagation since the mid-1950s, they still remain a viable population.

A limited sampling program was conducted for brook trout in Matson Creek below and above Hewett Falls on one occasion in July and one occasion in October 1986. Juvenile steelhead, coho salmon, and yearling cutthroat trout were caught below the falls, and approximately 50 cutthroat trout and 4 brook trout were caught above the falls during each sampling period. Brook trout ranged from 3 to 12 inches, which indicates a reproducing population.

Brook trout was the only species of recreational value present above Hewett Falls before cutthroat trout were introduced in the mid-1950s. The exact year that cutthroat trout were introduced is unknown.

This little-known population of brook trout provides a recreational fishery to a small group of anglers. These fish rarely exceed 12 inches in length.

This brook trout population is in an area of Matson Creek that is bordered in its entirety by private land, and as such the public has restricted access.

Operating Principle 1. **Brook trout shall be managed consistent with the Natural Production Policy.**

Objectives

Objective 1. **Maintain the production potential, genetic integrity, and size diversity of the brook trout population in Matson Creek while maintaining a recreational fishery on the population.**

Assumptions and Rationale

1. The current population is maintained by natural production.

2. Brook trout will probably not spread throughout the Coos River system, but they could be displaced by the resident cutthroat trout or by other introduced fish.

3. Habitat quality will be maintained or improved in the area where brook trout occur.

4. The current fishery on the population is not great enough to influence it.

Problems and Recommended Actions

Problem 1. Brook trout could be displaced by cutthroat trout where they both occur in Matson Creek.

Action 1.1 Do not introduce any fish species into the habitat where brook trout exist in the Matson Creek drainage.

Problem 2. Information is limited on brook trout and their ecosystem in the Matson Creek drainage.

Action 2.1 Conduct an inventory of fish species, relative abundance, and distribution in Matson Creek above Hewett Falls.

STRIPED BASS

Background

Striped bass, which are native to the Atlantic and Gulf coasts of the United States, were first introduced to the Pacific Coast in the late 1800s when 432 yearling fish were released into San Francisco Bay. The first striped bass appeared in Coos Bay in 1914 when two adult fish were caught in a gill net by Alfred Justrom, a commercial fisherman. Since 1914, reproducing populations of striped bass have become established in the Coos, Coquille, Umpqua, Smith, and Siuslaw estuaries. Striped bass have been found in the Columbia River and as far north as Barkley Sound, British Columbia.

The striped bass population in Coos Bay expanded rapidly after 1914, and by the mid-1920s a commercial fishery had become established and a recreational fishery was developing. The largest commercial landings of striped bass occurred in the 1940s with a total of 231,000 pounds landed in 1945 (Table 17). During more recent times, most of the commercial catch of striped bass occurred incidentally in gillnet fisheries for American shad. Striped bass became a "game fish" in 1973 as a result of legislative action. Restrictions on the legal size and breaking strength of gill nets in the American shad fishery after 1973 were designed to "minimize" the incidental catch of striped bass. Further action by the 1975 Oregon legislature prohibited any commercial landings of stripers.

Striped bass have added substantially to the diversity of recreational angling opportunities in the Coos Bay area. These are available at times of year when salmonid species are not available and in areas of the bay, such as Isthmus and Catching sloughs, where no other fisheries exist. The recreational fishery for striped bass has fluctuated over the years with fluctuations in population level. The very successful spawn of stripers in 1940 produced an abundance of adults throughout the 1940s (McGie and Mullen 1979). A joint Fish Commission-Game Commission report (Morgan and Gerlach 1950) recorded a recreational catch of 7,168 striped bass weighing 60,928 pounds during July and August 1949. A recreational catch of about 5,000 stripers was estimated for the 1950 season in Coos Bay. Those two estimates are the only estimates available for the recreational catch of striped bass in the Coos River system.

Morgan and Gerlach (1950) described the striped bass fishery as a "combination of boat and bank fishing." The report described the boat fishery as limited because of the "scarcity of skiffs." ". . . seven boat liveries on the bay . . . could supply a total of 38 skiffs, two inboards, and four launches. "A fishing lodge named Bass Harbor Lodge was located on Isthmus Slough because of the bass fishery, and bass tournaments were periodically held in Isthmus Slough. Currently, in conjunction with the loss of the striped bass fishery, boats cannot be rented anywhere in the upper Coos River system.

Recreational fishing regulations for striped bass have changed over the years. Catch limits have varied from unlimited through 1946 to the current limit of two fish in any 24 consecutive hours. A minimum size limit of 30 inches, which was placed in effect in 1989, remains in effect today (Table 18). In 1986, specific angling closures were adopted to protect an important wintering area for striped bass in Catching Slough and to protect spawning

Table 17. Commercial landings of striped bass in the Coos system 1931-75.

Year	Catch (lb.)	No. nets	Catch/ net
1931	18,049	75	240.7
1932	17,595	(60)[a]	293.3
1933	21,197	44	481.8
1934	25,712	51	504.2
1935	27,597	58	475.8
1936	29,255	93	314.6
1937	32,778	98	334.5
1938	42,480	97	437.9
1939	65,131	106	514.4
1940	75,298	119	632.8
1941	66,090	94	703.1
1942	50,534	80	631.7
1943	60,219	109	552.5
1944	89,575	139	644.4
1945	231,218	217	1065.5
1946	176,421	335	526.6
1947	87,415	279	313.3
1948	94,447	200	472.2
1949	21,413	150	156.1
1950	35,402	132	268.2
1951	24,976	97	257.5
1952	14,235	84	169.5
1953	25,441	64	397.5
1954	19,001	60	316.7
1955	22,383	67	334.1
1956	27,696	50	553.9
1957	8,075	52	155.3
1958	8,999	46	195.6
1959	9,656	38	254.1
1960	12,156	31	392.1
1961	14,211	36	394.8
1962	22,672	47	482.4
1963	45,181[b]	58	664.4
1964	27,233	71	383.6
1965	29,352	88	333.5
1966	31,958	69	463.2
1967	13,953	47	270.0
1968	9,857	47	209.7
1969	18,338	48	382.0

Table 17. Continued.

Year	Catch (lb.)	No. nets	Catch/ net
1970	13,523	42	322.0
1971	8,984	51	176.2
1972	11,376	53	214.6
1973	8,799	73	120.5
1974	8,344	57	146.4
1975	4,026	(28)[c]	143.8

[a] Calculated effort estimated by linear interpolation between the preceding and following year.
[b] Includes 1,608 lbs. landed from set lines (Breuser 1964).
[c] Fishermen were not required to purchase drift net licenses in 1974 and set net licenses in 1975. Numbers were estimate from set net site registrations and fishermen counts.

fish in South fork of the Coos and Millicoma rivers. The 1986 changes were made to protect the relatively small number of adults that remain in the bays, and further changes were made in 1989 for the same reason.

Table 18. Recreational fishing regulations for striped bass in Coos Bay, 1914-90.

Year	Bag Limit	Length Limit
1914-1946	NO BAG	NO LENGTH
1946-1949	15/day	NO LENGTH
1950-1960	5/day	NO LENGTH
1961-1977	5/day	16" Min.
1978-1988	3/day	16" Min.
1989-present	2/day	30" Min.

Abundance of striped bass in the Coos River system has experienced wide fluctuations because of infrequent "dominant" year classes. No dominant year class has occurred in the Coos River since 1958, and a general downward trend in the population has continued since the early 1960s. Estimated population size has ranged from 69,000 adult bass in 1945 to the current level, which may be only about one thousand fish (Table 19 and William G. Mullarkey, ODFW, unpublished data).

Table 19. Estimates of adult striped bass, aged 3 and older, in the Coos River system based on catch per unit effort (CPUE) and 1950 population estimate. Data for 1945 and 1950 are from Morgan and Gerlach (1950).

Year	CPUE[a]	Estimated Striped Bass Population
1945	1065.5	69,028
1950	268.2	17,382
1960	392.1	25,409
1962	482.4	31,251
1963	664.4	43,048
1964	383.6	24,852
1973	120.5	7,813
1968-1975[b]	208.6	13,511

[a] Catch per unit of effort (average catch per licensed net).
[b] An average thought to represent population levels during the period indicated.

Although striped bass are anadromous, little ocean movement of Oregon stripers is apparent. Tagging studies in the Coos and Umpqua rivers have shown only a small exchange of fish between the two systems. Although the populations in the Coos and Umpqua river systems have common origins, they now appear to be distinct.

Striped bass are pelagic spawners that spawn in tidal portions of the Coos, South Fork of the Coos, and Millicoma rivers in May and June. Spawning usually occurs at night. Most spawning occurs when water temperature is between 58^{0} and 70^{0} F. A high percentage of the population usually spawns over a period of a few days when desirable water temperature occurs. Egg incubation, hatching, and yolk absorption occur over a 6- to 8-day period. The alevins are 5 mm long when they hatch and are free-swimming after the yolk is absorbed. Fry begin feeding on plankton at that time.

The critical period of development for striped bass is the first 30 to 60 days after spawning. Studies in Coos Bay and other areas of the United States have shown that the number of 2- to 3-inch juvenile striped bass recruited to the population each year directly determines the size of the adult population 3 to 10 years later. ODFW studies have shown very low recruitment of juvenile striped bass since 1979 (Table 20).

Table 20. Estimated recruitment of young-of-the-year striped bass in the Coos River system, and releases of hatchery young-of-the-year striped bass, 1978-89. Hatchery releases were made in August.

Year	Number of sets	Number of fish	(Index) Catch-per-effort	Estimated wild population	Hatchery number released
1978	46	133	2.89	9,900	
1979	42	6	0.14	500	
1980	49	0	0.00	0	
1981	60	0	0.00	0	3,200
1982	60	13	0.22	750	
1983	60	18	0.30	912[a]	6,600
1984	58	19	0.33	1,150	
1985	60	4	0.07	372[a]	6,000[b]
1986	60	7	0.12	450	
1987	58	3	0.05	300	
1988	59	165	--	<500	15,800[c]
1989	59	252	--	<1,000	38,000[d]

a Actual population estimate using Peterson mark-recovery method.
b An additional 200,000 unfed fry were released into Catching Slough with no apparent success.
c The 1988 catch was heavily influenced by unmarked hatchery fish. Only 2 juvenile striped bass were captured prior to the hatchery release on August 24. All hatchery fish were marked and excluded from catch prior to 1988.
d The 1989 catch was heavily influenced by hatchery fish. Only 5 juveniles were captured prior to the hatchery release on August 29.

Experimental spawning and hatching of striped bass and white bass-striped bass hybrids on the South Fork of the Coos River from 1981 to 1985 has demonstrated the feasibility of producing juveniles for augmenting the natural population. Although releases of up to 25,000 juvenile striped bass per year have been authorized since 1981 for research purposes and as a payback program for producing hybrid bass, few fish were released prior to 1989. These small releases of marked juveniles have shown some survival to adults indicating that a striped bass culture program could enhance the Coos population at a relatively modest cost.

Striped bass use almost all of the habitats in the Coos River estuary at one time or another during their life. Tidal portions of the South Fork of the Coos, Coos, and Millicoma rivers provide critical habitat for 1+ to 5-year-old striped bass. Older fish use the entire estuary during different times of the year.

