

Long Tom Subbasin Fish Management Plan

Patrick J. Connolly
Mark G. Wade
James M. Hutchison
Jeffrey S. Ziller

Oregon Department of Fish and Wildlife

March 1991

CONTENTS

	<u>Page</u>
INTRODUCTION	1
GENERAL CONSTRAINTS	2
HABITAT	3
Background and Status	3
Description of Habitat	3
Legal Considerations	7
Habitat Management	8
Policies	11
Objectives	11
WARMWATER GAME FISH	13
Status and Background	13
Origin	13
Life History and Population Characteristics	13
Hatchery Production	13
Angling and Harvest	13
Management Considerations	13
Management Alternatives	13
Objectives	16
TROUT	18
Background and Status	18
Origin	18
Life History and Population Characteristics	18
Hatchery Production	19
Angling and Harvest	20
Management Considerations	20
Management Alternatives	20
Policies	20
Objectives	20
COHO	22
Background and Status	22
Origin	22
Hatchery Production	22
Angling and Harvest	22
Management Considerations	23
Objectives	23
ANGLING ACCESS	24
Background and Status	24
Policies	24
Objectives	24
IMPLEMENTATION AND REVIEW	25
PRIORITIES	26
REFERENCES	28

INTRODUCTION

The Fish Management Policy of the Oregon Department of Fish and Wildlife (ODFW) requires that management plans be prepared for each basin or management unit. The area covered by the Long Tom Subbasin Fish Management Plan includes running waters of the Long Tom River and its tributaries. A management plan for Fern Ridge Reservoir will be drafted at a later date.

Basin plans provide the public and other agencies the opportunity to help formulate ODFW management programs. They also provide a comprehensive approach to management of all fish species, and establish management priorities so that ODFW's funds and personnel can be used accordingly. Basin plans place in law (Oregon Administrative Rules) the goals, objectives and policies of basin management.

Preparation of this plan was guided by species plans for trout (ODFW 1987a) and warmwater game fish (ODFW 1987b), and the Willamette Basin Fish Management Plan (ODFW 1988). The species plans contain statewide management goals, guidelines, and objectives that provide general direction for basin management plans. The Willamette Basin Fish Management Plan contains policies that provide general direction for subbasin management plans in the Willamette Valley. Basin-wide concerns in the Willamette Basin Plan are not repeated in this document.

The Long Tom Subbasin Fish Management Plan was developed with the assistance of a public advisory committee and a technical advisory committee. The public advisory committee represented user groups and other interested citizens. The function of this committee was to serve as a sounding board for public interests. The technical advisory committee was composed of representatives of federal and private land management agencies and federal fisheries management agencies. This committee reviewed drafts of the plan.

Sections of this plan cover habitat, the major species or groups of species, and angling access. The sections are organized as:

1. Background and Status -- information that explains the context of the policies, objectives and actions.
2. Policies -- constraints for the objectives and actions.
3. Objectives -- what is to be accomplished.
4. Actions -- how the objective will be achieved.

The habitat and anadromous fish sections were originally prepared as part of the Integrated System Plan for Salmon and Steelhead Production in the Columbia River Basin (Columbia Basin Fish and Wildlife Authority, 1990). These sections have been modified to fit ODFW's format for subbasin plans.

GENERAL CONSTRAINTS

Besides the statewide species plans and the Willamette Plan, the Long Tom Plan must also conform to other 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 Wild Fish Management Policy. Portions of the McKenzie Plan adopted as Administrative Rules are contained in Appendix 3.
3. Procedures developed by ODFW--Manual for Fish Management (1977); A Department Guide for Introductions, Fish Disease Control Guidelines (ODFW 1979) and Transfers of Finfish into Oregon Waters (1982).
4. Agreements with other agencies--e.g., Bureau of Land Management, Army Corps of Engineers.
5. Rules and regulations of other federal, state, and local jurisdictions--e.g., Department of Environmental Quality, Department of Forestry, Department of Land Conservation and Development, Federal Energy Regulatory Commission.

HABITAT

Background and Status

Description of Habitat

The Long Tom subbasin has about 350 miles of perennial streams (Willamette Basin Task Force 1969) that drain 410 square miles of Lane and Benton counties. The Long Tom River originates in the Coast Range Mountains and travels 55 miles before entering the Willamette River at RM 149 (Fig. 1). Its largest tributary, Coyote Creek, enters at RM 27, an area inundated by Fern Ridge Reservoir.

Flows mimic seasonal precipitation, but are affected by water releases from Fern Ridge Dam (Table 1). Average monthly flows near the mouth range from 40 cfs in July to 1,980 cfs in December and average about 700 cfs (U.S. Geological Survey, unpublished).

Stream temperatures in the lower subbasin commonly exceed 70° F in the summer (Table 2). The Long Tom River between Fern Ridge Dam and its mouth can exceed 80° F (Willamette Basin Task Force 1969). High water temperatures severely limit production of salmonids and favor warmwater game fish. Resident cutthroat trout appear not as affected by the warmer water temperatures as other salmonids. Excessive sedimentation is also a problem in many of the low gradient stream reaches.

A small portion of the subbasin drains the geologically older deposits of the Coast Range Mountains, but most of the subbasin courses the recent alluvial deposits of the Willamette Valley. About 95 percent of the subbasin is below 1,000 feet with the highest point at 2,100 feet and the lowest point at 248 feet. Gradients of streams are moderate to low. The headwaters and tributaries of the upper subbasin have higher gradients as they flow through the steeper slopes of the Coast Range (Fig. 2), but the topography quickly flattens. Low gradient reaches typically have mud and silt substrates with limited spawning gravels (Willis et al. 1960).

Upland vegetation varies markedly with elevation and topography. The higher elevation and steeper sloped areas are covered with conifers (Douglas fir, western hemlock and western red cedar). Hardwood stands are more prevalent in lower elevations. Vegetation on the valley floor has been highly modified to agricultural crops.

Riparian overstory vegetation consists of cottonwood, red alder and bigleaf maple. Some riparian zones have been cleared by logging and agriculture uses. Long stretches of the mainstem Long Tom have been channelized and ripped.

Infrequent major storms can cause massive erosion or slides of the unstable clay soils of the upper subbasin and effect water quality for long periods of time (Lane Council of Governments 1983). All tributaries above Fern Ridge Reservoir have low levels of conductance, alkalinity, and chloride (Table 3). None of the mean values for nitrogen or phosphorous exceed state guidelines, but the levels for Amazon and Coyote creeks were close and sometimes exceeded guidelines on individual days (Lane Council of Governments

