MALHEUR RIVER BASIN

Fish Management Plan

Oregon Department of Fish & Wildlife

Malheur River Basin Fish Management Plan

Prepared by

Mary L. Hanson
Robert C. Buckman
William E. Hosford

Oregon Department of Fish and Wildlife

and

Gary W. Adams
William W. Weare, M.D.
Ron Wiley
George Zinie
Herbert B. Futter
Kirk Wolff
Mike Wilber
Kenneth C. Osborn, D.M.D

Citizen Task Force

July 1990

CONTENTS

	Page
INTRODUCTION	1
Organization of the Malheur Plan	1
General Policies and Guidelines	2
IMPLEMENTATION	5
HABITAT	10
Background and Status	10
Policies	24
Objectives	24
FISHERY RESOURCE	29
Background and Status	29
MALHEUR RIVER HEADWATERS AND TRIBUTARIES	32
Background and Status	32
Policies	45
Objectives	45
MIDDLE FORK MALHEUR RIVER ABOVE WARM SPRINGS RESERVOIR AND MAINSTEM SOUTH FORK MALHEUR RIVER	50
Background and Status	50
Policies	55
Objectives	55
MALHEUR RIVER AND NORTH FORK MAINSTEMS - RESERVOIRS DOWNSTREAM TO NAMORF DAM	57
Background and Status	57
Policies	64
Objectives	64
LOWER MALHEUR RIVER	67
Background and Status	67
Policies	70
Objective	70
RESERVOIRS	71
Background and Status	71
Policies	88
Objectives	89
CRAYFISH	93
Background and Status	93
Policy	94
Objectives	94

ACCESS 95
Background and Status 95
Policies 96
Objectives 96

REFERENCES 99

APPENDIX A. Plans and Policies that Guide Fish Management in Oregon . . 102

APPENDIX B. Southeast District 1987 Angler Survey Summary 107

APPENDIX C. Malheur Basin Fish Management Policies and Objectives . . . 123

APPENDIX D. Recommended Minimum Flows (cfs) for the Malheur River Basin 127

APPENDIX E. Fish Species Found in the Malheur River Basin 128

APPENDIX F. Summary of Inventory Information for Streams in the Malheur Drainage 130

APPENDIX G. Summary of Streams in the Malheur Drainage Where Coldwater Game Fish Have Been Identified 134

ACKNOWLEDGEMENTS

This plan is the result of efforts of many individuals both within the Oregon Department of Fish and Wildlife and outside the agency. Staff members who reviewed the various drafts and offered timely and constructive comments include Ray Temple, Jim Griggs, Phil Howell, Tom Nickelson, Nancy MacHugh, Bob Hooten, and Ron Bartels.

The authors wish especially to thank the task force members for their generous contribution of time, expertise, and insights in the development of the plan. Their participation was vital in incorporating public concerns into the planning process.

The large fold-out maps were done by Ellen Bartsch-Jones, cartographer, of the Cartographic Center, Portland State University. Additional maps and revisions were completed by Milton Hill of the Oregon Department of Fish and Wildlife.

INTRODUCTION

The Malheur Basin Fish Management Plan, (hereafter referred to as the Malheur Plan) is part of a statewide planning effort by the Oregon Department of Fish and Wildlife (ODFW) as directed by Oregon's Fish Management Policy (OAR 635-07-515). This policy requires development of management plans to "set forth goals, policies, and objectives for management of species and waterbodies, or areas". The planning effort will result in a more efficient allocation of manpower and money to solve fish resource problems while also achieving statewide goals of fish production and management.

Species management plans drafted by ODFW are the strategic planning documents for fish management statewide, and provide guidelines for individual species. The Trout Plan (OAR 635-500-100) and Warmwater Fish Plan (OAR 635-500-045) are the species plans relevant to the Malheur River Basin. A synopsis of options and alternatives available under these plans is included in **APPENDIX A.**

Basin and subbasin plans incorporate direction given in the species plans and identify management strategies specific to discreet stream systems. The Malheur Plan identifies ODFW fish management objectives in the Malheur River basin and provides an operational strategy for achieving those objectives.

Public input to the Malheur Plan was provided by a citizens task force made of up of individuals representing a cross section of the angling public in the basin. Task force members were from the Burns-Hines area, John Day, Drewsey, and the Vale-Ontario area, and included several natural resource professionals who provided additional technical assistance. Other task force members provided expertise on warmwater fisheries, trout fisheries, and the concerns of irrigators and the ranching community. In addition, an angler survey was conducted during the summer of 1987 to obtain information on angler use and preferences in southeastern Oregon. Public meetings were held in Burns and Ontario to generate input from the public at large. **APPENDIX B** is a summary of the angler survey.

Organization of the Malheur Plan

Following the section on implementation the Malheur Plan is divided into a habitat section, seven sections on the fishery resource, and an access section. First, the habitat section provides habitat objectives that are appropriate to management throughout the basin. After an introductory section on fishery resources, the Plan is divided into five geographic areas where management concerns and options were generally similar (Table 1, Figure 1). Objectives for fisheries management and specific habitat concerns were developed for each of these areas. An additional section on crayfish follows this. Finally, the access section details objectives for improving angler access in the basin.

The habitat, fishery resource (except for the introductory section), and access sections begin with background material pertaining to recommended objectives and actions. Each section concludes with the following:

Policies--mandatory operating principles developed specifically for management activities in the basin or area related to that species or topics;

Objectives--what is intended to be accomplished;

Assumptions and Rationale--support and justification for objectives;

Problems--obstacles to achieving the objectives; and

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

Table 1. Fishery resources included in the Malheur River Basin Fish Management Plan.