A substantial percentage of the striped bass in the Coos River population contain both male and female gonads, and the percentage appears to be

increasing. Morgan and Gerlach (1950) reported a 3% incidence of hermaphrodism during their study from 1949 to 1951 whereas more recent studies have shown up to 33% hermaphrodism (R. Bender, ODFW, unpublished data) Although no recent sampling has occurred hermaphrodites are thought to be rare in the Umpqua population and occur in very small numbers in other populations of striped bass that have been studied in the United States (Weston and Rogers 1978). The high degree of hermaphrodism in the Coos River population may be partially responsible for the population decline because hermaphrodites are usually unsuccessful spawners as females. Geneticists have speculated that the high degree of hermaphrodism in the Coos River population may be the result of inbreeding since the entire population probably started with a very small number of individuals (personal communication with R. Gould, USFWS). However, the Umpqua River population had similar origins and does not exhibit this problem. Other factors in the Coos River system such as log handling and transport in the spawning areas and continued channel deepening and widening projects may be responsible for the lack of spawning success and recruitment in the Coos River system.

Striped bass feed on a wide variety of fishes and invertebrates, including salmonids. Numerous studies have been done over the years to document feeding habits of striped bass. Striped bass are controversial in Oregon because of their feeding habits and cohabitation with salmonids during certain times of the year. A "White Paper" was prepared in 1985-86 by ODFW staff (Temple and Mirati 1986) to address the issue of striped bass and salmonid interactions. The conclusions from this paper are as follows:

1. Various treatments of adult coho salmon escapement indices suggest a time association between declines in coho spawning ground counts and increasing striped bass abundance in the 1960s. Fluctuations in index values are not consistent among index streams, nor do declines only occur with bass abundance. Effects of bass predation on adult coho salmon abundance are not substantiated or excluded by the counts.

2. Large samples of striped bass stomachs collected over many years indicate that consumption of salmonid smolts is greatest in early spring in tidewater of the Coos and Millicoma rivers. Some predation on smolts also occurs in mid-bay, associated with some tributary streams entering at mid-bay.

3. Increased predator (bass) abundance and increased prey (salmonid) abundance will result in increased salmonid consumption, but the relationship is probably not linear.

4. Fall chinook salmon migrants, currently much more abundant than in the 1960s, will be preyed on by bass. Some reduction in abundance will occur, the degree of the losses is uncertain.

5. Research is needed to ascertain current salmonid consumption patterns of bass, particularly predation on fall chinook salmon and on hatchery vs. wild coho and steelhead.

Striped bass have added substantially to the diversity in fishery opportunity and have the potential for substantial economic contribution to

the local area based on previous experiences in Coos Bay when populations of this fish were at much higher levels. Those benefits are desirable. Unfortunately, because adult striped bass are a top-level carnivore, their benefits cannot be pursued without taking some risk of adversely affecting other fishes in the ecosystem or other desired elements of the Coos River Basin Plan.

Considerable controversy resulted from an earlier proposal by ODFW to artificially increase the population of striped bass. That proposal and several other alternatives were considered by the Oregon Fish and Wildlife Commission at a public hearing in Coos Bay on 20 June 1986. The Commission instructed the ODFW staff to go back and reconsider the issue of striped bass management in the context of the entire Coos River Basin Fish Management Plan.

The advisory committee that assisted in developing the Coos River Basin Plan had a difficult time making a decision on striped bass management. The views of members of the advisory committee ranged from extensive enhancement of striped bass to the philosophy that striped bass are exotic and should be eliminated from the system. Because of this divergence of views, several advisory committee meetings were required to finally reach a consensus on management of striped bass.

One approach that was considered was to conduct a test of compatibility of striped bass in the Coos River system. This test involved releasing a large number of striped bass into the Coos River system to achieve a relatively large population of fish. A research project would be included to evaluate the impacts of striped bass on salmonids. This approach was abandoned after the proposal was thoroughly reviewed by a group of research biologists. The test of compatibility would have been expensive and would probably not have generated data adequate to thoroughly evaluate the program. Funding would have been difficult to obtain even if the research problems could have been resolved.

The advisory committee finally agreed to take a conservative approach to striped bass management. They agreed that striped bass are a valuable game fish and that the population should be enhanced with small releases of striped bass. This program has the potential to provide at least some increased diversity of angling opportunity. Full potential of the striped bass fishery cannot be realized under the agreed upon program. However, probability is low that substantial negative impacts will occur using this conservative approach.

The first release of 50,000 and subsequent annual releases averaging 25,000 striped bass should result in a gradual increase in the population of striped bass if survival is high. A modest recreational fishery should develop and increase until the average harvest rate approximately equals annual recruitment. As an example, if 10% of the annual release of striped bass survive to enter the fishery as age 3 or age 4 adults, then approximately 2,500 fish could be harvested annually by a recreational fishery. The population would remain stable if the harvest remained at 2,500 and survival of released fish remained at 10%. Natural recruitment would add some striped bass to the population each year, but natural recruitment has been very low since 1979. Even if survival is excellent and the program is implemented in 1988, fish from the first release will not reach the 20-pound class until 1997 to 2000. If the program is not funded or if survival of released fish is not

high, the striped bass population will likely continue to decline unless a large year class is produced through natural spawning.

Morgan and Gerlach (1950) estimated recreational harvests of 7,336 in 1949 and 2,563 in 1950 when the population of striped bass was estimated to be 18,000 fish. This information suggests that a recreational fishery could harvest 2,500 adults in Coos Bay with an adult population of less than 18,000 adults.

Because of the concern over possible impacts on salmonids of a larger population of striped bass, the advisory committee agreed on a target population of adult striped bass of 20,000 to 25,000 fish. The advisory committee agreed that steps should be taken to increase the recreational harvest by liberalizing angling regulations when a population estimate shows the adult population to be 20,000 or larger. If angling regulations are liberalized for several years and a subsequent population estimate shows the population to be greater than 25,000 striped bass, the ODFW will investigate other measures to reduce the population. We believe that the population will never reach 25,000 adult fish with the low release levels that were agreed upon unless a large year class occurs naturally.

Stray hybrid bass from Tenmile Lakes have been found in the estuary and tidewater of the Coos River system. These fish were not authorized for this system and ODFW has taken action to reduce the level of straying from Tenmile Lakes to the Coos River basin.

Operating Principle 1. **Striped bass shall be managed for production and harvest of naturally produced and hatchery fish consistent with the Natural Production Policy.**

Operating Principle 2. **A conservative, carefully monitored striped bass enhancement program shall be pursued to increase the diversity of angling opportunities in the Coos River system.**

Objectives

Objective 1. **Achieve an adult population of 20,000 to 25,000 striped bass.**

Assumptions and Rationale

1. Striped bass offer the potential for increased diversity of fishery opportunity.

2. Striped bass have the potential for substantial economic contributions to the local area based on previous experiences when populations were at much higher levels.

3. The benefits of striped bass cannot be pursued without taking some risk of adversely affecting other fishes in the ecosystem or other desired elements of this plan.

4. A modest recreational fishery will develop and increase until the average harvest rate approximately equals annual recruitment.

Problems and Recommended Actions

Problem 1. The current striped bass population is probably not capable of producing the desired number of adults in a reasonable period of time.

Action 1.1 Enhance the population by releasing 50,000 striped bass in the first year with subsequent annual releases that average 25,000 fish, not to exceed 50,000 fish in any one year.

Problem 2. Information is needed to properly monitor the population.

Action 2.1. Conduct a population estimate within 6 years of the first release of 50,000. Conduct subsequent population estimates every 3 to 6 years.

Problem 3. A large population of striped bass may have adverse impacts on other species.

Action 3.1 If the point estimate of a population estimate exceeds 20,000 adult striped bass, take measures to increase the recreational harvest by liberalizing angling regulations. If the point estimate of a population estimate exceeds 25,000 adults after 3 or more years of liberalized angling regulations, ODFW will investigate other measures to reduce the population.

Problem 4. Funds for a striped bass program are limited.

Action 4.1 Investigate the feasibility of developing a striped bass tag or stamp with the funds from such a program dedicated to the striped bass management activities identified in this plan.

Problem 5. Information on the naturally reproducing population is limited.

Action 5.1 Continue the annual recruitment survey to estimate the year-class strength of naturally reproducing striped bass.

Problem 6. Many critical questions concerning the role of striped bass in the Coos River system are unanswered.

Action 6.1 Encourage educational institutions and other research groups to study the life history of striped bass and to define the role that they play in the Coos River ecosystem.

Problem 7. Hybrid bass are present in the estuary and tidewater portions of Coos River basin.

Action 7.1 Examine the relative number and characteristics of stray hybrid bass in the Coos River system.

WHITE AND GREEN STURGEON

Background

Both white and green sturgeon are known to be present in the Coos River system although the populations appear to be fairly small. Some natural reproduction may occur in the Coos River basin but we think it is little if any. Recent tag recoveries in the Umpqua, Yaquina, and the Columbia river basins indicate that white sturgeon are quite mobile and move freely from one estuary to another. Tagged white sturgeon from the Columbia and Sacramento rivers have been recovered in the Umpqua River and other river systems as well. Large numbers of Columbia River white sturgeon are known to have moved into Tillamook bay after the eruption of Mt. St. Helens in 1980. We feel that most of the with in the Coos River system are migrants from other systems.

White sturgeon have a relatively long life span, grow to a large size, and are slow to mature. Males mature at approximately 12 years of age at a length of 4 feet, and females mature at 15 to 20 years of age at a length of 5.5 to 6 feet. Tagging studies in the Umpqua River have shown excellent growth rates. Tagged Umpqua River white sturgeon grew 4.7 inches per year. This is nearly double the growth rate of white sturgeon in the Columbia River.

White sturgeon are anadromous, spending most of their adult life in the ocean close to shore and migrating to fresh water to spawn (Galbreath 1985). Spawning requires water temperature of 48^0 to 59^0 F. Research done in the Columbia River indicated that spawning of white sturgeon occurred from April into June in fresh water (Galbreath 1985). Temperature requirements for egg incubation and for normal early development and survival range between 50^0 and 64^0 F and are optimum at 57^0 to 61^0 F. Substantial mortality occurs at incubation temperatures above 64^0 F.

The life history of green sturgeon is poorly documented. Spawning timing is similar to that of white sturgeon. Adult sturgeon are opportunistic carnivores that feed on spawning or spawned out fish, sculpins, lamprey, young sturgeons, shellfish, and other benthic invertebrates.

White and green sturgeon were caught in Coos Bay in commercial gillnet fisheries (1923-1949, Table 23). Relatively few sturgeon are caught in Coos Bay during recreational fisheries; however, numbers of anglers and white sturgeon catch are increasing each year. Recreational catch estimates are based on sturgeon catch cards. Sturgeon catch card data has been summarized for the years 1986 through 1988. Estimated annual catches were 42 white and 7 green in 1986, 77 white and 7 green in 1987, and 140 white and 5 green in 1988. We anticipate that white sturgeon will continue to grow in size and that more and more anglers will learn that catchable numbers of white sturgeon exist. Sturgeon are caught in Coos River, Isthmus Slough, lower Coos Bay, and other areas with most of these caught incidentally while angling for other species.