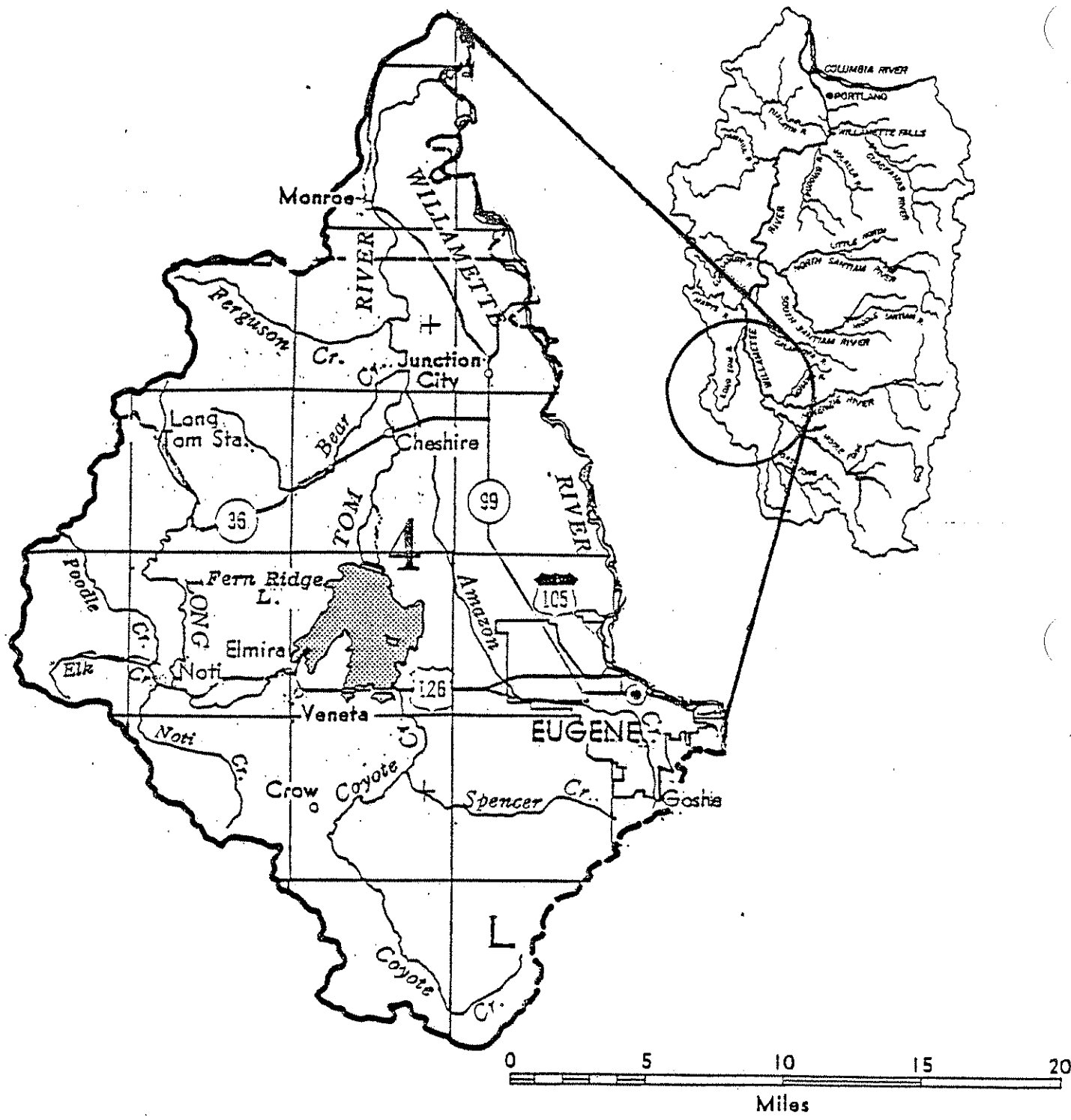


Figure 1. The Long Tom subbasin.

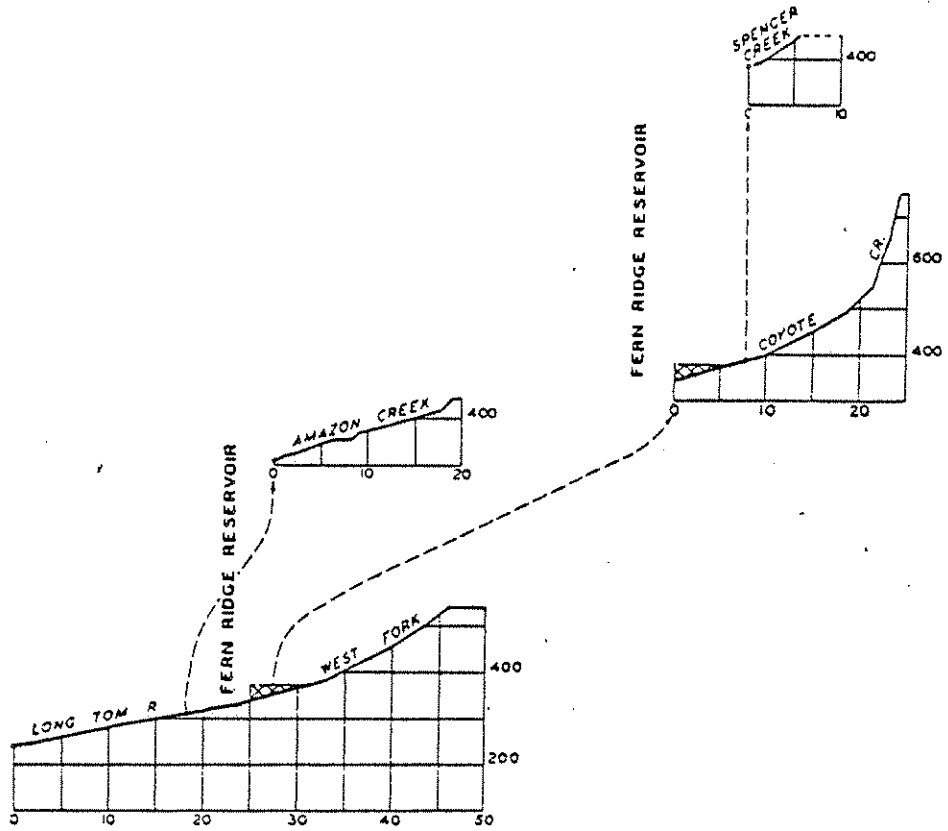


Figure 2. Profiles of stream gradients in the Long Tom Subbasin (WBTF 1969).

Table 1. Monthly and annual discharges at six locations in the Long Tom subbasin (USGS, unpublished data).

Station	Mean discharge (cfs)													Years of record
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Long Tom at Monroe, OR	1,300	1,404	707	534	243	96	39	48	75	870	1,043	1,977	692	1977-86
Long Tom at Alvadore, OR	831	707	339	350	161	78	55	67	79	846	865	1,498	474	1977-85
Long Tom below Fern Ridge Dam	831	801	343	294	140	69	48	61	72	841	795	1,348	469	1977-86
Long Tom at Noti, OR	365	512	334	247	123	68	31	15	21	36	205	495	203	1977-86
Coyote Creek near Crow, OR	296	438	237	180	68	18	4	<1	2	6	153	448	153	1977-86
Amazon Creek at Eugene, OR	18	8	9	4	2	<1	<1	<1	<1	<1	6	14	5	1963-75

Table 2. Water quality characteristics of the Long Tom at its mouth (from DEQ, unpublished).

Characteristic	Seasonal ^a mean values			
	Winter	Spring	Summer	Fall
pH	7.3	7.7	7.6	7.3
Temperature (°F)	46.4	64.5	72.7	49.9
Dissolved Oxygen (mg/l)	11.8	10.8	8.8	11.2
Turbidity (FTU)	30.5	11.1	10.9	27.2

^aWinter = Jan-Mar; Spring = Apr-Jun; Summer = Jul-Sep; Fall = Oct-Dec.