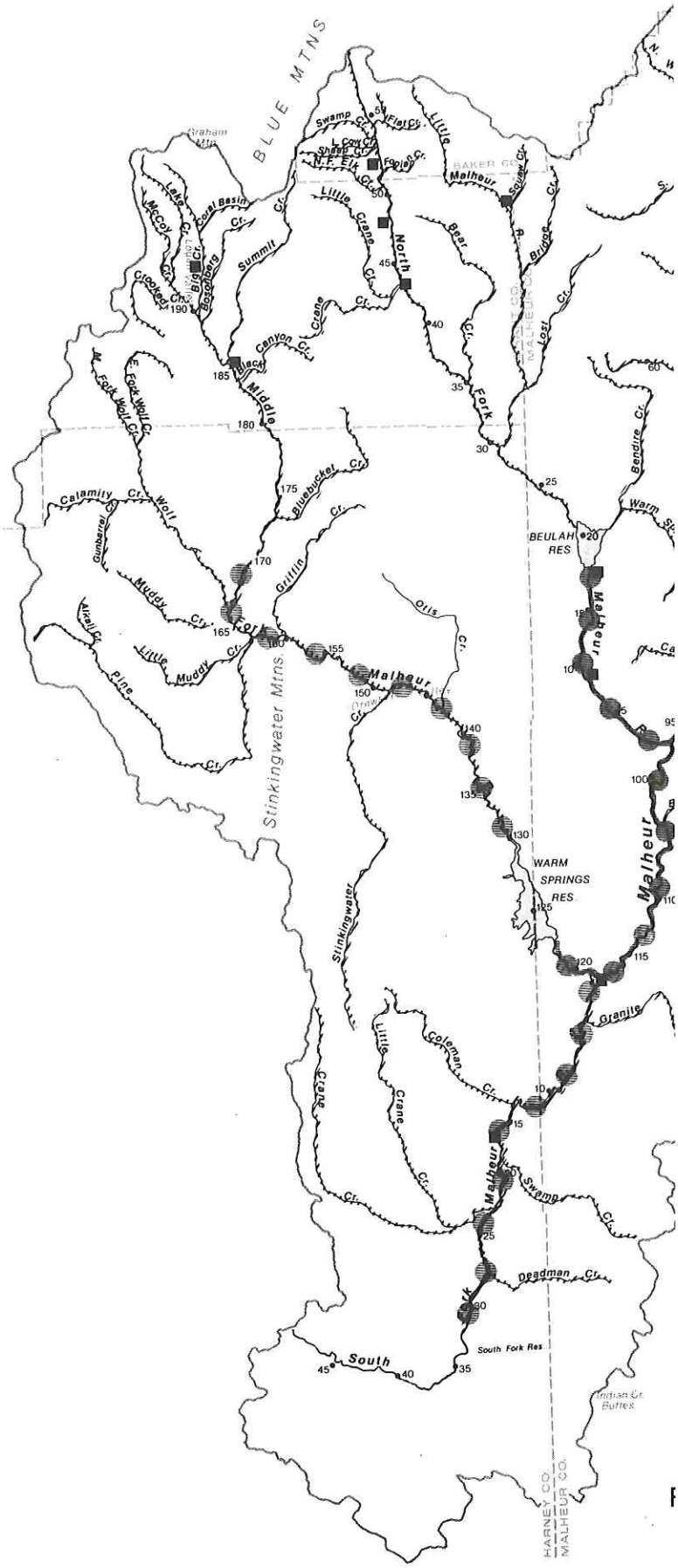
Category	Fisheries
1. Free flowing streams, usually above major agricultural lands.	Wild populations of indigenous coldwater fish.
2. River environment above major reservoirs, generally free flowing through a mix of range agricultural lands.	Mixed populations of hatchery and wild coldwater game fishes and smallmouth bass.
3. River environment below major reservoirs (Mainstem Malheur and North Fork below Warm Springs and Beulah Reservoirs).	Hatchery trout in river environments.
4. Lower 69 miles of mainstem in areas of intensive agricultural use.	Nongame fish and limited warmwater game fish.
5. Reservoirs.	Hatchery trout, warmwater game fish, or both in standing waters.

General Policies and Guidelines

In addition to the guidelines provided by the Trout and Warmwater Fish plans, the Malheur Plan must operate within the following constraints:

1. Legislation - Oregon Revised Statutes.

2. Oregon Administrative Rules - Statements of Fish and Wildlife Commission policy, e.g., Wild Fish Management Policy, Trout Management Policy, Warmwater Game fish Management Policy.


BLUE MTNS
Stinkingwater Mtns.
Graham Mtn
Swamp Cr.
Flat Cr.
L. Cow Cr.
Sheep Cr.
N.F. Elk
Fopiano Cr.
Little Creek
Malheur
Solem Cr.
BAKER CO.
Lake Cr.
Coral Basin
McCoy Cr.
Big Cr.
Bottleberg
Crooked Cr.
Summit Cr.
Little Crane Cr.
North Fork
Beer Cr.
Bridge
Canyon Cr.
Crane Cr.
Lost Cr.
Black
Middle Fork
M. Fork Wolf Cr.
E. Fork Wolf Cr.
Wolf Cr.
Calamity Cr.
Gunberrel
Muddy Cr.
Alkali Cr.
Little Muddy Cr.
Pine Cr.
Bluebucket Cr.
Griffin Cr.
Otis Cr.
Malheur
Bendire Cr.
Warm Sp.
BEULAH RES
Malheur
WARM SPRINGS RES.
Stinkingwater
Granite
Coleman Cr.
Little Crane Cr.
Crane Cr.
Malheur
Swamp Cr.
Deadman Cr.
South Fork Res
South Fork
Indian Cr.
Buttes
HARNEY CO.
MALHEUR CO.