Table 23. Pounds of white and green sturgeon landed in the commercial fishery in the Coos River system, 1923 to 1949.

Year	Green sturgeon	White sturgeon	Total
1923	478	3,178	3,656
1924	1,609	306	1,915
1925	1,533	289	1,842
1926	1,638	183	1,821
1927	75	20	277
1928	302	23	325
1929	638	258	890
1930	1,270	105	1,375
1931	1,159	---	1,159
1932	539	243	782
1933	164	945	1,109
1934	271	---	271
1935	277	---	277
1936	1,117	34	1,159
1937	587	29	616
1938	1,416	17	1,482
1939	195	76	271
1940	104	155	259
1941	67	---	67
1942	177	---	17
1943	464	---	464
1944	95	44	139
1945	178	66	244
1946	1,957	38	1,995
1947	379	---	379
1948	70	34	104
1949	395	26	42

Size limit regulations on sturgeon fisheries are designed to protect slow-growing, mature fish. Regulations allow sturgeon from 3 to 6 feet long to be taken in the recreational fishery and those from 4 to 6 feet long to be taken commercially. Propagation of white sturgeon in private hatcheries occurs in California and at one hatchery in Oregon on an experimental basis.

Management Considerations

We examined two management alternatives to achieve compliance with the Wild Fish Management Policy. Under alternative 1 sturgeon would have been managed as a wild population with no hatchery influence with reliance on natural production and/or recruitment from coast-wide sturgeon migrations originating from other river systems to meet fishery needs. Alternative 1 urged collection of baseline data primarily through a voluntary tagging effort by sport anglers. Alternative 2 called for management of wild stocks along with a small hatchery supplementation program. The Commission adopted alternative 2 with development of a hatchery program deferred until the Statewide Sturgeon Plan is adopted. We will also collect baseline data primarily through a tagging effort using ODFW personnel and sport anglers. Compliance with the Wild Fish Management Policy will be achieved since Columbia River sturgeon are known to enter the Umpqua River and presumably the Coos River system and natural spawning in this system is not thought to be extensive.

Operating Principle 1. **Sturgeon shall be managed for wild fish with a small hatchery supplementation program consistent with the Wild Fish Management Policy. Implementation of the hatchery program shall be delayed until adoption of the Statewide Sturgeon Plan.**

Operating Principle 2. **Programs that approach the limits of the Wild Fish Management Policy shall be modified or reduced proportionately to maintain compliance with the policy.**

Objective 1. **Gather baseline data needed to make management decisions.**

Assumptions and Rationale

1. We believe that the sturgeon population in the Coos River system is relatively small.

2. There appears to be little, if any, reproduction in the system.

3. Food and habitat availability for sturgeon are unknown in the Coos River basin, but assumed not to be limiting.

4. Sources of recruitment of sturgeon to the Coos River basin and straying rates of local fish is unknown but assumed to be the Columbia River.

5. Recent statewide regulation changes may alter future population levels of white sturgeon in the Coos River basin.

Problems and Recommended Actions

Problem 1. Insufficient information is available on the abundance, distribution, and ecology of sturgeon in the Coos River basin.

Action 1.1 Encourage ODFW Research Section to initiate a sturgeon inventory and tagging study.

Action 1.2 Encourage the Regional Volunteer Coordinator to organize volunteer help for sturgeon tagging.

Problem 2. No statewide sturgeon management plan is in place to guide local management strategies.

Action 2.1 Encourage ODFW to complete a statewide sturgeon management plan.

Action 2.2 Summarize known information on sturgeon status in the Coos River system for input to this process.

Objective 2. Enhance the white sturgeon population in the Coos River basin with juvenile white sturgeon from Columbia River stock until annual sport catch rates average 500 per year.

Assumptions and Rationale

1. Sturgeon catch card data for 1986 through 1988 indicate that current catches average under 100 white sturgeon per year.

2. The sturgeon population in the Coos River system is relatively small and reproduction is low or non-existent.

3. Recruitment of white sturgeon into the Coos River basin comes from other Oregon river systems and estuaries including the Columbia River.

4. Juvenile Columbia River white sturgeon are available and may be purchased from private aquaculture.

5. Columbia River sturgeon stocks are considered wild fish and could be a major source of the reproduction and recruitment for the Coos River basin.

Problems and Recommended Actions

Problem 1. Natural recruitment of white sturgeon in the Coos River basin is not high enough to provide a substantial sport fishery.

Action 1.1 Contact known experts in the field such as Surge Doroshov and Ken Beer.

Action 1.2 Initiate a stocking program by purchasing juvenile white sturgeon of Columbia River stock.

Problem 2. Hatchery stocked sturgeon may stray in or stray from the Coos River system.

Action 2.1 Conduct a thorough literature search on the migration and reproduction patterns of sturgeon.

Action 2.2 Mark or tag all released sturgeon.

Action 2.3 Conduct an intensive field sampling program to look for marked fish in the Coos River system (and other systems including the Columbia River) where the wild stocks may be reproducing.

Action 2.4 Conduct a fish-marking program when the fish reach catchable size (8 to 10 years away) to locate tagged fish.

AMERICAN SHAD

Background

The American shad (hereafter called shad) is an anadromous species native to the Atlantic coast of North America. Shad were successfully introduced to the Pacific coast in the late 1800s when they were stocked in the Sacramento and Columbia rivers. They soon became widely distributed along the Pacific coast and now have major reproducing populations as far north as the Fraser River in British Columbia and have a reported ocean distribution ranging from Southern California to Cook Inlet, Alaska, and Kamchatka, USSR.

A commercial fishery for shad developed in the Coos River system in the early 1920s. Commercial catches peaked in the 1940s with the maximum landing of 373,000 pounds occurring in 1946. For the 5-year period from 1974 to 1978, an average of 15,500 pounds of American shad was taken commercially from Coos Bay (Table 21). From 1979 until 1983, although the commercial seasons remained open, no fishing occurred in Coos Bay and no shad were landed. The 1983 legislature closed the commercial fishery for shad in the Coos River system, and the fishery remains closed. Some of the reasons given for the closure were the lack of participation in the fishery, protection of downstream migrating steelhead, protection of spring chinook and striped bass, and conflicts between the commercial fishery and the recreational fisheries for shad and striped bass.

Recreational fishermen take shad from the South Coos, Coos, and Millicoma rivers from April through June. Most of the fishery is by trolling from boats, but some angling also occurs from shore at many locations. A 1970 study estimated the recreational fishery at 10,362 angler hours (MacLeod 1970). The current recreational fishery for shad in the Coos River system is probably much larger than reported in the 1970 estimate because of a general statewide increase in recreational fisheries. The addition of the Myrtle Tree Boat Ramp on the South Coos River has also made the South Coos River much more accessible to anglers than it was in the 1970s.

Adult shad enter the bay in the spring and appeared in the commercial fishery when it opened in April. Spawning generally occurs in May and June in the tidal portions of the South Coos, Coos, and Millicoma rivers. Shad are pelagic spawners that usually spawn on the surface of the water at night. Spawning usually occurs when water temperature is between 57^{0} and 72^{0} F.

An annual juvenile recruitment survey conducted by ODFW in the Coos, South Coos, and Millicoma rivers measures relative abundance of juvenile shad each year. Shad are the most numerous species of fish captured in the survey from mid-July through October. Average catch of juvenile shad has ranged from about 85 shad/seine haul to about 190 shad/seine haul during the 9 years that the survey has been conducted (Table 22). Recruitment of juvenile shad appears to be relatively stable compared with recruitment of chinook salmon and striped bass, which tend to fluctuate considerably from year to year.

Table 21. Commercial landings of American shad in the Coos system, 1923-1982.

Year	Pounds landed
1923	56,530
1924	29,727
1925	68,490
1926	89,010
1927	130,745
1928	110,266
1929	66,498
1930	45,666
1931	164,610
1932	94,168
1933	52,903
1934	78,459
1935	115,620
1936	73,741
1937	42,251
1938	50,168
1939	91,943
1940	121,674
1941	114,022
1942	182,459
1943	151,288
1944	215,259
1945	320,400
1946	373,064
1947	366,404
1948	167,160
1949	216,068
1950	241,019
1951	232,521
1952	165,957
1953	80,914
1954	129,072
1955	103,185
1956	66,965
1957	32,568
1958	40,794
1959	25,997
1960	26,218
1961	55,642
1962	92,060
1963	95,701
1964	106,700
1965	100,321
1966	72,521
1967	58,409
1968	49,564
1969	32,425
1970	59,865
1971	54,927
1972	95,413
1973	30,703
1974	32,543
1975	20,219
1976	8,872
1977	4,215
1978	11,520
1979	0
1980	0
1981	0
1982	0

Table 22. Catch of juvenile American shad during recruitment surveys in the Coos River system, 1978-86. All seine hauls were made between 20 July and 1 October.

Year	Seine hauls	Catch	Catch-per-seine haul
1978	46	4,882	106.1
1979	42	5,772	137.1
1980	49	9,426	192.4
1981	60	10,464	174.4
1982	60	5,081	84.7
1983	60	6,028	100.5
1984	58	11,220	193.4
1985	60	10,883	181.4
1986	60	9,990	166.5

Juvenile shad begin to move downstream in early August and have appeared in lower estuary sampling as early as mid-August. Most juveniles apparently enter the ocean in late summer and fall, but some shad remain in upper tidewater until the following summer before migrating to the ocean.

Estimates in 1968 and 1970 based on tagging studies indicated a population of around 58,000 adult American shad in the Coos River system. The current size of the adult population of shad is unknown, but recruitment surveys for juveniles and test gillnetting for adults have shown the continued existence of a substantial run of shad in the Coos River system during recent years.

Operating Principle 1. **American shad shall be managed for wild fish consistent with the Wild Fish Management Policy. Hatchery fish shall not be released in the Coos River system.**

Objectives

Objective 1. **Maintain a stable population of American shad while striving to increase harvest of the species.**

Assumptions and Rationale

1. The Coos River population of shad has probably been underused for many years because of a low demand for commercially caught shad, because of the lack of ocean harvest, and because the current recreational fishery harvests only a small percentage of available adults.

2. Closing of the commercial season in 1983 eliminated that fishery as a potential use of the resource.

3. The current shad population is maintaining itself at a substantial but unknown level.

4. The population could withstand a higher rate of exploitation than has occurred in the past 15 years.

5. Shad add to the diversity of fishing opportunities and provide recreational opportunities at times of the year when more popular species are not available.

6. Limited studies have not shown any major impacts of shad on native species.

Problems and Recommended Actions

Problem 1. Shad are currently underused by the recreational fishing public, but commercial fisheries methods for shad can potentially affect other species.

Action 1.1 Promote increased use of shad by improving public angler access and by publicizing the fishery.

Action 1.2 Investigate methods to selectively harvest American shad without affecting other important species and their fisheries, and investigate the feasibility of reopening the commercial fishery for other than a gillnet fishery for shad through modification of pertinent Oregon Regulatory Statutes.

Problem 2. Information on abundance and trends in natural production of shad are limited.

Action 2.1 Continue the annual recruitment survey on the Coos, South Coos, and Millicoma rivers to measure annual changes in the level of abundance of juvenile shad and long-term trends in natural production.