Table 3. Water quality data for the Long Tom subbasin above Fern Ridge Dam (LCOG 1983)

Parameter	Units	Amazon Channel		Coyote Creek		Long Tom R.	
		Mean	Median	Mean	Median	Mean	Median
Flow	cfs	45.1	18.0	421	170	495	280
Temperature	°C	12.8	11.3	12.7	11.3	11.9	11.5
pH	su	7.2	7.2	7.0	7.0	6.9	6.8
Conductance	umho	140	123	100	78	44	38
Secchi	in	16.9	14.2	15.1	16.0	28.8	29
Turbidity	NTU	23.3	24.5	28.1	22.0	9.9	6.9
Tot Coll	#/ml	18.2	1,4.0	33.3	28.0	3.5	2.7
Fecal Coll	#/ml	6.3	4.0	22.4	12.4	1.2	0.8
Total Res.	mg/l	142.2	140.8	107.9	106.0	62.4	59
Non Fil Res	mg/l	28.9	24.0	29.6	34.5	20.9	22
Nitrogen	mg/l	.14	.14	.08	.07	.20	.17
Ammonia	mg/l	.02	.02	.04	.02	.02	.01
Phos Total	mg/l	.10	.09	.10	.10	.05	.05
Phos-Ortho	mg/l	.04	.04	.04	.04	.02	.01
Alkalinity	mg/l	48.6	42.6	26.4	24.3	13.5	12.5
Hardness	mg/l	54.6	46.6	29.7	28.8	11.9	11.1
Chloride	mg/l	10.4	9.0	9.6	6.8	3.7	3.5
DO	mg/l	8.3	.6	8.9	9.6	9.5	9.5
BOD	mg/l	4.4	4.3	4.6	4.9	2.7	2.3
COD	mg/l	20.5	19.3	12.1	11.4	8.3	7.8
Iron	mg/l	903	885	1,166	1,030	814	805
Lead	mg/l	7.4	5.5	14.2	1.0	0.8	1.0

^aExcludes one sample (9-29-81) with extreme pollutant values which greatly skew results.

^bItalicized values exceed state standards or guidelines.

1983). Fecal coliform levels and turbidity can be excessive in Amazon and Coyote creeks.

Land Use

Most (91 percent) of the land in the Long Tom subbasin is privately owned. BLM and USACE are the major federal landowners. Forestry and agriculture are the primary land uses (Table 4)

Table 4. Land use distribution in the Long Tom subbasin above Fern Ridge Dam (from Lane Council of Governments 1983).

		USACE	Urban	Rural	Agric.	Forest	Total
Long Tom River	Sq. mi.	0.5	1.1	2.6	12.7	91.1	108
	%	0.5	1.0	2.4	11.8	84.4	100/39.3
Coyote Creek	Sq. mi.	1.0	0.7	6.6	36.9	61.8	107
	%	0.95	0.65	6.2	34.5	57.7	100/38.9
Amazon Diversion Channel	Sq. mi.	0.1	12.4	3.4	5.9	2.2	24
	%	0.5	51.6	14.3	24.5	9.1	100/13.1
Direct drainages	Sq. mi.	2.2	1.0	10.3	12.4	10.1	36
	%	6.2	2.8	28.5	34.5	28.0	100/13.1
Total basin	Sq. mi.	3.8	15.2	22.9	67.9	165.2	275
	%	1.4	5.5	8.3	24.7	60.1	100/100

About 50% of the watershed is forested with commercial forests generally restricted to the upper reaches of the watershed. Most of the forested lands in the Long Tom subbasin have been logged at least once. Before forest practices were modified to protect streams, high erosion, channel-cutting, debris dams, and extreme losses of riparian and instream cover were common. Timber harvest has caused relatively minor increases in sedimentation and siltation of streams in the Long Tom subbasin (Lane Council of Governments 1983).

About 40% of the subbasin is suitable for agriculture (SWRB 1961). The majority of cultivated lands extend from the mouth of the subbasin up to and surrounding Fern Ridge Reservoir. Above the reservoir, agriculture is limited to the narrow valley floors of the Long Tom and its larger tributaries. Negative effects of agriculture on fish production have been pervasive. Water quality has been severely impacted as a result of excessive water withdrawals and sediment yields. Livestock wastes and other agricultural by-products have caused recurring water quality problems in Coyote Creek (Lane Council of Governments 1983). Substantial decrease and modification of fish habitat has occurred on the Long Tom River as a result of channelization related to

agriculture. Essentially the entire length of the Long Tom from its mouth to Fern Ridge Dam has been modified (G. McGinnis, WRD, pers. commun.).

The western portion of Eugene is drained by Amazon Creek. Small communities in subbasin include Veneta, Monroe and Junction City. Rural residential structures are prevalent. Pollutants from development along Amazon Creek and storm drain runoff have adversely effected fish production.

Fern Ridge Dam on the Long Tom River was completed in 1941 and is operated by the Army Corps of Engineers for flood control, irrigation and navigation. It also provides water for recreation, instream flows, and pollution abatement. No fish passage facilities were provided since anadromous salmonids were considered absent (USACE 1982). However, cutthroat trout that migrate between the Long Tom and Willamette rivers were blocked.

A significant portion of the Long Tom River is allocated for out-of-stream uses (Table 5) and much of the flow is diverted, primarily for irrigation (Table 6). This created low flow problems throughout much of the subbasin. A minimum streamflow of 0 from natural flows and 370 cfs from storage has been established for the Long Tom River below Fern Ridge Dam. This flow is to be provided by releases from Fern Ridge Dam. This flow is not always been met, especially during drought periods (USACE 1980).

Legal Considerations

The Oregon Forest Practices Act (ORS 527.610 to 527.730) was adopted in 1972 and is administered by the Oregon Department of Forestry. Forest Practices Rules regulate commercial timber operations on state and private land and contains provisions to protect aquatic habitat. USFS and BLM have agreed to meet or exceed Forest Practices Rules and state water quality standards. The Forest Practices Act does not apply within the urban growth boundary of towns and cities which may or may not have regulations for stream protection.

The Oregon Removal-Fill Law (OAR 141-85-005 to 141-85-090) requires a permit for the removal or filling of 50 cubic yards or more of material in natural waterways. The Division of State Lands issues permits and enforces the law. ODFW has the opportunity to recommend conditions on permits to protect fish and wildlife

DEQ has developed state water quality standards that are in compliance with federal standards. DEQ administrative rules (Chapter 340, Division 41) address water quality standards for the Long Tom subbasin.

The Oregon Land Conservation and Development Commission has developed statewide planning goals. Goal 5, which addresses fish and wildlife habitat, and Goal 6, which addresses water quality, affect fishery resources. Lane County has adopted a land use plan.

Water rights have not been adjudicated in the Long Tom subbasin.

Senate Bill 140 (ORS 537.332 through 537.360) directed the Water Resources Commission to convert minimum streamflows to instream water rights.

In 1989 the Oregon Fish and Wildlife Commission adopted OAR 635-400-000 through 635-400-040 to identify procedures (including amount of flow) to be followed by ODFW in applying for instream water rights.

Oregon Senate Bill 523 of 1985 initiated a coordinated effort among state agencies for planning and managing water resources.