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

4. Memorandums of Understanding and Resource Management Agreements between ODFW and other state and federal agencies.

5. Rules and regulations of other state jurisdictions, e.g., Department of Environmental Quality, Division of State Lands, Water Resources Department.

IMPLEMENTATION

This document may be viewed as the basis for development of specific management strategies over time. It is intended to function on a continuum with adjustments made as new information or need suggests they are warranted. Upon adoption by the Oregon Fish and Wildlife Commission, the policies and objectives become Oregon Administrative Rules (*see* **APPENDIX C** for Rules pertaining to the Malheur River Basin). Revision of these rules requires action by the Oregon Fish and Wildlife Commission. Progress on specific actions will be reviewed every 2 years by staff prior to preparation of the biennial budget recommendations. At that time priorities will be reexamined and adjustments will be made where necessary, and a progress report prepared.

Management priorities are established on the basis of importance and need. Money and manpower limitations influence achievement of these priorities. The following actions are the highest priorities in the Malheur River basin:

1. Inventory and monitor fish populations to increase understanding of fish biology and management with the goal of:

    a. protecting and enhancing indigenous fish, specifically bull trout and redband trout, and

    b. improving recreational fisheries at reservoirs and in the mainstem Malheur between Beulah and Warm Springs Reservoirs and Namorf Dam.

2. Improve coordination and cooperation with land managers and the public with the goal of:

    a. restoring and preserving fish habitat, and

    b. increasing the level of consideration for fishery values in land management activities in the basin.

The Malheur Plan defines specific problems in each section that must be overcome in order to achieve plan objectives. The problems that are the highest priority for management are listed in priority order for each section of the Plan in Table 2 along with funding scenarios.

Table 2. Problem priorities and funding scenarios.

Priority	Requires action by other agencies	Currently funded	Requires additional ODFW Funding	
			Short-term	Long-term
HABITAT				
1. Decisions affecting land management activities do not always reflect a concern for fish habitat and the fish resource (Objective 1, Problem 1, page 24).	X	X	X	X
2. Watersheds in poor condition, including uplands and riparian areas, contribute to water quality problems that affect fish life in the Malheur basin (Objective 2, Problems 1 and 2, page 25-26).	X	X	X	X
3. Reduced streamflows from out-of-stream diversions aggravate poor water quality conditions and dewater sections of the river (Objective 2, Problem 3, page 26).	X	X	X	X
HEADWATERS AND TRIBUTARIES				
1. Information is lacking on bull trout distribution, life history, population status, habitat requirements, and habitat status for streams in the Malheur basin (Objective 1, Problems 1 and 5, pages 46-47).	X	X	X	X
2. Information is lacking on redband trout distribution and the status of their habitat in the Malheur basin (Objective 1, Problems 3 and 5, page 47).	X	X	X	X

Priority	Requires action by other agencies	Currently funded	Requires additional ODFW Funding	
			Short-term	Long-term
HEADWATERS (continued)				
3. Habitat degradation affects indigenous coldwater game fish in the Malheur basin (Objective 1, Problem 7, page 48).	X	X		
4. Land management decisions by the U.S. Forest Service and the U.S. Bureau of Land Management do not always recognize effects of management on sensitive species (Objective 1, Problem 6, page 47).	X	X	X	
MIDDLE FORK MALHEUR ABOVE WARM SPRINGS RESERVOIR AND SOUTH FORK MALHEUR MAINSTEM				
1. Habitat degradation limits game fish populations (Objective 1, Problem 1, page 55).	X	X	X	
2. Inventory data of fish populations is limited (Objective 1, Problem 2 page 55).	X	X		
3. Project work has been approved by the Northwest Power Planning Council, but funding has not been released by the Bonneville Power Administration (Objective 1, Problem 3, page 56).	X	X		

Priority	Requires action by other agencies	Currently funded	Requires additional ODFW Funding	
			Short-term	Long-term
MALHEUR RIVER AND NORTH FORK MALHEUR RIVER MAINSTEMS - RESERVOIRS DOWNSTREAM TO NAMORF DAM				
1. Nongame fish tend to out-compete trout (Objective 1, Problem 1, page 64).	X	X		
2. Degraded stream corridor and restricted access on the North Fork Malheur limit fishery development (Objective 1, Problem 2, page 65).	X	X	X	
3. Lack of adequate holding areas limits fish production, particularly during the non-irrigation season (Objective 1, Problem 3, page 65).	X	X	X	
LOWER MALHEUR RIVER BASIN				
1. Nonpoint source pollution limits fish production in the lower Malheur River (Objective 1, Problem 1, page 70).	X	X	X	
RESERVOIRS				
1. Information on warmwater gamefish production in the Malheur Basin reservoirs is limited (Objective 1, Problems 1 and 2, page 89).	X	X		
2. Build-up of nongame fish populations affects trout production in Beulah and Malheur Reservoirs (Objective 2, Problem 1, page 90).	X	X		X

Priority	Requires action by other agencies	Currently funded	Requires additional ODFW Funding	
			Short-term	Long-term
RESERVOIRS (continued)				
3. Additional demand for warm-fisheries exist in the Burns area (Objective 3, Problem 1, page 91).	X	X		
4. Habitat degradation affects fish production (Objective 1, Problem 3; Objective 2, Problem 2; and Objective 3, Problem 2, pages 89-91).	X	X	X	
ANGLER ACCESS				
1. Expand and secure access and recreation facilities at Malheur Reservoir (Objective 1, Problem 1, page 96).	X	X		X
2. The boat ramp at Beulah is in need of repair and ramps at both Beulah and Warm Springs Reservoirs need lengthening (Objective 2, Problem 1, pages 97).	X		X	
3. Private land owners are reluctant to grant access because of concern for property damage or privacy (Objective 3, Problem 1, page 97).		X		