MISCELLANEOUS FRESHWATER AND ANADROMOUS FISH SPECIES

Species

Reside shiner	Western brook lamprey
Speckled dace	Coastrange sculpin
Longnose dace	Prickly sculpin
Largescale sucker	Reticulate sculpin
Pacific lamprey	Threespine stickleback

Background

The species in this category are native to the Coos River system. Little information is available on abundance of these 10 species, but their numbers are probably large, and the populations are in ecological balance with the carrying capacity of their habitat.

The redside shiner, speckled dace, longnose dace, and largescale sucker are a part of the ancient Columbia River species assemblage. As primarily freshwater fishes, they are able to withstand little or no salt water and they probably reached the Coos River system in past geologic time by stream connections with the Umpqua River system or at an earlier time when the upper Umpqua River was part of the Willamette River. These species are not present in many coastal rivers. Although isolated for thousands of years, the Coos River population of longnose dace (known as the Millicoma dace) is more similar in morphological characteristics (Bisson and Reimers 1977) to the Columbia River populations. However, the Millicoma dace is morphologically distinct from the Umpqua River population and has specialized by living among rubble in the swiftest water of the Coos River. This population is especially important to scientists and no doubt will eventually receive additional behavioral and ecological study. The Millicoma dace now appears on the Oregon Sensitive Wildlife Species List.

Lampreys, sculpins, and threespine sticklebacks are all secondarily derived from marine fishes and have had various opportunities to broaden their distribution by moving from system to system as sea level changes have occurred in past years. They are generally found in all coastal streams.

These 10 species have limited direct food value to humans. However, suckers provide an indirect recreational fishery. The practice of discarding hook- and line-caught suckers on the streambank is common. Some suckers are actively sought for bait for striped bass fishing. Redside shiners, speckled dace, small suckers, and sculpins are also captured by some fishermen in minnow traps for striped bass bait.

Some of these species may possibly be competitors with salmonid species for food and space in the riverine and tidewater areas of the Coos River basin, but we know of no definitive studies to determine this. At this time we do not believe that competition or predation by any of these species is a limiting factor for salmonids in the Coos River basin. The Pacific lamprey is a known predator of salmonids in the ocean phase of its life, but the effect of mortality from this predator cannot be separated from that of other marine predators. However, juvenile and adult stages of many of these species are

food for economically important fishes such as fingerling and smolt salmonids and striped bass.

Objectives

Objective 1. Maintain populations of these native species at an abundance consistent with their habitat requirements.

Assumptions and Rationale

1. Habitat protection efforts will help maintain habitat for these species.

2. As far as we know, none of these species are at a critical level of abundance.

3. Although these species have limited direct value to fisheries, they need to be recognized for their importance as a food source for other fish and for being a natural part of the Coos River basin ecosystem, contributing to its complexity.

4. No unauthorized introductions of freshwater fishes will occur.

Problems and Recommended Actions

Problem 1. Information on the ecology, life histories, and other aspects of these species is limited.

Action 1.1 Encourage educational institutions and other research groups to study the life histories, ecology, behavior, and other aspects of these species.

Action 1.2 Support and become involved in cooperative interagency research on the ecological communities these species occupy.

Objective 2. Determine the population status of the Millicoma dace.

Assumptions and rationale

1. Past habitat degradation from activities such as splash-damming probably had negative impacts on the Millicoma dace.

2. Habitat enhancement projects to improve general quality for species like fall chinook salmon will also help the Millicoma dace.

3. This fish is on the Sensitive Species List and requires special efforts to collect population and distribution information.

Problems and Recommended Actions.

Problem 1. Information on this fish is limited.

Action 1.1 Conduct an inventory of the relative population abundance and habitat requirements of this fish.

PRINCIPAL MARINE RECREATIONAL FISH SPECIES

SPECIES

Pacific herring	Black rockfish
Surf smelt	Blue rockfish
Shiner perch	Bocaccio
Striped seaperch	Canary rockfish
Silver surfperch	China rockfish
Walleye surfperch	Copper rockfish
White seaperch	Grass rockfish
Pile perch	Quillback rockfish
Redtail surfperch	Kelp greenling
Pacific staghorn sculpin	Rock greenling
Cabezon	Lingcod
Red Irish lord	

Background

Surfperch

The surfperch family has historically contributed the majority of fish taken by anglers in the Coos River estuary. A resource-use study conducted in Coos Bay in 1971 by the Fish Commission of Oregon (Gaumer et al. 1973) estimated that 28,600 surfperches were caught and retained by anglers. This was 58% of the total estimated catch for that period. The leading surfperch species were shiner perch, redtail surfperch, striped seaperch, white seaperch, and pile perch. The very small shiner perch, often considered insignificant, was shown to be the most commonly caught and kept species.

Surfperches are taken mainly in the mid to lower areas of the bay from February through the summer months. However, some surfperches can probably be found in the lower bay all year.

Surfperches are livebearers and spawn by releasing well-developed young fish that resemble the adults. Spawning takes place in the mid to lower estuary primarily during the late spring and summer months. All of the surfperch species listed have been observed in spawning or near-spawning condition in estuaries and along the open coast.

We have no reason to believe that there are separate Coos Bay stocks of surfperches. Instead the fish present in Coos Bay most likely are part of a larger ocean stock.

Rockfish

The black rockfish is the only member of the rockfish family that is consistently caught in Coos Bay. The copper, blue, grass, and canary rockfishes and the bocaccio are occasionally seen in angler catches. During the 1971 Resource-Use Survey, 4,000 black and 140 copper rockfish representing 8% and 0.3%, respectively, of the total finfish catch during the study were estimated caught. The estuary fishery takes rockfishes mainly during the late spring and summer months in the lower areas of Coos Bay.

Black rockfish are not known to spawn in any of Oregon's estuaries. The adult females release larval young in the near-shore ocean zone (30 fathoms or less) in February and March.

We do not believe that there are discrete Coos Bay stocks of rockfish. The abundance of rockfish within the estuary is probably dependent upon the much larger population in the ocean.

Greenlings

The greenling family is represented in Coos Bay by at least three members: lingcod, kelp greenling, and rock greenling. Occasional references indicate the presence of whitespotted greenling in Coos Bay, but most likely these are misidentified kelp greenling. This family accounted for 4% of the total finfish catch in 1971. However, the lingcod is more important than these data indicate. Lingcod are a particular "trophy" species for many anglers who deliberately fish for them in the lower bay, principally off the jetties. These people are much more likely to catch a lingcod than the average angler. The continued presence of lingcod is very important to this portion of the angling public.

Lingcod and greenlings normally composed about 5% of the fish taken from offshore reefs near Coos Bay. Here again, the lingcod is a highly prized addition to the angler's catch.

The biological information available indicates that the lingcod and greenlings in or near Coos Bay do not form a discrete stock. The general pattern of known lingcod spawning behavior is that mature fish travel from deeper water to shallow water reefs and rocky shore areas during the winter to spawn. Tagging studies have documented some north-and-south movement of lingcod. We believe that the in-bay populations of lingcod and greenling in Coos Bay are thus dependent upon migration of fish from outside the estuary itself.

Sculpin

Several species of sculpin are taken by anglers in Coos Bay. Of these, normally only the cabezon and red Irish lord are considered to be desirable food fish. However, ODFW sampling indicates that up to 20% of the total fish retained by anglers are Pacific staghorn sculpins. These anglers are often youngsters fishing off docks, but many Pacific staghorn sculpins are kept by adults. We do not know the ultimate disposition of such catches, but they obviously are of some importance to those keeping them.

We have little biological information on these sculpins. However, the presence of good numbers of these species in a basically continuous band along the Oregon coast makes it unlikely that there are separate Coos Bay stocks.

Surf Smelt

Surf smelt are sometimes taken by anglers during the late spring and summer months in lower Coos Bay. We know little about the surf smelt specifically in Coos Bay, but a comparison with other areas indicates it is highly unlikely that a separate stock exists in this area.

Pacific Herring

During part of the year, Pacific herring are abundant in the Coos River estuary. However, no estimate of historical or current biomass is available. Several different runs of spawning fish enter Coos Bay from January through April, with the largest numbers seen in February and March. These herring come into the bay and wait up to a few weeks while their eggs mature prior to spawning. At spawning, the adhesive eggs are deposited on the chosen substrate, which can be rocks, vegetation, logs and pilings, or almost any solid material, including boats and ships. Spawning has been observed in many areas of Coos Bay, from the jetties upstream at least to the city of Coos Bay waterfront area. The eggs hatch in 10 to 15 days, and the resulting larvae (and later juveniles) are present in the estuary for several months.

Herring are only known to spawn within estuaries in Oregon; we do no have documentation of spawning occurring in the open ocean. This type of behavior makes it possible that different estuaries could have discrete stocks of herring. It is possible that as spawning time approaches, these stocks could separate out and each return to its estuary of origin.

Most anglers catch Pacific herring in lower Coos Bay during the spring. Catches are used for bait and for food.

Objectives

Objective 1. Maintain abundance of these species to continue providing recreational fisheries in the estuary at present levels.

Assumptions and Rationale

1. Ocean stock conditions for all these species are good.

2. With the possible exception of the Pacific herring, separate in-bay stocks of these species probably do not exist.

3. Since the fish that are caught in the bay are part of larger ocean stocks, there is little need to be very restrictive about the Coos Bay recreational catch.

4. Management measures for recreational species are limited to daily angling catch limits.

5. Research to evaluate the effects of catch on populations will continue or expand.

Problems and Recommended Actions

Problem 1. Funds for management of and research on marine fish are limited.

Action 1.1 Seek funds earmarked for work on marine recreational fishes.

Problem 2. Additional information necessary to evaluate fisheries and stock status is needed.

Action 2.1 Continue and expand efforts to evaluate the effects of catch on populations of these species.

Action 2.2 Inventory stocks of these species.

Action 2.3 Monitor the recreational catch.

Problem 3. Some species are not used in fisheries to their full potential, partly because they are dispersed throughout the bay and not necessarily concentrated near fishing areas.

Action 3.1 Obtain and publicize recreational fishery information and encourage angling through implementation of the fishery management objective.

Action 3.2 Install artificial reefs associated with fishing piers to increase angler opportunity. Any proposed artificial reefs must be evaluated with criteria listed in the National Artificial Reef Plan of the National Marine Fisheries Service.

Problem 4. Interest has developed in in-bay herring fisheries, but little is known about the feasibility of this activity.

Action 4.1 Investigate the potential for commercial and roe-on-kelp herring fisheries and, if such fisheries are feasible, monitor and control their development.

Action 4.2 Identify and protect herring spawning areas and insure good water quality during spawning periods.

OTHER FISH SPECIES WITH CURRENT OR POTENTIAL FISHERY IMPORTANCE

SPECIES

English sole	Eulachon
Starry flounder	Longfin smelt
Sand sole	Topsmelt
Big skate	Pacific tomcod

Background

Little information is available on the estuarine abundance of these species, with the exception of starry flounder in the upper bay. Populations have probably declined from historical levels partly as a result of decreases in their estuarine habitat.