Oregon House Bill 2990 exempts streams having anadromous fish from hydroelectric development. The Protected Areas program of the Northwest Power Planning Council extended protection to streams significant to resident fish. A total of 16 miles of stream are protected from hydroelectric development in the Long Tom subbasin.

Federal laws protecting fish habitat are listed in Appendix A.

Habitat Management

Cooperation among fishery, land, and water managers is necessary to achieve comprehensive management of the watershed to benefit the entire system and its resources. Other agencies involved in management of fisheries and fish habitat in the Willamette system include:

Federal agencies:

- Army Corps of Engineers (USACE)
- Bonneville Power Administration (BPA)
- Bureau of Land Management (BLM)
- Federal Emergency Management Agency (FEMA)
- Federal Energy Regulatory Commission (FERC)
- Fish and Wildlife Service (USFWS)
- Forest Service (USFS)
- Geological Survey (USGS)
- National Marine Fisheries Service (NMFS)
- National Park Service, National Register of Historic Places (NPS)
- Northwest Power Planning Council (NWPPC)
- Soil Conservation Service (SCS)

State agencies:

- Department of Agriculture (DOA)
- Department of Environmental Quality (DEQ)
- Department of Forestry (DOF)
- Department of Geology and Mineral Industries (DOGMI)
- Department of Land Conservation and Development (LCDC)
- Department of Transportation (ODOT)
- Division of State Lands (DSL)
- Water Resources Department (WRD)

Each of these agencies has regulatory authority over some aspect of land or water use, or has overall responsibility for specific geographic areas. Each of these agencies has its own policies, procedures, and management directives associated with its area of responsibility. ODFW coordinates with these agencies regarding their habitat protection and management programs.

Table 5. Water rights by category in the Long Tom subbasin (WRD, unpublished data).

Stream, Unit	Agriculture	Industrial	Municipal	Domestic	Recreation	Total
Long Tom R.						
cfs ^a	324.1	0	0	0.1	0	324.0
acf ^b	3,312.0	0	0	0	0	3,313.0
Ferguson Creek						
cfs	6.9	0	0	<0.1	0	6.8
acf	0	0	0	0	0	0
Bear Creek						
cfs	37.8	0.1	0	<0.1	<0.1	36.9
acf	0	0	0	0	0	0
Amazon Creek						
cfs	14.9	0	0	0	0	14.9
acf	0	0	0	0	0	0
Amazon Canal						
cfs	0.1	0	0	0	0	0.1
acf	0	0	0	0	0	0
Coyote Creek						
cfs	17.9	0	0	0	0	17.9
acf	38.1	0	0	0	5.0	43.1
Fern Ridge Res.						
cfs	1.1	0	0	0	0	1.1
acf	1,662.8	0	0	0	0	1,662.8
Indian Creek						
cfs	22.9	0	0	0	0	22.9
acf	2,180.4	0	0	0	0	2,180.4
Noti Creek						
cfs	43.0	0	0.2	0.7	0	44.0
acf	0	0	0	0	0	0
Other						
cfs	12.2	0	0	<0.1	0.1	12.4
acf	158.0	0	0	0	0	158.0
Total						
cfs	479.9	0.1	0.2	0.9	0.1	481.2
acf	7,353.3	0	0	0	5.0	7,358.3

^acfs = cubic feet per second.

^bacf = acre feet.

Table 6. Surface water withdrawals by use category in the Long Tom subbasin (USGS, unpublished data).

Use	Quantity (cfs)
Public supply	16.1
Domestic	2.2
Commercial	<0.1
Irrigation	42.9
Livestock	1.5
Industrial	44.3
Mining	<0.1
Total	107.0

Applications for permits issued by other agencies are forwarded to ODFW to review and recommend conditions or denial to avoid impacts on fishery interests. The role of ODFW in habitat protection is not usually through direct management, however, ODFW does have authority to require fish screens and fish passage, can apply for instream water rights to protect fish habitat and can collect value of fish and wildlife destroyed and costs of habitat restoration from polluters.

Memoranda of understanding among ODFW and the Bureau of Land Management (BLM), and the U.S. Army Corps of Engineers (USACE) describe cooperative activities for protecting and improving fish habitat on federal lands. ODFW will comment on a new BLM management plan for western Oregon to be completed in the early 1990s. BLM fish habitat improvement projects are closely coordinated with ODFW. BLM has entered into a memorandum of understanding with ODFW that says in part that BLM agrees "to protect water quality and riparian areas by using appropriate bureau operational guidelines: e.g. buffer strips, proper road and culvert construction, bank stabilization methods, and other practices to minimize erosion from land management activities" (Memorandum of Understanding, ODFW - BLM 1981). Annual contracts with USACE have been established to mitigate for fish production lost as a result of USACE projects.

USACE coordinates its annual operating plan for Willamette Basin reservoirs with the State of Oregon through the Water Resources Department. ODFW recommends opportunities to protect fish and wildlife through reservoir and downstream flow manipulation based on each year's water supply forecast.

The Oregon Water Resources Department (WRD) is updating its water management plan for the Willamette Basin (WRD 1985). The plan affects future water rights, sets priorities for water use, and prescribes actions to solve water problems. ODFW has identified issues for the planning process.

The Governor's Watershed Enhancement Board provides an opportunity for individuals and organizations to be involved in watershed rehabilitation. The board includes a member of the Oregon Fish and Wildlife Commission.

Policies

Policies listed in the Willamette Basin Plan (ODFW 1988) and the Willamette River Subbasin Salmon and Steelhead Production Plan (CBFWA 1990) are applicable to the Long Tom subbasin. Modifications of these policies are scheduled to be presented to the Commission soon after the presentation of this plan.

Objectives

Objective 1. Protect fish populations from impacts caused by land use activities.

Assumptions and Rationale

1. Maintaining high quality habitat is essential to maintaining naturally reproducing fish populations.
2. Logging and related activities on steep slopes and highly erodible soils can be particularly damaging to fish habitat.
3. Water withdrawals reduce available habitat and increases water temperatures. Some streams in the Long Tom subbasin are over-appropriated for out-of-stream use.
4. Instream water rights and other conditions on water use permits, state and federal water quality standards, and zoning restrictions help protect fish habitat.
5. Removal of large woody debris and gravel from streams destroys fish cover and pool habitat, reduces channel stability and increases bank erosion.

Actions

- 1.1 Reduce impacts of logging and related activities on fish habitat by assisting DOF in applying the Forest Practices Rules and working with BLM to protect aquatic habitat from degradation resulting from timber harvest.
- 1.2 Identify stream reaches needing protection and apply for instream water rights.
- 1.3 Review permits, make on-site inspections and perform other such activities in order to assist WRD, DSL, USACE, Lane County and other agencies in protecting habitat.

- 1.4 Promote the STEP storm drain marking and education programs to reduce pollutants entering Amazon creek.
- 1.5 Ensure minimum flows are released from Fern Ridge Dam.
- 1.6 Reduce impacts of diversions on fish by working with the watermaster to ensure that withdrawals do not exceed water rights.
- 1.7 Ensure that all diversions are properly screened and maintained.
- 1.8 Investigate fish kills resulting from spills of hazardous materials and collect value of fish and wildlife destroyed and costs of habitat restoration from polluters.