(W C Hosford)

HABITAT

Background and Status

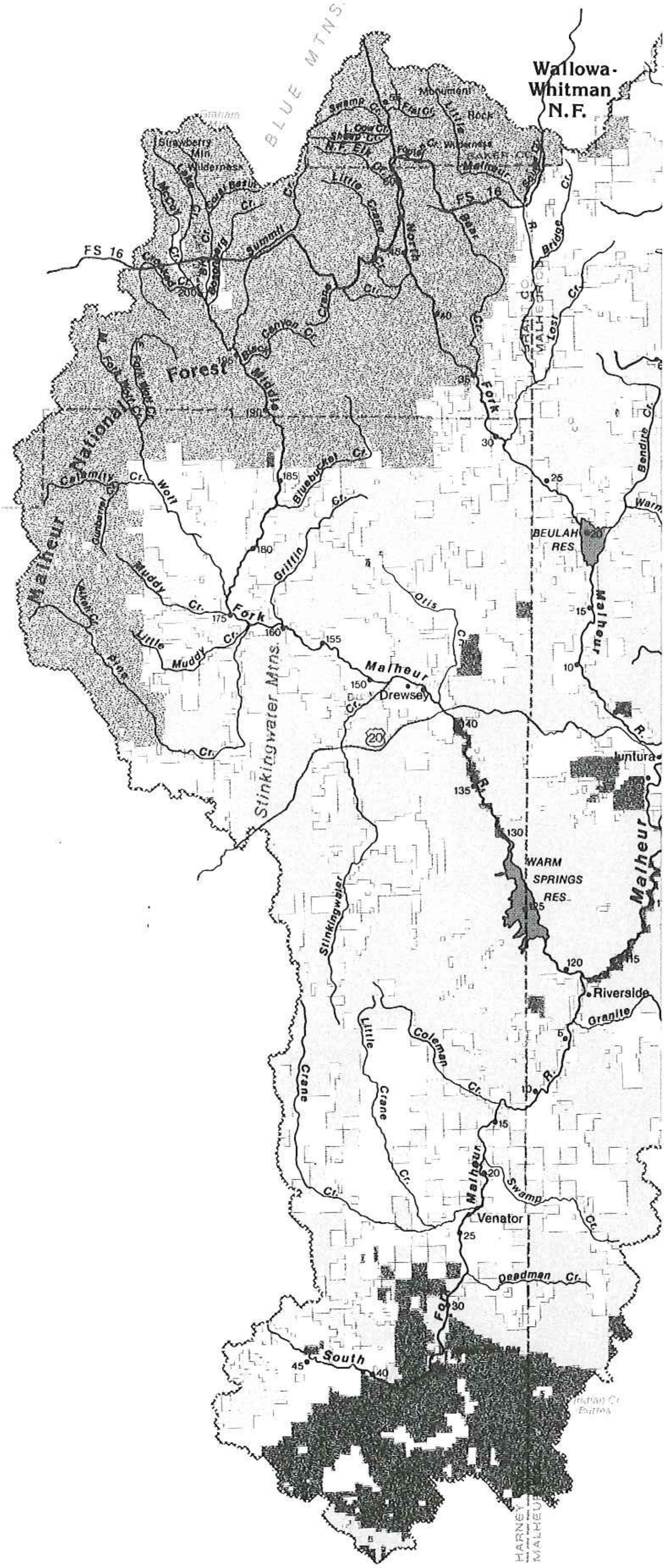
Basin Description

The Malheur River basin is situated in southeastern Oregon. The majority of the basin is located in northern Malheur County with smaller portions in Baker, Grant, and Harney counties. Total drainage area is approximately 5,000 square miles and total length from headwaters to mouth is 190 miles. The highest point in the basin is Graham Mt. (elevation 8,570 ft[1]) located in the Blue Mountains. Elevations drop to approximately 2,000 ft at the Malheur's confluence with the Snake River. Public ownership accounts for approximately 66% of land in the basin divided between the USFS (13%), BLM (47%), and state owned land (6%) (Figure 2).

Agricultural production and processing are the basin's primary economic activities. River valleys from Harper eastward are devoted to intensive and

---

[1] *All elevations are expressed in feet above sea level.*



Wallowa-
Whitman
N.F.
BLUE MTNS.
Malheur National Forest
FS 16
Monument Rock
BEULAH RES.
Drewsey
Juntura
WARM SPRINGS RES.
Riverside
Venator
Stinkingwater Mtns.
Malheur R.
Stinkingwater
Crane Cr.
Little Crane Cr.
Coleman Cr.
Swamp Cr.
Deadman Cr.
Bluebucket Cr.
Griffin Cr.
Otis Cr.
Bendire Cr.
Granite
Muddy Cr.
Little Muddy Cr.
Pine Cr.
Wolf
Calamity Cr.
Camp Cr.
Summit Cr.
Little Crane Cr.
Bear Cr.
Bridge Cr.
Lost Cr.
Warm
HARNEY
MALHEUR

diversified agriculture. The most important crops produced are alfalfa, clover, sugar beets, onions, potatoes, corn, small grains, and truck and seed crops (SWRB 1969). Livestock production dominates river valleys in the upper portion of the basin where irrigated lands are used primarily for growing hay and forage crops. Rangelands throughout the basin also provide livestock forage during the summer. Timber harvest occurs in the northwest portion of the basin as well (Table 3).