The in-bay environment is very important to these species. English sole, starry flounder, and sand sole require a sand-mud-eelgrass type of habitat. All of these species move between the ocean and the estuary, and for some of them an important portion of their juvenile recruitment comes from the estuary. Juvenile starry flounder are found upstream as far as head of tide. Sampling in the upper bay up to the head of tide from 1979 to the present shows that young-of-the-year flounder are present at least in the spring and summer months. Relative abundance in the upper bay has fluctuated substantially from year to year since 1979.

We currently have an incomplete understanding of the relationships between these species and the ocean and estuarine ecosystems they are part of. Recent increases in the number of marine mammals may affect these species, particularly the flatfishes. Human activities in the bay have probably caused a decline in habitat quantity and quality.

The number of fish currently available for fisheries on these species is difficult to determine. Fishing effort in the estuary is generally not targeting on these species, but effort is our only index of abundance.

Longfin smelt and eulachon may have occurred in large numbers in past years, but they have apparently not been abundant enough in recent years to attract an active dipnet fishery.

Big skate provide the opportunity for a fishery since they occur nearshore and occasionally in the bay.

Previously, topsmelt would concentrate around outfalls from shrimp plants to feed in numbers great enough to attract a fishery. These species were also gillnetted for food. Currently a limited recreational fishery exists on this species.

Historically a recreational fishery targeted on the three flatfish species, primarily on starry flounder in the lower bay. Incidental catch of Pacific tomcod and sand sole occurs during starry flounder fisheries. Currently abundance of adult starry flounder in the bay is down compared with abundance observed in the early to mid-1970s.

Objective

Objective 1. Determine the relative abundance of flatfishes, smelts, and other miscellaneous species and their availability to in-bay recreational fisheries.

Assumptions and Rationale

1. Existing recreational fisheries on these species are not affecting the populations.

2. These species add diversity to the bay's fisheries and could provide recreational opportunities at otherwise "slow" times of the year.

3. Maintaining the quantity and quality of estuarine habitats will aid in maintaining abundance of these species because actual enhancement possibilities are minimal.

Problems and Recommended Actions

Problem 1. Some of these species may provide increased fisheries.

Action 1.1 Encourage angling on these species by providing information on them and explore other means of better using them in fisheries.

Problem 2. Insufficient information exists on the contribution of these species to fisheries and on their ecology.

Action 2.1 Monitor in-bay fisheries to determine how much these species contribute to the catch.

Action 2.2 Sample at different sites in the bay to develop a better understanding of ecological relationships and the timing and distribution of these species. Coordinate this with fishery information received from recreational anglers.

OCCASIONAL MARINE VISITORS AND MISCELLANEOUS ESTUARINE FISH SPECIES

SPECIES

Marine Species

Leopard shark	Padded sculpin
Spiny dogfish	Mosshead sculpin
Longnose lancetfish	Buffalo sculpin
Pomfret	Tidepool sculpin
White seabass	Fluffy sculpin
High cockscomb	Silverspotted sculpin
Snake prickleback	Tubenose poacher
Wolf-eel	Northern clingfish
Pacific pompano	Whitebait smelt
Pacific sandfish	

Estuarine Species

Bay pipefish	Tube-snout
Penpoint gunnel	Speckled sanddab
Saddleback gunnel	Northern anchovy
Arrow goby	Pacific sand lance
Bay goby	

Background

With the exception of the bay goby, the fish species in these two groups are marine fishes that are not dependent on estuaries for the completion of their life cycle. The bay goby lives on estuarine tideflats in the burrows of the ghost shrimp. The estuarine fishes occur commonly in Coos Bay, but in low abundance; the occasional visitors venture from marine waters into Coos Bay only occasionally or in some instances rarely.

The distribution of these fishes and their habitat preferences in Coos Bay are varied. Many of these species are bottom-oriented. The bay goby and bay pipefish are found throughout the length of the estuary. The tubenose poacher, speckled sanddab, and Pacific sandfish prefer sandy bottoms located predominantly in the lower bay. Buffalo sculpin, tubesnout, bay pipefish, penpoint gunnel, saddleback gunnel, arrow goby, bay goby, and snake prickleback are more commonly found on tideflats often in association with eelgrass beds in the lower bay. The abundance of fish species in the lower bay increases in the summer because of the higher salinity. The higher salinity and rocky habitat along the jetties and shoreline off Fossil Point in the lower bay also provide favorable conditions for species such as the wolf eel, the sculpins, and the northern clingfish.

The leopard shark, spiny dogfish, whitebait smelt, northern anchovy, and Pacific sand lance range throughout the water column and can be found at times over tideflats as well as in the channels of the lower reaches of Coos Bay.

In general, little is known about the importance of the fishes in these two groups regarding their feeding and breeding habits and their interactions with the other fish species that inhabit Coos Bay. Collectively these species

represent a substantial number of fish that significantly contribute to the structure and function of the estuarine community, and to the diversity of the Coos Bay fish assemblage, but the significance of this added complexity is poorly understood. They may, for example, represent an important food source for fish of recreational or commercial value.

Objectives

Objective 1. Maintain self-sustaining populations of miscellaneous estuarine and marine species.

Assumptions and Rationale

1. Habitat protection efforts will help maintain habitat for these species. Estuarine habitat diversity will be maintained.

2. As far as we know, none of these species are at a critically low level of abundance.

Problems and Recommended Actions

Problem 1. Information on the life history, ecology, and behavior of these species is limited.

Action 1.1 Encourage educational institutions and other research groups to study the life history, ecology, and behavior of these species.

DUNGENESS CRAB

Background

Dungeness crabs prefer a sand-mud substrate and are distributed from low tide level to the deepest channels. A Fish Commission tagging study (Waldron 1958) has shown that Dungeness crabs move between bays and the ocean and from bay to bay, but 84% of the crabs tagged in bays were recovered within 4 miles of the tagging site.

Mating occurs in the nearshore ocean zone in the spring. The eggs hatch out the following winter, and the larvae are free-swimming for 3 to 5 months. Crab larvae (megalops) are found in high abundance in Coos Bay in late spring and summer. Crab larvae are a significant prey item for a wide variety of predators in Coos Bay. The relative amount of rearing in the estuaries versus the ocean is not fully understood (Armstrong et al. 1987), but Coos Bay may be an important nursery area. Juveniles are abundant as far as the upper reaches of the estuary, especially in the summer and early fall. Small Dungeness crabs are more tolerant than larger individuals of low salinities. Juvenile crab grow quickly in estuaries, then migrate to the ocean as 1-, 2-, or 3-year-old crab (Armstrong et al. 1987). Male and female Dungeness crab mature at age 2, although males may not breed until age 3 or older. Mating occurs in the ocean. Molting probability decreases with age, and females do not molt after reaching 155 mm (approximately 6 inches) in carapace width (Hankin et al. 1985). At this size the females become senescent; they are no longer producing viable egg masses. Movement of adult crab back into the estuary is seasonal and represents a small portion of the ocean population.

The lower Coos River estuary has supported a popular and productive recreational crab fishery for many years. A resource-use study by the Oregon Fish Commission of Oregon (Gaumer et al. 1973) showed that in 1971, Dungeness crabs made up 77% of the recreational boat fishing catch in the lower bay. A small commercial fishery has also existed for many years with the majority of landings occurring in the months of September, October, and November. Since 1971, the landings have fluctuated considerably with an annual average of 9,107 lbs (Table 24). The bay fisheries are seasonal and depend on migration of legal-sized crabs into the bay when salinity is relatively high.

Fishery regulations for Dungeness crab allow for the taking of only mature males. This precludes any serious concerns regarding stock depletion, since adequate spawning numbers are assured. Also, only 1-2% of the crab harvest (ocean and estuary) is from the estuaries. Personal use regulations allow for males 5 3/4 inches or larger to be taken (generally age 3 or older), with a catch limit of 12 per person per day. Recreational crabbers are restricted to three rings or pots per person. Commercial regulations restrict the catch to males 6 1/4 inches or larger (age 4 or older). Commercial crabbers fishing in the bay are restricted to fishing with no more than 15 crab rings per vessel, on weekdays only (excluding holidays), from the day after Labor Day through 31 December of each year.

The existence of both recreational and commercial crab fisheries in the bay has resulted in some real or perceived conflicts between the user groups and was addressed in 1984 in a series of hearings (one of which was held in

Table 24. Coos Bay commercial crab catch and effort, 1971-89.

Year	Pounds	Boats	Trips	Price/lb	Dollar value
1971	26,700				
1972	8,100				
1973	6,000				
1974	4,800				
1975	0				
1976	8,200				
1977	13,830	38	155	$0.55	7,600
1978	27,626	51	172	$0.97	26,797
1979	9,701	39	86	$0.85	8,245
1980	7,548	18	77	$0.80	6,038
1981	3,225	16	60	$1.05	3,386
1982	1,211	15	33	$0.90	1,089
1983	3,082	15	63	$1.30	4,006
1984	9,280	17	140	$1.50	13,920
1985	7,285	24	249	$1.75	12,748
1986	10,849	24	166	$1.75	18,986
1987	20,000	39	268	$1.75	35,000
1988	16,428	30	214	$1.75	28,749
1989	35,538	44	436	$1.85	65,745

Coos Bay) and by the Commission in 1987. These hearings resulted in the current commercial regulations.

Objectives

Objective 1. Promote an equitable harvest of Dungeness crab among resource users.

Assumptions and Rationale

1. Approximately 100% of recreational Dungeness crab catch occurs in bays and estuaries (personal communication from Darrell E. Demory, ODFW, Marine Region, Newport, Oregon).

2. The Coos Bay population of Dungeness crab is a small component of the coastal population and harvest will fluctuate seasonally as crabs migrate in and out of Coos Bay.

3. Effort will remain at a high level and perhaps increase, which makes the risk of recreational-commercial fishery conflicts greater.

Problems and Recommended Actions

Problem 1. The magnitude of the recreational fishery has not been assessed since 1977, and economic and social values have not been assessed.

Action 1.1 Monitor the recreational fishery for one year to obtain data on catch and effort, size and condition, and sex ratio.

Action 1.2 Obtain economic and social data when the fishery is monitored.

Problem 2. Up to 43% of Dungeness crabs in the recreational catch are softshelled and of low quality (unpublished data from Darrell E. Demory, ODFW, Marine Region, Newport, Oregon).

Action 2.1 Initiate education efforts to inform users that these crabs are of low quality and should not be taken.

Problem 3. Up to 35% of Dungeness crabs in the recreational catch are below the minimum legal size limit (unpublished data from Darrell E. Demory, ODFW, Marine Region, Newport, Oregon).

Action 3.1 Promote strict enforcement of crab regulations.

Problem 4. Females 6 inches and larger do not spawn and are abundant at times, but cannot be legally taken under current regulations.

Action 4.1 Investigate the feasibility of changing the law to allow large females to be harvested.

Problem 5. Interactions leading to conflicts between recreational and commercial crabbers are likely to continue.

Action 5.1 Document conflicts.

CLAMS

SPECIES

Gaper clam
Butter clam
Native littleneck clam
Basket cockle
Softshell clam
Northern razor clam
Manila littleneck clam

Background

Butter Clams

Butter clams are native to Coos Bay. Although they are found subtidally up to the US Highway 101 bridge, most occur in the Empire to Charleston area, and in South Slough.