Objective 2. Restore and enhance riparian and instream fish habitats.

Assumptions and Rationale

1. Habitat restoration and enhancement will increase natural production.
2. Restoration and enhancement projects can play an important role in education and consolidation of support for fishery resources.
3. Current physical and biological stream surveys do not adequately identify habitat factors that limit production and allow evaluation of habitat enhancement needs.

Actions

- 2.1 Update existing physical and biological stream surveys and conduct new surveys. Supplement ODFW efforts with volunteers, sporting clubs, private landowners, and public land management agencies.
- 2.2 Establish basin-wide priorities and implement habitat restoration and enhancement projects.
- 2.3 Identify unnatural barriers to fish passage such as road culverts, diversion structures and check dams. Work with landowners, volunteer groups and individuals to obtain compliance with ODFW fish passage statutes.
- 2.4 Improve passage and encourage routine maintenance at the dam on the Long Tom River at Monroe (RM 7).
- 2.5 Implement ODFW fish screening statutes based on priorities developed through the ODFW Screen Report and basin planning process.

WARMWATER GAME FISH

Status and Background

Origin

Streams in the Long Tom subbasin support populations of largemouth bass, white crappie, black crappie, bluegill, warmouth, brown bullhead, yellow bullhead and pumpkinseed sunfish. These species were introduced into the Willamette basin into the 1800s.

Life History and Population Characteristics

Largemouth bass, bullhead, bluegill, warmouth and crappie exist throughout the Long Tom River below Fern Ridge Dam, but information on the populations is sparse (Table 7). Warmwater game fish, especially crappie, flush from Fern Ridge Reservoir and contribute to populations downstream.

Specific data on the life history characteristics of warmwater game fish in the Long Tom subbasin is lacking. The populations probably do not exhibit life history characteristics substantially different from the general descriptions presented in the Warmwater Game Fish Management Plan.

Hatchery Production

Warmwater game fish populations in the Long Tom subbasin are maintained by natural production.

Angling and Harvest

Creel checks have been spotty, but show the bulk of the angler activity for warmwater fish occurs on the Long Tom River below Fern Ridge Dam.

Management Considerations

The Long Tom River below Fern Ridge Reservoir provides a popular angling opportunity for a variety of warmwater species. Largemouth bass, bluegill, black crappie, white crappie and bullhead provide the majority of the catch. These populations are only lightly harvested and are limited by habitat. Channel catfish have been released and contributed to the catch, but they may no longer be present.

Management Alternatives

One management alternative was developed. Existing populations of largemouth bass, crappie, bluegill and warmouth will be maintained through habitat protection, habitat enhancement and better knowledge of the populations. Angling will be increased by improving access and informing the

public of opportunities. Introductions of new species are possible, but only after careful review.

Table 7. Survey data for warmwater game fish in the Long Tom River (ODFW, unpublished).

Site	Date	Species ^a	Number collected	Size range (cm)
RM 2.5	8/79 ^b	LB	2	4.0-18.6
		WC	2	4.4- 5.6
		BC	3	4.1- 4.4
		Bg	5	2.7- 4.5
		Wm	1	3.0
RM 3.1	8/79 ^c	YB	4	7.1-12.3
RM 3.5	8/79 ^b	LB	2	4.7- 4.8
		Bg	4	2.4- 3.0
RM 3.7	8/79 ^b	LB	1	1.4
		Bg	6	2.0- 4.2
		Wm	13	2.1- 4.3
		BrB	4	7.9- 8.9
		YB	1	6.8
RM 4	8/79 ^b	LB	2	13.1-13.9
		Bg	8	2.9- 4.5
RM 4.7	8/79 ^d	BC	1	4.0
		BrB	1	11.4
		YB	8	4.4- 8.7
RM 7.1	8/79 ^d	WC	52	4.6- 9.1
		BC	1	6.9
		Bg	2	5.0- 5.8
		YB	7	5.6-10.4
RM 16	8/79 ^b	LB	1	8.7
		WC	37	3.2- 5.8
		BC	6	2.8- 4.5
		Bg	9	2.2- 5.6
		BrB	2	7.2- 7.3
		YB	1	6.3

(continued)

Table 7. Continued.

Site	Date	Species ^a	Number collected	Size range (cm)
RM 16.5	8/79 ^b	WC	16	3.3- 5.2
		Bg	2	2.4- 2.5
	8/79 ^d	WC	15	4.5- 5.5
		Wm YB	1 11	4.1 5.8-10.7
RM 18	8/79 ^b	LB	1	5.0
		WC	17	3.2- 6.0
		Bg	7	1.9- 4.1
		Wm	4	2.5- 4.3
		BrB	2	4.3- 5.7
	8/79 ^d	LB	1	4.8
		WC	16	4.6 -9.1
		BrB	2	8.7- 9.1
		YB	1	5.2
	8/79 ^d	WC	20	4.6- 5.7
Bg		7	4.8- 5.7	
YB		9	5.4-12.0	
RM 25	8/79 ^b	LB	78	3.9-10.7
		WC	26	4.6- 8.4
		Bg	5	4.3- 5.0
		BrB	1	5.7
RM 37	8/78 ^e	None	--	--
Owens Creek	8/78 ^d	None	--	--
Ferguson Creek	8/78 ^d	None	--	--
Sturtevant Creek	8/78 ^d	None	--	--

^a LB=Largemouth bass, WC=White crappie, BC=Black crappie, Bg=Bluegill, Wm=Warmouth, BrB=Brown bullhead, YB=Yellow bullhead.

^b Collected by boat electroshocker.

^c Collected by setline.

^d Collected by gillnet.

^e Collected by backpack electroshocker.

Policies

- Policy 1. Any management proposals for warmwater game fish will be reviewed and evaluated for potential effects on indigenous fish species.

Objectives

- Objective 1. Protect and enhance existing warmwater game fish populations.

Assumptions and Rationale

1. Existing populations of largemouth bass, bluegill, black crappie, white crappie and bullhead will provide relatively stable, self-sustaining fisheries if habitat is protected, restored and enhanced.

Actions

- 1.1 Inventory distribution and abundance of all species of warmwater game fish in the Long Tom River below Fern Ridge Dam.
- 1.2 Implement applicable habitat protection actions listed in the Habitat section.
- 1.3 Identify and implement habitat improvement opportunities for largemouth bass, crappie and channel catfish.

- Objective 2. Provide a diversity of warmwater angling opportunities.

Assumptions and Rationale

1. The broad range of opportunities with a variety of species and sizes of fish best fit the Basic Yield option of the Warmwater Game Fish Management Plan.
2. The angling effort for warmwater game fish, especially crappie and largemouth bass would increase with better access and if the public were better informed of opportunities.
3. Introductions of new species of warmwater game fish such as channel catfish will increase angler effort and diversify fisheries.

Actions

- 2.1 Implement appropriate actions listed in the Access section.
- 2.2 Improve collection of information on angling effort and harvest.
- 2.3 Prepare a guide to warmwater angling opportunities in the Upper Willamette Valley.
- 2.4 Continue to inform the public of angling opportunities through ODFW's weekly fishing report.

2.5 Consider releasing channel catfish or other species.

Objective 3. Minimize impacts of new species of warmwater game fish on indigenous species.