Table 3. Land-use in the Malheur River basin. (Source: WRD Land-Use Map, 1979)

Land-use	Acres	% of Basin
Range	2,694,519	83.0
Forest	311,936	9.6
Irrigated agriculture	214,063	6.6
Nonirrigated agriculture	8,017	0.3
Water	7,991	0.2
Other	5,197	0.2
Urban	4,357	0.1
Total	3,246,080	100.0

Physical and Biological Characteristics

The climate in the Malheur Basin is semiarid, characterized by hot dry summers and cold winters. Summer temperatures may exceed 100°F, and winter temperature may drop below -20°F. Average annual precipitation over the Malheur basin is 12 inches and ranges from 40 inches in the upper mountains to less than 10 inches in the lower reaches. Most of the precipitation occurs in the winter, usually as snow. Mountain snowpack is the principal source of stream flow (Malheur County 1978).

Most of the Malheur River basin consists of gently sloping to rolling lava plateau uplands dissected by river canyons or valleys. The northwest portion of the Malheur basin lies in mountainous terrain.

Wooded areas consist primarily of mixed fir and pine forest in the higher elevations with ponderosa pine *Pinus ponderosa* and western juniper *Juniperus occidentalis* occurring in the transition zones. The uplands are dominated by sagebrush and grass communities. Low-elevation terraces and flood plains are occupied primarily by irrigated crop land in the lower basin valleys.

Stream gradient in the Malheur River is characteristic of southeastern Oregon streams as described by Bowers et al. (1979). Headwater streams of the Middle Fork and North Fork Malheur begin at an elevation of 6,500 to 7,500 ft, drop 100 ft/mile or more, and are characterized by high water velocity and substantial downstream movement of coarse bedload material. Steep gradient

limits fish movement.

The mainstem through the forest downstream to Namorf Dam has stream gradient and riffle frequency characteristic of trout habitat. The stream gradient gradually decreases to an average of 20 ft/mile. Sediment load consists of coarse (sand to baseball-sized) material, and floodplains have developed where velocity and gradient permit. Gravel bar deposits, islands, and new channels are formed by the constantly shifting bedload.

Below the town of Harper, gradient averages 1 ft/mile, and stream velocity is reduced. Fine bedload material settles out forming compacted banks and a deep meandering single channel. The lower velocity combined with poor water quality limit game fish production.

In general, the streams of the Malheur basin possess characteristics attributable to the semiarid climate. On an average annual basis, low precipitation produces relatively low runoff although large variations can be expected on an annual and on a seasonal basis. Natural flow, except for that resulting from snowmelt in the spring, is usually quite low. Occasional high flow occurs in the winter and spring from rainstorms augmented by snowmelt, frozen ground, or both (SWRB 1969).

Large reservoirs constructed for irrigation storage on the mainstem Malheur and several tributaries have altered streamflow characteristics in the lower Malheur basin. Streamflow is regulated primarily by the following reservoirs:

1. Warm Springs Reservoir, Malheur River.

2. Beulah Reservoir, North Fork Malheur River.

3. Bully Creek Reservoir, Bully Creek.

4. Malheur Reservoir, Willow Creek.

Warm Springs, Beulah, and Bully Creek reservoirs are major components of the Bureau of Reclamation's Vale Project, an irrigated area of about 35,000 acres located along the Malheur River and lower Willow Creek around the town of Vale. The stored water in Warm Springs and Beulah Reservoirs, together with natural streamflow, is diverted from the Malheur River by the Namorf Diversion Dam to the Vale Main Canal. The project is operated and maintained by the Vale, Oregon, Irrigation District.

Major diversions occur in the lower Malheur below Namorf Dam and in the Drewsey Valley. Water is also diverted in the Logan Valley. The Malheur basin has no appreciable quantity of unappropriated surface water subject to the jurisdiction of the State Water Resources Commission (formerly the State Water Resources Board). Legal rights exceed yield in all years except those of unusually high amounts (SWRB 1969).

Surface water quality in the Malheur system varies from excellent in the headwaters to poor in the lower basin. The majority of water quality problems

in the basin result from nonpoint source pollution associated with land-use practices.

The Malheur basin was inventoried for nonpoint source pollution problems in 1978, and moderate and severe areas in the basin were mapped. Problems included sedimentation, streambank erosion, elevated water temperature, nuisance algae, and decreased streamflow (Malheur County 1978). A recent inventory by DEQ indicated that in addition to those problems identified in 1978, turbidity and insufficient stream structure are also problems throughout the basin. In addition,the lower Malheur basin has problems with nutrients, pesticides, salt water intrusion, bacteria, and viruses (Department of Environmental Quality 1988).

Habitat Management Agencies

ODFW's role in habitat management is primarily advisory to land management agencies and private land owners. However, the agency can influence habitat directly through its statutory authority to require screens on diversions (ORS 498.248-254, ORS 509.615), fishways at dams or obstructions (ORS 498.268, ORS 509.605), permits for use of explosives harmful to fish (ORS 509.140), and certification of fish habitat improvement projects (ORS 496.260).

ODFW meets annually with other agencies in the region to review current and future projects affecting fish and wildlife resources. On an ongoing basis ODFW is asked to review and comment on a wide variety of activities that affect fish and wildlife habitat, i.e., timber sales, grazing allotment management plans, fill and removal permits, habitat management plans. ODFW cooperates in a variety of habitat improvement projects. Many of the projects on public lands use volunteers from a variety of fish and wildlife interest groups to complete the work.

Although U.S. Forest Service and Bureau of Land Management are the major public land managers in the basin, several other state and federal entities have jurisdiction over activities that affect fish habitat. These include the Soil Conservation Service, the Federal Energy Regulatory Commission (FERC), Northwest Power Planning Council, Corps Of Engineers, Department of Environmental Quality, Water Resources Department, Department Of Forestry, Department of Geology and Mineral Industries, and Division of State Lands.