Butter clams prefer a substrate of a gravel, rock, and sand mixture, although they can be found in nearly pure sand-mud substrata. They are found 6 to 12 inches below the surface and are nonmobile.

Butter clams are plankton feeders. They are summer spawners and have a free-swimming larval stage of about 3 to 4 weeks. Large females contain several million eggs. Butter clams reach sexual maturity in 3 years at an average length of 45 mm. They are slow growing, and 20-year-old individuals have been observed in the harvest. They can reach a size of 5 inches but mostly range from 3 to 4 inches.

Butter clams are found intertidally and subtidally and are the subject of an important recreational fishery. A resource-use survey for Coos Bay by the Fish Commission of Oregon (Gaumer et al. 1973) showed that in 1971, butter clams made up 19.2% of the recreational catch. Butter clams are generally taken incidentally to other species in the commercial fishery, and nearly all are taken subtidally. In 1989, commercial clam diggers harvested 2,511 pounds in the bay. Commercial landings for 1985 through 1989 averaged 1,475 pounds (Table 25).

In 1980 an ODFW survey (Gaumer and Robart 1980) of a 48-acre subtidal commercial fishing plot adjacent to Pigeon Point revealed an estimated 236,000 butter clams.

Basket Cockle Clams

Basket cockles are native to Coos Bay and are found in the same areas as butter clams. Basket cockles prefer a substrate of pure sand but will occur in a sand, shell, and gravel substrate. They are found from the surface down to a depth of 3 inches.

Basket cockles are plankton feeders. They are hermaphroditic, are summer spawners, and have a free-swimming larval period of about 3 weeks. They reach sexual maturity in 2 years at a size of 25 to 40 mm. Basket cockles are fast growing, can reach 66 mm in two years, and are occasionally found up to 145 mm in diameter. They can reach 15 years of age but are seldom seen over 7 years of age.

Table 25. Summary of commercial bay clam harvest in Coos Bay (lb), 1969-89.

Year	Native littleneck	Basket cockle	Softshell	Gaper	Butter	Total
1969	--	--	--	--	--	5,109
1970	141	2,658	0	1,218	505	4,522
1971	0	466	65	10,278	84	10,893
1972	0	1,876	12,019	30,751	0	44,642
1973	0	2,280	508	65	0	2,853
1974	106	2,724	0	0	402	3,232
1975	282	6,247	0	15,024	0	21,553
1976	0	0	0	85,713	816	86,529
1977	50	5	0	12,011	0	12,066
1978	0	6,064	0	35,740	0	41,804
1979	0	2,031	0	14,277	0	16,308
1980	85	460	0	64,350	40	64,935
1981	4,686	459	0	68,508	2,249	75,902
1982	1,424	726	0	106,385	2,892	111,427
1983	2,380	380	15	89,682	3,260	95,717
1984	388	840	0	50,304	3,231	54,763
1985[1]	400	1,759	233	20,121	517	23,030
1986	165	943	262	16,519	1,668	19,557
1987	44	3,242	117	5,478	1,333	10,214
1988	0	3,595	85	1,481	1,347	6,508
1989	22	951	225	2,662	2,511	6,371

[1] No permits were issued to mechanically harvest subtidal bay clams from 1985 to present.

Basket cockles are found intertidally and subtidally and are the subject of an important recreational fishery. The 1971 Resource-Use Survey (Gaumer et al. 1973) indicated that basket cockles were the second most important species, making up 19.3% of the harvest. They are also taken commercially and are commonly used for crab bait. In 1989, 951 pounds were taken by commercial fishermen. The commercial landings for 1985-89 averaged 2,098 pounds annually (Table 25). Most of the commercial harvest is by hand on subtidal stocks.

In 1980 an ODFW survey of a 48-acre subtidal commercial fishing plot adjacent to Pigeon Point revealed an estimated 17,000 basket cockles.

Gaper Clams

Gaper clams are native to Coos Bay and are found in the same areas as butter clams. In Coos Bay they are commonly referred to as Empire clams. Gaper clams prefer a substrate of gravel, shell, and sand mixture. They occupy a depth of 4 to 16 inches in the substrate and are frequently found in eel grass beds.

Gaper clams are plankton feeders, consuming flagellates and diatoms. They are our only winter spawning clam, and they have a free-swimming larval period of about 3 weeks. Gapers reach sexual maturity in 3 to 4 years at an average size of 3 inches. A female will contain several million eggs. Gaper clams are the largest clam found in Coos Bay where they reach a size of 7 to 8 inches and a weight in excess of 3 pounds. Gapers have been found to reach 15 years of age.

Gapers are found intertidally and subtidally and are important in recreational and commercial fisheries. The 1971 Resource-Use Survey (Gaumer et al. 1973) found gaper clams to be the most-harvested clam, making up 38.9% of the total clam harvest.

The gaper clam is also the most important clam in the commercial harvest. Nearly all commercially-harvested gaper clams are taken subtidally, and since 1984 they have been harvested by hand. For many years mechanical equipment (by special permit) was allowed to take subtidal clams in Coos Bay, with gaper clams being the target species. Poor recruitment for gaper clams since 1975 necessitated a change in that harvest policy, and since 1984 no mechanical harvest has been allowed. In 1989, 2,662 pounds were commercially harvested in Coos Bay. The 1985 to 1989 average was 9,252 pounds per year (Table 25).

In 1980 an ODFW survey of a 48-acre subtidal commercial fishing plot adjacent to Pigeon Point revealed an estimated 606,000 gaper clams that weighed 464,000 pounds.

Manila Littleneck Clams

Manila littleneck clams are not native. They were accidentally introduced into Washington as seed clams with oysters from Japan in the 1930s. The Manila littleneck clam has since become the number two producer in Washington's commercial harvest and the demand far exceeds supply. Because of the ease of propagating the Manila littleneck clam, the public's desire for this type of clam, and the noncompetitiveness of this species with other clam

species (Anderson et al. 1982), ODFW, in the 1970s initiated efforts to introduce Manila littleneck clams in Oregon.

Recent successes by the University of Washington, Washington Department of Fisheries, and ODFW suggest that we might see far reaching success in our enhancement efforts. Since 1973, ODFW has introduced an estimated 186,000 Manila littleneck clams into several areas of Coos Bay and South Slough. Recent introductions in the Joe Ney area of South Slough have shown nearly 100% survival one year after release. Manila littleneck clams in test plots under screens have confirmed that very good growth and survival is possible from planted age 0+ seed clams. ODFW anticipates continuing this program in Coos Bay with the goal of developing an adult population of breeding stock. A moratorium is currently in effect on further planting of Manila little neck clams in the South Slough subbasin, as a result of an April 1987 decision by the South Slough National Estuarine Sanctuary Commission.

Manila littleneck clams are plankton feeders. They are spring through fall spawners and are known to spawn several times a year. They have a free-swimming larval period of about four weeks and reach sexual maturity in two years. Manila littleneck clams prefer a substrate of pea-size gravel mixed with sand, shell, and small amounts of mud. They occur at a depth of 1 to 4 inches in the substrate.

Manila littleneck clams are an intertidal species and are usually found at the plus three to plus six foot elevation. The Manila littleneck clams also can tolerate salinities lower than most other species of hardshell native clams. Washington Department of Fisheries has been so impressed by the value on Manila littleneck clams to Washington's economy that they are directing staff to investigate enhancing Manila littleneck clams in their state. Some areas are producing in excess of $65,000 per acre/year for commercial markets.

Native Littleneck Clams

Native littleneck clams are found in the same areas as butter clams. Native littleneck clams prefer a substrate of fine gravel with broken shell and sand intermingled with large rocks. They occupy a depth of 1 to 6 inches in the substrate.

Native littleneck clams are plankton feeders. They are summer spawners and have a free-swimming larval period of about three weeks. They reach sexual maturity in two years and average 1 inch at that time. Littlenecks are relatively slow growing, reaching 1-1/2 inches in three to four years. Occasionally littlenecks in excess of 3 inches occur in the harvest. Littlenecks over eight years of age are rarely observed.

Native littleneck clams are found intertidally and subtidally and are important in the recreational harvest. The 1971 Resource Use Study found that littlenecks made up 5.6% of the recreational harvest. Few littlenecks are taken commercially in Coos Bay. In 1989, only 22 pounds were taken commercially. Commercial harvest for 1985 to 1989 averaged 126 pounds (Table 25).

In 1980 an ODFW survey of a 48-acre subtidal commercial fishing plot adjacent to Pigeon Point revealed an estimated 152,000 littleneck clams.

Northern Razor Clams

Northern razor clams are an open-coast species that occasionally find a site suitable for survival in an estuary. A small population exists in lower Coos Bay. Northern razor clams prefer a pure, somewhat stable sand beach. They generally are found at a depth of 6 to 12 inches in the substrate but when disturbed can rapidly dig beyond the reach of a digger.

Northern razor clams are planktonic feeders. They are spring spawners with a free-swimming larval period of 8 weeks. Large females contain 6 to 10 million eggs. Most northern razor clams are mature by age 3, at an average length of 10 cm.

Northern razor clams are found intertidally and subtidally on the open coast, but to our knowledge are found only intertidally in Coos Bay. A small recreational fishery currently exists in the bay, but none were observed harvested in the 1971 Resource-Use Survey (Gaumer et al. 1973). Northern razor clams are not harvested commercially in Coos Bay.

Softshell Clams

Softshell clams were introduced to the Pacific coast in the 1870s by oystermen introducing oysters from the Atlantic coast. Softshell clams are primarily an intertidal clam in Coos Bay and are found mainly in the upper bay above Empire.

Softshell clams prefer a mud-sand substrate but can be found in large abundance in areas containing a rock-mud mixture. They are found at a depth of 6 to 12 inches in the substrate.

Softshell clams are plankton feeders. They reach sexual maturity at a size of about 1 inch, are summer spawners, and have a free-swimming larval period of about 2 to 5 weeks depending on water temperature. Softshell clams can reach nearly 6 inches in length, and 10-year-old clams have been observed in the recreational harvest.

The intertidal stocks of softshell clams are quite extensive in the upper bay and support an important recreational fishery. The 1971 Resource-Use Survey (Gaumer 1973) found that softshell clams made up 16.3% of the recreational harvest. Few are taken commercially in Coos Bay. In 1989, 225 pounds were commercially harvested. An average of 184 pounds per year were taken for the 1985 to 1989 period, (Table 25).

ODFW has conducted intertidal surveys on all the tideflats from the mouth of Coos Bay up to Eastside. South Slough tideflats were surveyed up to Yonkers Point. Subtidal surveys were completed in main Coos Bay up to Empire and in South Slough up to Yonkers Point. Clam distribution and abundance by species were recorded along with information on shrimp distribution and abundance, vegetation type, and substrate type.

Objectives

Objective 1. Maintain the abundance, diversity, and required habitat of each clam species.

Assumptions and Rationale

1. Continued regulation and monitoring of recreational and commercial harvests will allow current users to benefit from the resource while maintaining abundance and diversity for future harvests.

2. The quantity and quality of habitat required by clam species will be maintained through estuarine habitat protection measures and continued coordinated efforts with other agencies.