Assumptions and Rationale

1. Warmwater game fish can compete with salmonids and other endemic fish and may have a substantial impact on other endemic fauna.
2. Releases of new species of warmwater fish will be evaluated through the ODFW Stocking Policy Review Process.

Actions

- 3.1 Discourage illegal introductions of warmwater game fish by educating angling clubs and other anglers about the possible negative consequences.

TROUT

Background and Status

Origin

Native cutthroat trout are found at least seasonally in almost all streams supporting fish. Fern Ridge Dam and potentially two other artificial barriers between Fern Ridge Dam and Monroe isolate segments of the population. Downstream migration over these barriers is possible which allows a one-way exchange of genetic material between populations.

The provisional inventory of stocks for the Wild Fish Policy lists one stock of cutthroat trout above Fern Ridge Dam and the fish below it as part of the mainstem Willamette group.

Life History and Population Characteristics

Abundance: Density of resident cutthroat trout has not been systematically assessed. Cutthroat trout are relatively numerous in most smaller tributaries (ODFW, unpublished data). Younger cutthroat trout appear to be absent from the Long Tom below Fern Ridge Dam (Ely 1980; ODFW, unpublished survey in 1979) and larger adults appear only seasonally.

Age and Growth: Age structure of cutthroat trout in small tributary streams in the Willamette system has often been found to differ from that of cutthroat trout in lower stream reaches (Moring and Youker 1979). A sample of 21 cutthroat trout in the lower Long Tom River were all 2 or 3 years old. These age structure data indicate that cutthroat trout populations in lower reaches of streams of the Long Tom subbasin may rely heavily upon production in smaller tributaries for recruitment (Moring and Youker 1979). These fish ranged from 6.5 to 10.4 inches fork length at age 2 and between 6.2 and 12.0 at age 3 (Moring and Youker 1979). These lengths are within the range of lengths recorded for other streams of the Willamette Valley.

Time of Spawning: Cutthroat trout in the Willamette Valley spawn over a broad range of time, but mostly from January through March. The only months spawning activity has not been observed are July, October, and November (Moring and Youker 1979). Time of spawning may vary between lower and higher elevation streams and is most likely related to flow and water temperature cycles (Moring and Youker 1979).

Fecundity: Cutthroat trout were collected from the Long Tom below Fern Ridge Dam in 1967-68 and held at Leaburg Hatchery (Moring and Hooton 1978). Hatchery propagated females averaged 11.8 inches with 500-700 eggs at age III and 16.1 inches with 1,300 eggs at age IV. The stock was discontinued in 1991.

Movement and Migration: Cutthroat move out of Fern Ridge Reservoir up the Long Tom in late July or early August (Moring and Youker 1979). This movement could be caused by the water warming in the reservoir.

An upstream movement of larger-sized cutthroat trout during late fall through early summer has been documented in other streams of the Willamette system such as the Marys (Wetherbee, ODFW, unpublished data) and McKenzie (Moring and Youker 1979) rivers. At least some of this movement is related to spawning (Nicholas 1978). Cutthroat trout in small tributaries, however, may exhibit minimal migration (Wyatt 1959; Aho 1977).

Other Stock Characteristics: Cutthroat trout from the Long Tom subbasin have been noted for their unusual ability to survive in warm water (Hutchison et al. 1966) and their unusual silvery, "sea-run" coloration (Moring and Youker 1979).

Hatchery Production

Annual releases of hatchery rainbow trout in the Long Tom subbasin were terminated in the early 1960s (Table 8.) The only releases of hatchery cutthroat trout from 1955 to present are Long Tom stock fry in Coyote Creek in 1987 and 1988 by STEP volunteers.

Table 8. Releases of legal-size rainbow trout in the Long Tom River, 1955-90.

Year	Number released
1955	1,740
1956	1,501
1957	2,001
1958	5,007
1959	4,000
1960	3,998
1961	3,999
1962	4,013
1963	3,930
1964	0
1965	0
1966	0
1967	0
1968	0
1969	0
1970 ^a	300

^a No legal-size rainbow trout have been released since 1970.

Angling and Harvest

Estimates of angler use and catch rate in the subbasin are not well substantiated. Therefore, estimates of total harvest of wild trout are impossible to make with any confidence.

Management Considerations

Natural production of native cutthroat in most small streams of the upper reaches of the Long Tom subbasin provide low intensity self-sustaining fisheries. These small streams also serve as spawning and rearing areas for potamodromous cutthroat that migrate to larger streams and Fern Ridge Reservoir. Few hatchery produced trout have been released since the 1960s. Channelization, removal of riparian vegetation, urban and agricultural runoff, and excessive sediment loads have degraded some streams and, consequently, their cutthroat trout populations have been reduced or eliminated. Fern Ridge Dam and several smaller un-laddered dams below it limit upstream migrations. Logging and road building near streams can create problems such as lack of shade, silt, debris accumulation and impassable road culverts.

Management Alternatives

ODFW considers Willamette cutthroat trout as stocks of concern because of suspected declines in abundance and habitat, but data are lacking. The plan for cutthroat trout presented below emphasizes increased monitoring of distribution and abundance, determining life history characteristics of the populations, protecting the habitat and enhancing habitat where applicable.

The provisional inventory of stocks for the Wild Fish Policy lists the cutthroat trout above Fern Ridge Dam as one stock and the fish below it as part of the mainstem Willamette group. This undoubtedly will change as new information is collected on life history characteristics, migrations and barriers separating populations.

The plan is compatible with the Wild Fish Management Policy. No hatchery trout or steelhead will be released and the annual spawning populations is believed to be much larger than 300 fish. No alternatives were developed.

Policies

Policy 1. Cutthroat trout will be managed for natural production of wild populations consistent with the Wild Fish Management Policy. No hatchery trout will be released.

Objectives

Objective 1. Protect and enhance the productivity of wild cutthroat trout populations.

Assumptions and Rationale

1. Protection, restoration and enhancement of high quality habitat will help maintain the genetic diversity and productivity of wild trout populations.
2. Better information on abundance and life history of cutthroat trout will help identify habitat enhancement opportunities.
3. Willamette basin cutthroat trout are listed as a stock of concern due to insufficient information regarding their status. Cutthroat trout should be given a high priority with respect to population and habitat inventory and monitoring.

Actions

- 1.1 Monitor distribution and relative abundance of wild cutthroat trout.
- 1.2 Conduct life history studies of wild cutthroat trout.
- 1.3 Identify and implement habitat improvement opportunities for cutthroat.

Objective 2. Provide self-sustaining fisheries for cutthroat trout.

Assumptions and Rationale

1. The widely dispersed fisheries cutthroat trout under general regulations best fit the Basic Yield alternative of the Trout Plan.
2. Wild cutthroat trout are available to anglers in most streams.
3. There is limited potential for production of large numbers of large trout.
4. Angling pressure is relatively light.
5. Current harvest levels are unknown.

Actions

- 2.1 Improve monitoring of angler effort, harvest, and catch rate.

COHO

Background and Status

Origin

Coho are not native to the Willamette River above Willamette Falls. In the 1960s coho were widely introduced above the falls including the Long Tom River (Williams 1983). Today, coho are considered absent from the Long Tom subbasin.