U.S. Forest Service: The majority of federal forest land in the basin is in the Malheur National Forest, with a minor amount in the adjacent Wallowa-Whitman National Forest (*See* Figure 2). The area includes portions of Strawberry Mountain and Monument Rock wilderness areas.

The Omnibus Oregon Wild and Scenic Rivers Act of 1988 (P.L. 100-557) designated 7 miles of the Middle Fork Malheur from Bosonberg Creek downstream to Malheur Ford and 25.5 miles of the North Fork Malheur from the headwaters downstream to the Malheur National Forest boundary as scenic river. Scenic designation means that resource activities in the stream corridor (1/4 mile on

either side of the river) may take place, but they cannot detract from the natural character of the area. The Middle Fork Malheur from Malheur Ford downstream to the Malheur National Forest boundary (6.7 miles) was designated wild river. This designation prohibits development (e.g., timber harvest, hydroelectric projects, construction) in the stream corridor.

Forest management plans that guide management activities for the next several decades include the Malheur National Forest Plan completed on May 25, 1990 and the Wallowa-Whitman National Forest Plan completed May 4, 1990. Separate management plans will be written for river corridors designated wild and scenic and will be added to the final Forest Plan as amendments.

Management activities that affect fish habitat include logging, road building, and grazing. Of particular concern is the way in which these activities impact the riparian zone and the cumulative effects of management activities in a given watershed on water quality, specifically water temperature, sedimentation, and turbidity, as well as loss of large woody debris. Timber harvest can also influence the timing, duration, and magnitude of runoff events. Increased recreational development has the potential to impact fisheries on the forest by increasing access in undeveloped areas with sensitive species, such as the bull trout. There are five designated roadless areas (RAs) in the basin. Under the Malheur National Forest Plan, Flag Creek RA will be managed to maintain big-game winter range, as would the North Fork Malheur RA outside the wild and scenic area. The Malheur River and Flag Creek RAs outside the wild and scenic area would be managed for general forest and rangelands except for the southern quarter of Flag Creek RA that would be managed to maintain big-game winter range. Glacier Mountain RA would be managed for semi-primitive motorized recreation.

Bureau of Land Management: Bureau of Land Management (BLM) managed land in the basin is administered by the Burns District in the west and Vale District in the east. Management plans that direct BLM activities in the Vale District include the Southern Malheur Rangeland Program Summary and the Rangeland Program Summary for the Ironside EIS area. In addition, the Vale District Native Redband Trout Habitat Management Plan identifies streams with redband trout and lists objectives for habitat and an implementation schedule. The plan is updated and new streams added to it as new information becomes available.

The Drewsey Management Framework Plan guides management in the Burns District. However, it will be superseded by the Three Rivers Resource Management Plan when the final is approved. Habitat management plans may also be written for a particular species or habitat.

The overriding habitat concern on BLM land is grazing, particularly season long grazing, and its effects on the riparian zone and water quality. Riparian objectives for grazing allotments are identified in the BLM land-use management plans and are updated as new inventory and monitoring information becomes available. The Burns district will also identify objectives for water quality and aquatic habitat in the Three Rivers Resource Management Plan. Allotment evaluations will also be required within five years of plan adoption

and three years of monitoring data.

Some placer gold mining occurs annually in the upper Willow Creek basin. Detrimental effects include disruption of the streambed gravel and riparian vegetation and increased sedimentation and turbidity.

Renewed interest in mineral exploration for gold is occurring throughout southeastern Oregon. Exploration sites have been identified near Vale, Harper, and Drewsey, primarily on public land. If developed, the mines would use the cyanide heap leach method to extract the gold. The excavated ore is heaped on a plastic liner and a weak solution of cyanide applied to leach out the gold. The leachate is collected and the gold precipitated out.

Potential impacts to fishery include degradation of water quality through increased sedimentation, contamination of ground water and surface water from the chemicals used, or from exposure of toxic minerals already existing in the soil, e.g. mercury (Cockle 1989, Carrels 1989). Since the process involves large amounts of water, there is concern that demands made on surface or groundwater supplies may deplete them to the extent that fish habitat would be impacted (Sahagun 1988). The cumulative effects of several mining operations in a river basin is also a concern.

Under federal law notification of the appropriate land management agency and submission of a plan of operation is required when 5 acres or less of public land are disturbed during the calendar year. Measures taken to reclaim the land must be included in the plan of operation (43 CFR 3809).

Northwest Power Planning Council: The Northwest Power Planning Council was established to prepare and adopt a regional conservation and electric power plan and a program to protect, mitigate, and enhance fish and wildlife in the Columbia River and its tributaries.

Under the Council's Fish and Wildlife Program, resident fish programs are eligible for habitat improvement funding through the Bonneville Power Administration as compensation for loss of anadromous fish runs because of hydroelectric development. During February 1986, ODFW, U.S. Forest Service, and the BLM cooperatively applied to the Council for resident fish habitat project funding. A Program amendment for the work was approved by the Council during the summer of 1986; however, funding for the project through the Bonneville Power Administration has not been provided. The Columbia Basin Fish and Wildlife Authority, which recommends projects for funding to BPA, needs to place a higher priority on the project for the Malheur in order for funding to be realized.

U.S. Soil Conservation Service: The Soil Conservation Service advises private landowners on a variety of improvement projects in both the uplands and the stream corridor. A considerable amount of streambank stabilization has taken place in the Drewsey Valley and the section from the town of Harper downstream to the mouth of the river. Projects that improve soil stability in the watershed indirectly benefit fish habitat by controlling erosion and

improving the storage capacity of the soil. Projects that involve fish habitat can be designed to meet the landowners' needs and benefit the fishery. Federal money is available to private land owners on a cost share basis for a variety of projects under programs administered by the Agricultural Stabilization and Conservation Service.