Problems and Recommended Actions

Problem 1. Information on fishery trends and on clam availability, size, age, and distribution is limited.

Action 1.1 Continue and expand the collection of information on trends in fishery effort and on species availability, size, and age.

Action 1.2 Continue intertidal and subtidal surveys of Coos Bay, and resurvey other previously surveyed areas to update distribution and abundance information.

Operating Principle 1. No further introduction of the Manila littleneck clam shall occur in the South Slough subbasin.

Objective 2. Where acceptable, enhance populations of Manila littleneck clam and native clam species.

Assumptions and Rationale

1. Manila littleneck clams propagate easily, are desired by the public, and have not been shown to compete with native clam species.

2. Opportunities exist for enhancement that could improve harvest and help maintain abundance of native clam species through years of poor natural recruitment.

Problems and Recommended Actions

Problem 1. Information on specific enhancement needs is limited.

Action 1.1 Evaluate natural recruitment success as a means of determining if and when enhancement is needed.

Problem 2. Because natural recruitment success is cyclic, enhancement efforts may be unsuccessful if done at the wrong time.

Action 2.1 Document and predict the cyclic nature of recruitment success.

Problem 3. Since Manila littleneck clams are not native, introducing them into South Slough may be detrimental to the native fauna of the protected estuary.

Action 3.1 Do not plant any more Manila littleneck clams in the South Slough subbasin.

Objective 3. Open more subtidal areas of the bay to commercial harvest.

Assumptions and Rationale

1. Increased harvest will not adversely affect the resource.

Problems and Recommended Actions

Problem 1. Poor water quality has occasionally kept commercial harvesters out of certain areas.

Action 1.1 Work with the State Health Division and DEQ to improve water quality.

GHOST AND MUD SHRIMP

Background

Ghost and mud shrimp are both native to and widely distributed throughout Coos Bay. Ghost shrimp are an intertidal species, whereas mud shrimp occur from the intertidal zone to a depth of 30 feet in the subtidal zone. Ghost shrimp prefer a sandy-mud substrate. Mud shrimp prefer a muddy-sand substrate. Both live in burrows and can be found several feet deep in the substrate.

Both species are detritus feeders. Ghost shrimp obtain food by ingesting mud or by filtering water. Mud shrimp only filter water. Reproduction occurs in summer for ghost shrimp and winter for mud shrimp. Ghost shrimp are capable of producing three or four broods per year. Larvae of both species are free-swimming for several weeks and are generally flushed out to sea on outgoing tides. Both species may live as long as 15 years.

Both species are taken by recreational and commercial fishermen for fish bait. Shrimp can be taken recreationally by hand or may be pumped mechanically with the proper permit. No catch limits are imposed. Commercial users must have a bait license and the proper permit to take shrimp. The 1971 Oregon Fish Commission Resource-Use Survey in Coos Bay (Gaumer et al. 1973) showed over 20,000 ghost shrimp taken by recreationists, but only 116 mud shrimp were taken. Commercial landings for 1986 showed 2,392 pounds of ghost shrimp and 9,347 pounds of mud shrimp harvested. For 1982 to 1986, combined landings averaged 2,779 pounds per year.

Recent market development in California for mud and ghost shrimp for use as bait (referred to as bait shrimp) has created a tremendous increase in interest in supplies of bait shrimp. To date, market far exceeds supply.

ODFW has completed shrimp surveys (Thomas F. Gaumer, Oregon Department of Fish and Wildlife, Newport, Oregon, unpublished data) on all Coos Bay tideflats. Unfortunately, under existing harvest techniques, many of the shrimp are inaccessible to commercial pumpers.

Ghost shrimp (and to some degree mud shrimp), because of their burrowing behavior, cause considerable harm to oyster grounds and clam beds. The "plowing" of the substrate by both shrimp species precludes clam set from settling out in these areas and can smother adult oysters.

Objectives

Objective 1. Maintain self-sustaining populations of ghost and mud shrimp in sufficient abundance to support bait fisheries.

Assumptions and Rationale

1. Biological and ecological problems associated with the current fishery are minimal.

2. No substantial restrictions are imposed on the taking of ghost and mud shrimp as the fishery is basically self-regulating, much of the population is inaccessible to commercial pumpers.

Problems and Recommended Actions

Problem 1. We have no definitive studies on whether biological or ecological problems exist or could occur with the current fishery.

Action 1.1 Continue to monitor the commercial fishery to determine catch and identify trends in catch.

Action 1.2 Update information on abundance and distribution of ghost and mud shrimp in Coos Bay.

Action 1.3 Determine effects of shrimping on recruitment and adult shrimp populations.

Action 1.4 Determine effects of commercial shrimping on different clam species.

Problem 2. Information on the ecological role of ghost and mud shrimp in the estuary is limited.

Action 2.1 Encourage research by ODFW and other agencies or institutions to determine the role ghost and mud shrimp play as forage in the estuarine food web.

OTHER SHELLFISH SPECIES

SPECIES

Other shellfish important in the Coos Bay estuary not previously discussed are listed in APPENDIX A.

Background

These species, and numerous others not listed, function in a number of ecological roles in the Coos system, primarily in the estuary. Some of these species are valuable as food items for important fish species and some are the subjects of scientific studies, individually or as part of ecological communities. These organisms also act as indicators of the overall health of the ecosystem. In addition, crayfish, bay mussels, the piddocks, Macoma and jackknife clams, and red rock crabs are harvested recreationally. Oysters are harvested commercially.

The abundance, distribution, and habitat preferences of these shellfishes are varied. Most are benthic, and the group as a whole tolerates a wide range of salinities.

This group includes native species such as the red rock crab (commonly called the Japanese crab) and exotics introduced to Coos Bay including the Japanese shrimp.

State law states that all oysters are private property and as such are not managed by ODFW or harvested as a common property resource. Oysters are under the management jurisdiction of the Department of Agriculture.

Objectives

Objective 1. Maintain the abundance of crawfish, red rock crab, clams, mussels, and piddocks.

Assumptions and Rationale

1. Daily catch limits will prevent overharvest of those species harvested recreationally.

2. Estuarine habitat protection measures will help maintain the required habitat for these species.

ANGLER ACCESS

Background

Concerns exist for the quantity and the quality of angler access throughout the basin. Access to the South Coos River is limited because much of the river is behind a locked gate on private land. The gate is generally opened to the public on holidays and weekends when Weyerhaeuser is not hauling logs. When open, 25 miles of stream are accessible to fishing. Road access along the Millicoma River is unrestricted, but private land ownership limits bank access. Bank access around the lower bay is blocked by private ownership. Additional access is needed throughout the bay and upper basin in the form of boat ramps, bank access, and public fishing and crabbing piers (Figure 3). Some existing boat ramps are in poor condition and are nearly unusable. Improvement and maintenance of existing sites are needed. Additional public piers in the bay for fishing and crabbing convenience would increase opportunities for using the resource.

Objectives

Objective 1. Develop additional access sites around Coos Bay and in the upper basin.

Assumptions and Rationale

1. Additional access sites would increase opportunities for using fish and shellfish resources. Some fish species are underused in fisheries because of access limitations.

2. Access sites will include bank access, boat ramps, and public piers. Priority areas are identified in Figure 3.

Problems and Recommended Actions

Problem 1. Opportunities for developing bank access are limited by private ownership.

Action 1.1 Explore all cooperative efforts between landowners and ODFW and negotiate with landowners to gain additional access and maintain or improve existing access. Include the use of incentives that encourage donation of sites.

Problem 2. Agencies other than ODFW control land and water development at some identified potential access sites.

Action 2.1 Coordinate with other agencies to promote the integration of angler access into shoreline development.

Action 2.2 Work with the Oregon State Marine Board and other agencies to identify and develop access sites.

Problem 3. Funds are not always available for purchasing access sites.

Action 3.1 Seek legislative funds to use in expanding the access program.

Action 3.2 Cooperate and coordinate with recreational groups to use volunteer work forces and donated money to secure, develop, and maintain access sites.

Objective 2. Maintain and improve existing access sites in the Coos River basin.

Assumptions and Rationale

1. Some existing boat ramps are in poor repair and are nearly unusable.

2. Priority areas are identified in Figure 3.

Problems and Recommended Actions

Problem 1. Landowners on Palouse and Larson sloughs, and other areas, have the option of closing off their lands to anglers.

Action 1.1 Develop educational programs to reduce conflicts between anglers and landowners.

Problem 2. Funds are not always available to maintain or improve access sites.

Action 2.1 Negotiate with landowners to maintain or improve existing sites.

See Actions 3.1, and 3.2 under Objective 1 also.

Problem 3. Road access along the forks of the Millicoma River is open at any time, but private land ownership restricts riverbank access.

Action 3.1 Encourage private landowners whose holdings border rivers to continue to allow entry onto their land and road systems.

Problem 4. Parking is inadequate at some clam bed access sites.

Action 4.1 Work with state and local road departments to improve parking at these sites.

Problem 5. Access sites are not under jurisdiction of ODFW.

Action 5.1 Inform managing agencies of status of access sites and recommend improvements.