Hatchery Production

Early-run Toutle stock yearlings and coastal stock fry were intermittently released from 1967 through 1972 to establish a self-sustaining population (Table 9). Successful natural spawning of coho was documented (Howell et al. 1985), but adult returns were never numerous.

Table 9. Release of coho in the Long Tom subbasin (Williams 1983^a).

Year Hatchery	Fry	Fingerlings	Yearlings	Adults	Release location
1967 Nehalem ^a	26,700				Booker Creek
	12,500				Elk Creek
	15,700				Hayes Creek
	103,600				Main stem
1970 Sandy ^b			16,330		Ferguson Creek
1971 Cascade ^b			17,600		Ferguson Creek
1972 Cascade ^b			14,550		Ferguson Creek

^a Coastal stock.

^b Early run Toutle stock.

Angling and Harvest

No coho were caught from 1975 through 1987 (ODFW 1989). The Long Tom subbasin has been closed to salmon angling since 1980.

Management Considerations

Coho are not native to the Long Tom subbasin. The failure of introduced hatchery fish to establish self-sustaining runs in areas below Fern Ridge Dam has been largely attributed to the high rates of harvest in the ocean and lower Columbia River fisheries (Smith et al. 1983) and low flows in the summer and fall that limit spawning and juvenile production (Howell 1986). Most of the subbasin is not accessible to anadromous fish because Fern Ridge Dam has no fish passage facilities. There are also several smaller dams downstream that hinder passage. Introducing a "late run" stock such as Cowlitz may establish some natural production, unfortunately these fish migrate north in the Pacific Ocean and do not contribute well to Oregon fisheries. Production of native cutthroat trout would be expected to be reduced if coho were introduced. Releases of coho in the Long Tom subbasin are restricted to tagged experimental groups by the Willamette Basin Fish Management Plan (ODFW 1988).

Objectives

Objective 1. The Long Tom subbasin will not be managed for coho.

Assumptions and Rationale

1. The Long Tom subbasin offers little habitat suitable for coho.

ANGLING ACCESS

Background and Status

The State Land Board classifies the Long Tom as navigable from its mouth to RM 11. Classification is based on historical use for log drives. Stream banks of waters designated as navigable are publicly owned up to the ordinary high water mark and can be used by the public for angling. Unless lands above the ordinary high water mark are publicly owned or access is granted by private owners, access can be restricted to boaters only. Nearly all of the stream banks in the Long Tom subbasin are privately owned. Public ownership is concentrated in the upper reaches of the system (BLM) and near Fern Ridge Reservoir.

Policies

Policy 1. ODFW will seek to provide public angling access to allow use of the fish populations, provide a diversity of angling opportunities, and disperse angling effort.

Objectives

Objective 1. Increase access to public waters for angling.

Assumptions and Rationale

1. Three sites are listed by ODFW (1990) as needed for increasing public access: Cox Butte, Monroe, and Crocker's Bridge. These sites are privately owned and require acquisition and development. Although these sites are listed as a low priority relative to other sites statewide, the Cox Butte site probably should be a high priority in recognition of the high use of the Long Tom River by warmwater anglers and the lack of adequate public access in the area.
2. Angling opportunities on the Long Tom River below Fern Ridge Dam are reduced by water release schedules from the reservoir.
3. Public access needs could change as angling pressure changes.

Actions

- 1.1 Acquire and develop an access site at Cox Butte as well as Monroe, and Crocker's Bridge.
- 1.2 Cooperate with the USACE to determine flows that improve opportunities for angling below Fern Ridge Dam.
- 1.3 Periodically review access needs.

IMPLEMENTATION AND REVIEW

This plan is intended to provide both long term and short term direction for management of fish and fisheries in the Long Tom subbasin. It should not be viewed as the final statement on the management of the fish and fisheries in the Long Tom subbasin. The plan will respond to changes in condition of the resources, desires of the public and to new information. A public meeting will be held every two years to review progress towards meeting objectives and to allow input on modifications to the priorities and actions identified in the plan. This review will precede submitting ODFW's biennial budget to the legislature.

Upon adoption by the Oregon Fish and Wildlife Commission, the policies and objectives will become Oregon Administrative Rules. Revision of these rules requires action by the Commission. Every 10 years, the entire plan will be reviewed, revised and the changes in Administrative Rules presented to the Fish and Wildlife Commission for adoption.

PRIORITIES

The following are considered the highest priorities in the Long Tom subbasin:

- Protect fish populations from impacts caused by land use activities.
- Protect and enhance the productivity of wild cutthroat trout.
- Provide additional angling opportunities for warmwater game fish while protecting native species.
- Maintain public access and provide additional sites.

The Long Tom Subbasin Fish Management Plan lists many activities, more than can be completed within existing budgets. Some activities are currently on-going and only need to be continued or modified. Other activities are new and need funding before they can be implemented. In order to achieve the objectives of this plan within ODFW's budgetary and staff limitations, priorities for fund and effort must be identified.

High priority activities were identified for habitat, species and access (Table 10). A "Yes" in the currently funded column denotes that at least some funding is budgeted under existing programs. If addition funds are needed, it is noted in the remarks column.

Table 10. High priority issues in the Long Tom Subbasin Fish Management Plan and funding status.

Issues	Currently Funded	Remarks
HABITAT		
Apply for instream water rights to ensure adequate flow for fish production. (Action 1.2)	Yes	
Prevent impacts of timber harvest on fish production. (Action 1.1)	Yes	
Review permit applications to prevent impacts from development on fish production. (Action 1.3)	Yes	
Enhance habitat for cutthroat trout, largemouth bass and crappie. (Action 2.2)	Yes	Additional funding needed
TROUT		
Determine distribution, abundance and life history of cutthroat trout. (Action 1.1)	Yes	Additional funding needed
WARMWATER		
Determine distribution and abundance of warmwater fish in the Long Tom River below Fern Ridge Dam (Action 1.1)	Yes	Additional funding needed
Develop a warmwater angling guide for the Upper Willamette District. (Action 2.3)	Yes	
ANGLING ACCESS		
Acquire key sites on the Long Tom River below Fern Ridge Dam. (Action 1.1)	Yes	Additional funding needed
Determine flows below Fern Ridge that improve angling. (Action 1.2)	Yes	