Federal Energy Regulatory Commission: The Federal Energy Regulatory Commission issues federal hydroelectric permits and licenses. Preliminary permits have been issued for two sites in the Malheur basin but have since expired. Both permits were for projects at existing dams, Warm Springs and Beulah. If hydroelectric development becomes economically feasible, these sites would no doubt be reconsidered.

During review of the application for permits ODFW determined that turbine intakes would have to be screened to protect and bypass migrating fish exiting the reservoir. In addition, it was identified that proposed power peaking operations with large resultant changes in flow for brief or irregular intervals in the river below the projects would have adverse effects on fish. However, hydroelectric operation during winter would have the potential to improve streamflows below the dams.

U.S. Army Corps of Engineers: Activities in the Malheur basin that involve the U.S. Army Corps Of Engineers (USACE) are primarily fill-and-removal projects associated with streambank stabilization, irrigation system work, bridge construction and repair, and work on utility installations. An application for a federal permit is required for any fill and removal activity in United States waters or adjacent wetlands. The USACE will make a determination if a federal permit is required when more than 10 cu yd of fill or removal material is involved.

Oregon Division of State Lands: Fill-and-removal activities are also regulated by the Division of State Lands (DSL), which administers Oregon's fill-and-removal law (ORS 541.605-541.695 and 541.990). An application for a permit is required if 50 cu yd or more of fill-and-removal material is involved. The regulations apply to the stream channel up to the top of the streambank, roughly the 2-year flood plain. A permit is issued for 1 year, and annual renewals are granted provided the activities for which the permit was granted are not changed. A cooperative permit may be issued to a series of land owners involved in a Coordinated Resource Management Plan. In order to streamline the permit process, a joint application to DSL and USACE for permit may be made by the applicant.

DSL also manages grazing on state-owned land within its jurisdiction in the Malheur basin.

Oregon Department of Environmental Quality: The Department of Environmental Quality (DEQ) sets standards for water quality and administers Oregon's water quality program. Water quality standards for the Malheur Basin

are found in OAR 340-41-805.

Point source pollution is tracked by issuing permits specifying the level of discharge permitted. The nonpoint source program relies on best management practices implemented by land management agencies. Best management practices are methods, measures, or practices selected by an agency to meet its nonpoint source control needs. DEQ meets annually with the agencies to review their monitoring plans.

DEQ is in the process of developing a new nonpoint strategy that includes refining of definition of best management practices, evaluating the designated management agency annual review process, defining what monitoring is, and developing a process for public participation in the nonpoint program.

Oregon Water Resources Department: Water Resources Department (WRD) administers Oregon's water law, which includes issuing water rights for the diversion of water for beneficial uses and licensing of hydroelectric plants. The District Watermasters in Vale and Burns are the local representative of WRD with jurisdiction in the Malheur basin.

The Water Resources Commission, the policy making body for WRD, may establish minimum streamflows, withdraw water from further appropriation, or classify water for certain uses. These designations become administrative rules.

Streamflow requirements of game fish were determined in an ODFW study conducted in 1965 and 1966. Recommended minimum flows based on biological requirements of fish inhabiting the system and water availability were noted for 44 points in the basin and submitted to the WRD for consideration in their basin planning program (Thompson and Fortune 1967). However, none of the recommended minimum streamflows was adopted. **APPENDIX D** includes a list of recommended minimum flows for the Malheur basin.

Until 1987 application for a minimum streamflow was the only instream flow designation available to ODFW. During that year passage of the Public Instream Water Right Law (ORS 537.332 to 537.360) made it possible to apply for an instream water right for fish life and recreational uses. Contrasted to the minimum streamflow that may be changed or rescinded by the Water Resources Commission, an instream water right would be equivalent to an out-of-stream water right which is granted in perpetuity. It can only be cancelled if 5 years of nonuse is proven. Both the minimum streamflow and instream water right would be lower in seniority to previously granted water rights. Established minimum streamflows would be converted to instream water rights under the new law.

Oregon Department of Forestry: The Department Of Forestry regulates forest practices on state owned and private timberlands under Oregon's Forest Practices Act (ORS 527.610 to 527.992). According to Forest Practices Act rules the Department Of Forestry may impose certain conditions with regard to timber harvest near Class I or Class II streams to protect fish habitat.

Class I streams are those streams that are significant for domestic use, angling, water dependent recreation, or spawning, rearing, or migration habitat for anadromous or game fish. Class II streams are those which have a definite channel or bed, and Class II special protection waters are Class II waters that have a significant influence on a downstream Class I stream with anadromous or game fish.

In the Malheur basin, the Department Of Forestry has supervised timber harvest activities, primarily thinning and juniper clearing, in the area east of U.S. Highway 26 and northwest of the town of Ironside involving approximately 40,000 acres in the Willow Creek drainage.

Department of Geology and Mineral Industries: The Department of Geology and Mineral Industries (DOGAMI) regulates mineral activities and collects and distributes geologic information in Oregon. A permit from DOGAMI is required prior to surface mining activity that disturbs more than 1 acre of land or extracts more than 5,000 cu yds of minerals within a period of 12 consecutive months (ORS 517.750). Compliance with the permit is monitored by DOGAMI on an annual and non-scheduled basis.

ODFW receives permit applications for review and comment, but its recommendations are not binding for permit approval. Guidelines currently being developed by ODFW at DOGAMI's request will address impacts of cyanide heap leach mining on terrestrial and aquatic wildlife. The guidelines will provide recommendations to DOGAMI in the areas of studies and inventory methods, habitat protection measures, mitigation, and reclamation.