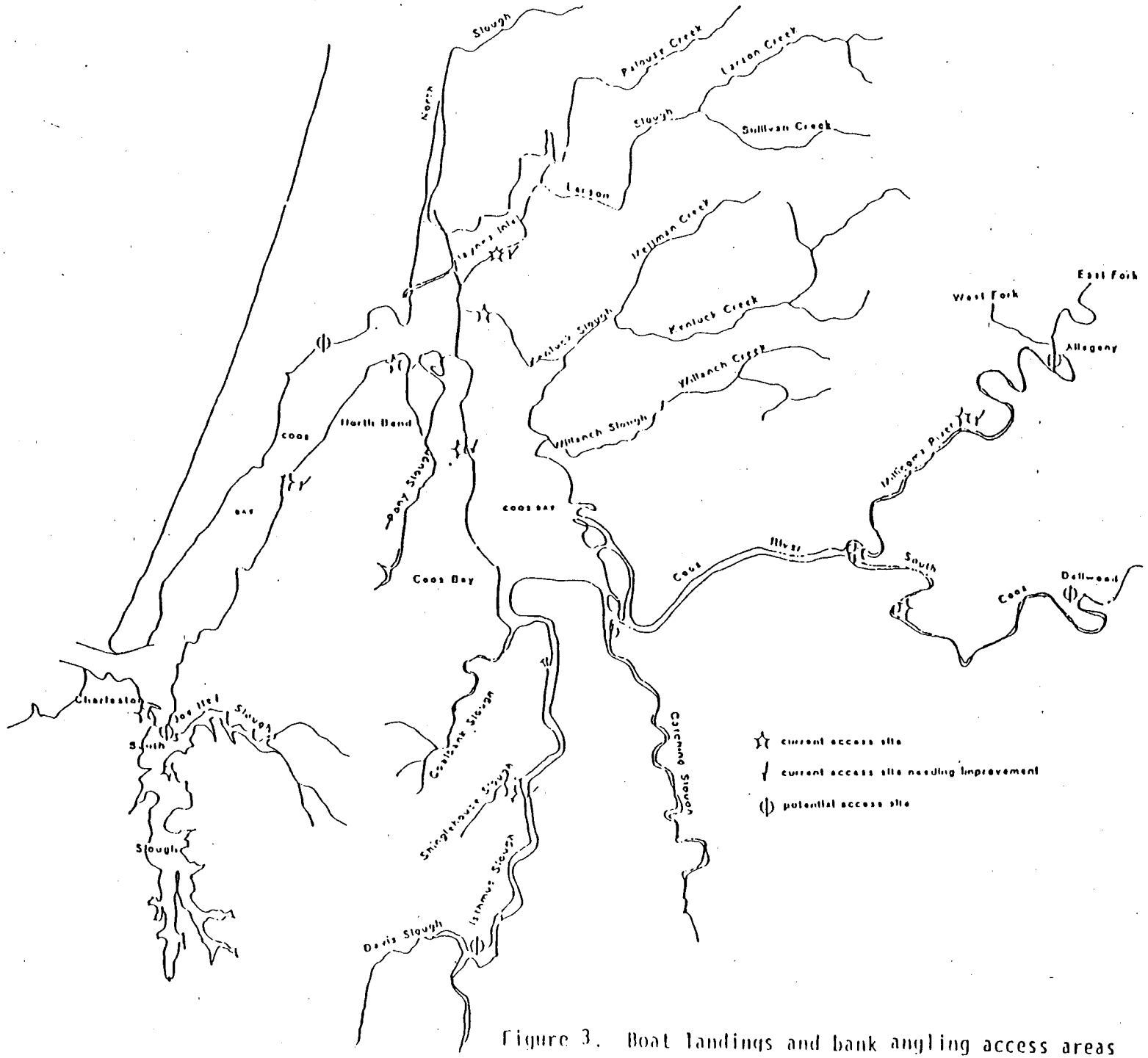

Figure 3. Boat landings and bank angling access areas

ANGLING LAW ENFORCEMENT

Background

Angling regulations enforced by OSP exist to protect our fishery resources and to permit an orderly and equitable use of the resource. Violations that involve the illegal harvest of fish and shellfish occur in the Coos basin. Commonly occurring shellfish harvest violations include taking undersize crabs and exceeding catch limits on clams. Trout angling in streams prior to the opening of the season occurs occasionally. Snagging and pitchforking of salmon is a problem in some locations.

Although the State Police are responsible for enforcing regulations, ODFW can assist in curtailing illegal harvest through the following objective.

Objectives

Objective 1. Reduce the illegal harvest of fish and shellfish resources through coordinated efforts with OSP.

Assumptions and Rationale

1. Violations of fish and shellfish regulations occur in Coos Bay.

2. Foul-hooking of salmon may increase with the development of fisheries resulting from the release program at Anadromous, Inc.

Problems and Recommended Actions

Problem 1. The rationale behind specific angling regulations is not always understood by the public, nor are the resource effects of illegal harvesting.

Action 1.1 Increase efforts to educate anglers (especially young ones) and the general public as to the reasons for and benefits of angling regulations and of the detriments of illegal harvesting; and encourage their help in apprehending violators.

Problem 2. People are not always aware of the penalties of violating regulations.

Action 2.1 Work with sportsmen's groups to organize and to pressure the courts to deliver substantial penalties to violators, and encourage newspapers to publish the results.

Problem 3. OSP troopers are not always available to be on hand to apprehend violators.

Action 3.1 Encourage the legislature to provide adequate law enforcement staffing.

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APPENDIX A

Fish and Shellfish Included in this Plan

FISH SPECIES

This plan includes 82 species of fish and 34 species of invertebrates in the Coos River basin (Tables 1 and 2).

Table 1. Fish species occuring in the Coos River basin.

Common name	Scientific name
Lampreys	**Petromyzontidae**
Pacific lamprey	*Lampetra tridentata*
Western brook lamprey	*Lampetra richardsoni*
Requiem sharks	**Carcharhinidae**
Leopard shark	*Triakis semifasciata*
Dogfish sharks	**Squalidae**
Spiny dogfish	*Squalus acanthias*
Skates	**Rajidae**
Big skate	*Raja binoculata*
Sturgeons	**Acipenseridae**
Green sturgeon	*Acipenser medirostris*
White sturgeon	*Acipenser transmontanus*
Herrings	**Clupeidae**
American shad	*Alosa sapidissima*
Pacific herring	*Clupea harengus pallasi*
Anchovies	**Engraulidae**
Northern anchovy	*Engraulis mordax*
Trouts	**Salmonidae**
Chum salmon	*Oncorhynchus keta*
Coho salmon	*Oncorhynchus kisutch*
Chinook salmon	*Oncorhynchus tshawytscha*
Cutthroat trout	*Oncorhynchus clarki*
Steelhead	*Oncorhynchus mykiss*
Brook trout	*Salvelinus fontinalis*
Smelts	**Osmeridae**
Whitebait smelt	*Allosmerus elongatus*
Surf smelt	*Hypomesus pretiosus*
Longfin smelt	*Spirinchus thaleichthys*
Eulachon	*Thaleichthys pacificus*

Table 1. Continued

Common name	Scientific name
Lancetfishes	**Alepisauridae**
Longnose lancetfish	*Alepisaurus ferox*
Carps and minnows	**Cyprinidae**
Longnose dace	*Rhinichthys cataractae*
Speckled dace	*Rhinichthys osculus*
Redside shiner	*Richardsonius balteatus*
Suckers	**Catostomidae**
Largescale sucker	*Catostomus macrocheilus*
Clingfishes	**Gabiesocidae**
Northern clingfish	*Gobiesox maeandricus*
Codfishes	**Gadidae**
Pacific tomcod	*Microgadus proximus*
Silversides	**Atherinidae**
Topsmelt	*Atherinops affinis*
Jacksmelt	*Atherinopsis californiensis*
Stickelbacks	**Gasterosteidae**
Tube-snout	*Aulorhynchus flavidus*
Threespine stickleback	*Gasterosteus aculeatus*
Pipefishes	**Syngnathidae**
Bay pipefish	*Syngnathus leptorhynchus*
Temperate basses	**Percichthyidae**
Striped bass	*Morone saxatilis*
Hybrid bass	*Morone saxatilis x M. chrysops*
Pomfrets	**Bramidae**
Pacific pomfret	*Brama japonica*
Drums	**Sciaenidae**
White seabass	*Atractoscion nobilis*
Surfperches	**Embiotocidae**
Redtail surfperch	*Amphistichus rhodoterus*
Shiner perch	*Cymatogaster aggregata*
Striped seaperch	*Embiotoca lateralis*
Walleye surfperch	*Hyperprosopon argenteum*
Silver surfperch	*Hyperprosopon ellipticum*
White seaperch	*Phanerodon furcatus*
Pile perch	*Rhacochilus vacca*

Table 1. Continued.

Common name	Scientific name
Sandfishes	**Trichodontidae**
Pacific sandfish	*Trichodon trichodon*
Prickelbacks	**Stichaeidae**
High cockscomb	*Anoplarchus purpurescens*
Snake prickleback	*Lumpenus sagitta*
Gunnels	**Pholidae**
Penpoint gunnel	*Apodichthys flavidus*
Saddleback gunnel	*Pholis ornata*
Wolffishes	**Anarhichadidae**
Wolf-eel	*Anarrhichthys ocellatus*
Sand lances	**Ammodytidae**
Pacific sand lance	*Ammodytes hexapterus*
Gobies	**Gobiidae**
Arrow goby	*Clevelandia ios*
Bay goby	*Lepidogobius lepidus*
Butterfishes	**Stromateidae**
Pacific pompano	*Peprilus simillimus*
Scorpionfishes	**Scorpaenidae**
Copper rockfish	*Sebastes caurinus*
Quillback rockfish	*Sebastes maliger*
Black rockfish	*Sebastes melanops*
Blue rockfish	*Sebastes mystinus*
China rockfish	*Sebastes nebulosus*
Bocaccio	*Sebastes paucispinis*
Canary rockfish	*Sebastes pinniger*
Grass rockfish	*Sebastes rastrelliger*
Greenlings	**Hexagrammidae**
Kelp greenling	*Hexagrammos decagrammus*
Rock greenling	*Hexagrammos lagocephalus*
Lingcod	*Ophiodon elongatus*

Table 1. Continued.

Common name	Scientific name
Sculpins	**Cottidae**
Padded sculpin	*Artedius fenestralis*
Silverspotted sculpin	*Blepsias cirrhosus*
Mosshead sculpin	*Clinocottus globiceps*
Coastrange sculpin	*Cottus aleuticus*
Prickly sculpin	*Cottus asper*
Reticulate sculpin	*Cottus perplexus*
Buffalo sculpin	*Enophrys bison*
Red Irish lord	*Hemilepidotus hemilepidotus*
Pacific staghorn sculpin	*Leptocottus armatus*
Tidepool sculpin	*Oligocottus maculosus*
Fluffy sculpin	*Oligocottus snyderi*
Cabezon	*Scorpaenichthys marmoratus*
Poachers	**Agonidae**
Tubenose poacher	*Pallasina barbata*
Lefteye flounders	**Bothidae**
Speckled sanddab	*Citharichthys stigmaeus*
Righteye flounders	**Pleuronectidae**
English sole	*Parophrys vetulus*
Starry flounder	*Platichthys stellatus*
Sand sole	*Psettichthys melanostictus*
Toadfishes	**Batrachoididae**
Plainfin midshipman	*Porichthys notatus*

Table 2. Key invertebrate species occurring in the Coos River basin.

Common name	Scientific name
Clams, mussels, and oysters	**Bivalvia**
Pea pod borer	*Adula californiensis*
Basket cockle	*Clinocardium nuttallii*
Pacific oyster	*Crassostrea gigas*
False mya	*Cryptomya californica*
Nestling saxicave	*Hiatella arctica*
Baltic Macoma clam	*Macoma balthica*
Irus clam	*Macoma inquinata*
Bentnose clam	*Macoma nasuta*
Freshwater mussel	*Margaritifera margaritifera*
Soft-shell clam	*Mya arenaria*
Bay mussel	*Mytilus edulis*
Native oyster	*Ostrea lurida*
Common piddock	*Penitella penita*
Native littleneck clam	*Protothaca staminea*
Butter clam	*Saxidomus giganteus*
Northern razor clam	*Siliqua patula*
Jacknife clam	*Solen sicarius*
Manila littleneck clam	*Tapes philippinarum*
Bodega tellen	*Tellina bodegensis*
Gaper clam	*Tresus capax*
Rough piddock	*Zirfaea pilsbryi*
Crustaceans	**Crustacea**
Crabs and shrimps	**Decapoda**
Ghost shrimp	*Callianassa californiensis*
Dungeness crab	*Cancer magister*
Red rock crab	*Cancer productus*
Alaskan gray shrimp	*Crangon alaskensis*
Common gray shrimp	*Crangon franciscorum*
Bay shrimp	*Crangon nigricauda*
Sand shrimp	*Crangon stylirostris*
Hairy shore crab	*Hemigrapsus oregonensis*
Lined shore crab	*Pachygrapsus crassipes*
Native crayfish	*Pacifastacus leniusculus*
Japanese shrimp	*Palaemon macrodactylus*
Kelp crab	*Pugettia producta*
Mud shrimp	*Upogebia pugettensis*