REFERENCES

- Aho, R.S. 1977. A population study of the cutthroat trout in an unshaded section of stream. M.S. Thesis. Oregon State University, Corvallis.
- Columbia Basin Fish and Wildlife Authority. 1990. Integrated system plan for salmon and steelhead production in the Columbia River Basin, public review draft. Portland.
- Ely, C. 1980. Wild trout study Willamette River Basin. Administrative Report No. 80-1. Oregon Department of Fish and Wildlife, Portland.
- Howell, P.J. 1986. Willamette basin fish management plan: status and progress 1979-1985. Oregon Department of Fish and Wildlife, Portland.
- Howell, P., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids. Two volumes. Final Report to Bonneville Power Administration (Contract No. DE-AI79-84BP12737), Portland, OR.
- Hutchison, J.M., K.E. Thompson, and J.D. Fortune, Jr. 1966a. The fish and wildlife resources of the upper Willamette basin, Oregon, and their water requirements. Oregon State Game Commission, Portland.
- Lane Council of Governments. 1983. Fern Ridge clean lakes study. Final Report, Eugene, OR.
- Moring, J.R., and R.M. Hooton. 1978. Oregon rainbow and cutthroat trout evaluation. Job Progress Report. Oregon Department of Fish and Wildlife, Portland.
- Moring, J.R., and R.L. Youker. 1979. Oregon rainbow and cutthroat trout evaluation. Final Report. Oregon Department of Fish and Wildlife, Portland.
- Nicholas, J.W. 1978a. A review of the literature and unpublished information on cutthroat trout (*Salmo clarki clarki*) of the Willamette watershed. Information Report 78-1. Oregon Department of Fish and Wildlife, Portland.
- Oregon Department of Fish and Wildlife. 1987a. Oregon's trout plan. Fish Division, Portland.
- Oregon Department of Fish and Wildlife. 1987b. Warmwater game fish management plan. Fish Division, Portland.
- Oregon Department of Fish and Wildlife. 1988. Willamette basin fish management plan. Portland.
- Oregon Department of Fish and Wildlife. 1989. Oregon salmon and steelhead catch data, 1975-86. Fish Division, Portland.
- Oregon Department of Fish and Wildlife. 1990a. Oregon angling access database. Fish Division, Portland.

- Oregon Department of Fish and Wildlife. 1990b. Wild Fish Policy. Fish Division, Portland. Draft.
- Smith, E.M., R.H. Williams, and J.C. Zakei. 1983. Willamette River salmon studies. Annual Progress Report, Oregon Department of Fish and Wildlife, Portland.
- State Water Resources Board. 1961. Upper Willamette River basin. Salem, OR.
- U.S. Army Corps of Engineers. 1980. An environmental impact statement on operations and maintenance of the Willamette reservoir system. Portland, OR.
- U.S. Army Corps of Engineers. 1982. Willamette River projects, hydrologic and temperature effects, preliminary literature review and data analysis. Portland, OR.
- Water Resources Department of Oregon. 1985. Upper Willamette River basin. Before the Water Policy Review Board, Salem.
- Willamette Basin Task Force. 1969. The Willamette basin, comprehensive study of water and related land resources. Pacific Northwest Rivers Basin Commission.
- Williams, R. 1983. Releases of coho salmon into the upper Willamette River, Oregon. Research and Development Section, Oregon Department of Fish and Wildlife, Corvallis.
- Willis, R.A., M.D. Collins, and R.A. Sams. 1960. Environmental survey report pertaining to salmon and steelhead in certain rivers of eastern Oregon and the Willamette River and its tributaries, Part II. Survey reports of the Willamette River and its tributaries. Research Division, Fish Commission of Oregon, Clackamas.
- Wyatt, B. 1959. Observations on the movements and reproduction of the Cascade form of cutthroat trout. M.S. Thesis. Oregon State College, Corvallis.

APPENDIX A

Federal laws protecting fish habitat

Conservation Programs on Public Land Act of 1960: Federal and state agencies cooperatively plan, develop, and maintain programs designed to conserve, rehabilitate, and protect fish, wildlife, and threatened and endangered species.

Endangered Species Act of 1973 - P.L. 93-205, reauthorized 1988: Provides protection for habitat of endangered and threatened species and provides for status review of candidates for listing.

Federal Aid in Wildlife Restoration Act of 1937: Provides funding for wildlife programs such as land acquisition, habitat improvement, research and education.

Federal Aid in Sport Fish Restoration Act of 1950, expanded in 1984 (Wallop-Breaux Act) and amended in 1988: Provides funding for sport fish restoration and fish programs such as land acquisition, habitat improvement, research and education.

Federal Land Policy and Management Act of 1976 -P.L. 94-579: Allows Congress to withdraw or designate federal lands for specified purposes.

Federal Water Pollution Control Act, amended by the Clean Water Act of 1977: Establishes as an objective the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Sections of the act provide authorization for regulations regarding the discharge of pollutants (Section 402) and the disposal of dredged or fill material (Section 404).

Fish and Wildlife Coordination Act of 1934: States that fish and wildlife conservation shall receive equal consideration with water resources development programs.

Flood Control Act of 1936: Legislative mandate authorizing the USACE to study, plan, and construct major flood control works.

Floodplain Management, 1977 - Executive Order 11988: Designed to avoid adverse impacts associated with destruction or modification of floodplains and to mitigate impacts when avoidance cannot be achieved.

Food Security Act of 1985: Designed to reduce erosion and sedimentation in watersheds.

Forest and Rangeland Renewable Resources Planning Act of 1974: Directs management planning process for units of the National Forest System.

Land and Water Conservation Fund Act of 1965 - P.L. 88-578: Provides federal assistance to states for planning, acquisition and development of land and water recreation resources.

Magnuson Fishery Conservation and Management Act: Establishes forum for recommendations to the Pacific Fishery Management Council for establishing harvest rates and for conservation, restoration, and enhancement of habitat of anadromous salmonids.

Mitchell Act of 1938, amended in 1946: Authorized the establishment of hatcheries and fishways for anadromous fish in the Columbia River watershed of Idaho, Washington, and Oregon and annually provides operation and maintenance funding.

Multiple Use - Sustained Yield Act: Authorizes and directs the administration and development of the renewable surface resources of the national forests.

National Environmental Policy Act of 1969: Requires that any federal agency proposing an action that significantly affects the human environment must prepare an environmental impact statement.

National Forest Management Act of 1976: Provides for multiple use and sustained yield of the products and services of National Forest System land; includes legislation for protection of riparian vegetation.

Northwest Power Act of 1980: Creates an interstate policy making and planning body for electrical power and fish and wildlife in the Columbia River Basin.

O&C Act: Principle legal mandate for BLM and USFS management of O&C lands.

Rivers and Harbors Act of 1899: Authorizes the U.S. Army Corps of Engineers to issue permits for many types of activities in navigable waters of the United States.

Sikes Act: Provides for state and federal cooperative management of fisheries resources..

United States - Canada Reciprocal Fisheries Agreement: Governs the harvest of fish stocks of mutual concern.

Water Bank Act of 1970 - P.L. 91-559: Authorizes the Secretary of Agriculture, after coordination with the Secretary of the Interior, to enter into 10-year contracts with landowners to preserve wetlands and retire adjoining agricultural lands. Annual payments to landowners and sharing in the costs of conservation measures are included.

Water Pollution Control Act of 1972 - P.L. 92-500: Precursor to the Clean Water Act. Authorized issuance of permit to discharge fill or dredged material into navigable waters at specified disposal sites.

Water Resources Planning Act of 1965 - P.L. 89-80: Established the Water Resources Council, which issues the "Principles and Standards and

Procedures for Federal Participation in Water and Related Land Resource Planning and Development." The act also authorized establishment of State-Federal River Basin Commissions.

Water Use Act of 1940: Provides domestic, mining, milling and irrigation uses of waters within national forests.

Watershed Protection and Flood Prevention Act of 1954: Assures cooperation of the federal government with state and local agencies in preventing damage from floodwater, erosion and sediment.

Wild and Scenic Rivers Act of 1968, revised 1988: Designates selected rivers for protection under the National Wild and Scenic Rivers System, which preserves scenic, recreational and fish and wildlife characteristics.

Wilderness Act of 1964: Preserves selected units of land for their wilderness characteristics.