County Land-Use Plans: Comprehensive land-use plans developed by the counties set policy for land-use activities in the county and place restrictions on types of development through zoning and county ordinances.

The portion of the basin in Harney County is zoned exclusive farm use and forest use and includes the rural community of Drewsey. The standard for both zones requires that buildings be set back a minimum 100 ft from the high water line along streams and lakes.

Except for small areas of national forest in Grant and Baker counties, the remainder of the basin is in Malheur County. The Malheur County Comprehensive Plan goals for fish and wildlife habitat include cooperation with local, state, and federal agencies to identify the location, quality and quantity of fish and wildlife habitat; consideration of the effects of proposed development on fish and wildlife habitat when making land-use decisions; recognition of ODFW's "Fish and Wildlife Habitat Protection Plan" as a guideline for planning decisions; and continued recognition of the contribution that fishing and hunting make to the economy and the total recreation needs of the county. The county's floodplain ordinance requires notification of Division of State Lands prior to any alteration or relocation of a watercourse. Malheur County is zoned exclusive farm use in irrigated sections along the mainstem and Willow Creek. The remainder of the basin is zoned exclusive range use except for commercial timberlands zoned exclusive

farm and forest use and rural service centers and urban areas.

Basinwide Habitat Concerns

Land-use factors that affect instream and riparian habitat are major concerns to fishery management. Natural habitat in the Malheur Basin has been altered dramatically, and much of the historical fishery no longer exists. The challenge for the fishery manager has been to create productive fisheries in the artificial habitat while preserving remaining indigenous species in the less altered habitat.

The habitat concerns with basinwide applications are nonpoint source pollution, riparian zone conditions, altered streamflow patterns, unscreened diversions, and reservoir conditions.

Nonpoint source pollution: Water quality determines to a large extent the type of fishery a given stream segment can support. The distribution of trout and of warmwater game fish is a reflection of water quality, primarily temperature, sedimentation, and turbidity. Sedimentation and turbidity are associated with nonpoint source pollution.

Sedimentation reduces available spawning habitat, reduces egg survival, impedes spawning and egg incubation, and limits production of aquatic organisms by covering up the substrate and interfering with oxygen exchange. Sediments accumulating in pool areas also reduces available instream habitat. Turbidity limits plankton production by preventing the penetration of sunlight, and reducing the ability of sight feeders to obtain food. This factor also interferes with angling opportunities in the basin.

The most severe degradation of water quality from nonpoint source problems occurs in the lower basin from agricultural activities. Irrigation return flow carries a large amount of silt that settles out and buries spawning gravel that occurs in riffle areas in the lower river. Naturally occurring minerals and manmade chemicals leached from the soil are also present in the return flow, but their effect on the aquatic resource has not been determined. Sampling of invertebrates, fish, plants and birds in the Malheur mainstem will be done by the U.S. Fish and Wildlife Service in 1990 as part of a national study to assess irrigation induced water quality problems. Sampling of water and bottom sediments will be done by the U.S. Geological Survey (telephone interview on 26 March 1990 with William Mullins, Environmental Contaminant Specialist, U.S. Fish and Wildlife Service, Boise, Idaho)

Increased mining activity may aggravate this situation because mercury often occurs in the same deposits where gold is found. Potential point source pollution may occur from leaks or spills of toxic substances used in the cyanide heap leach process.

Lack of stabilizing vegetation elsewhere in the basin contributes excess sediment to the system compounding turbidity problems. Poorly vegetated

uplands and streambanks are vulnerable to erosion during periodic high flow events and contribute a large amount of sediment. Improved watershed conditions would benefit the fishery by reducing sedimentation.

Riparian Zone Conditions: The effects of water temperature extremes in streams are lessened by the presence of healthy riparian vegetation. Water temperature between 40° and 70°F is needed to support trout. However, it is not uncommon for redband trout to tolerate afternoon temperature of 80°F if evening temperature is low. Warmwater species prefer water temperature in the range of 60° to 80°F. Most warmwater species require 65° to 70°F water temperature for spawning and egg incubation.

Riparian habitat conditions directly influence the instream habitat that affects the stream's ability to maintain stable streambanks, good water quality, and late season streamflow. Effects on fish habitat from loss of riparian vegetation include increase in water temperature, loss of cover, increase in erosion, and a general shallowing and widening of the stream channel. Loss of perennial streamflow can also occur with destruction of the riparian habitat. Because so much of the basin is rangeland, the principle land-use activity that affects the riparian zone is livestock grazing, although timber harvest, mining, and some farming practices can lead to similar results. Improvement of riparian zone conditions would benefit fish production throughout the basin.

Altered Streamflow Patterns: Reservoir construction has drastically altered the streamflow pattern in the Malheur drainage (Figure 3). Instead of summer and fall low flow, a sustained summer high flow now exists as water is released from the dams for irrigation. During the winter, when flow was normally consistent, extreme low flow now occurs as the reservoirs store water for the next irrigation season. Low flow is a major factor limiting fish production. Fishery benefits are generally secondary objectives to the primary purposes of irrigation storage and flood control.

Out-of-stream diversions during the irrigation season limit fish production by reducing the amount of water in the stream. Some stream segments are completely dewatered immediately below the diversions. Not all diversions have headgates, and few have monitoring or measuring devices. Once water is diverted, loss occurs in unlined or leaky canals and ditches. Disputes over water allocation among users are common, particularly during drought years. In some areas habitat occurs only where water must remain in the stream to satisfy downstream water rights.

Improved supervision of water diversions would benefit fish by insuring that water in excess of legal rights remained in the stream. Obtaining instream water rights would protect fish habitat from further out-of-stream diversion.

Unscreened Diversions: Unscreened diversions channel fish into irrigation ditches where they become stranded and die. The Malheur basin has

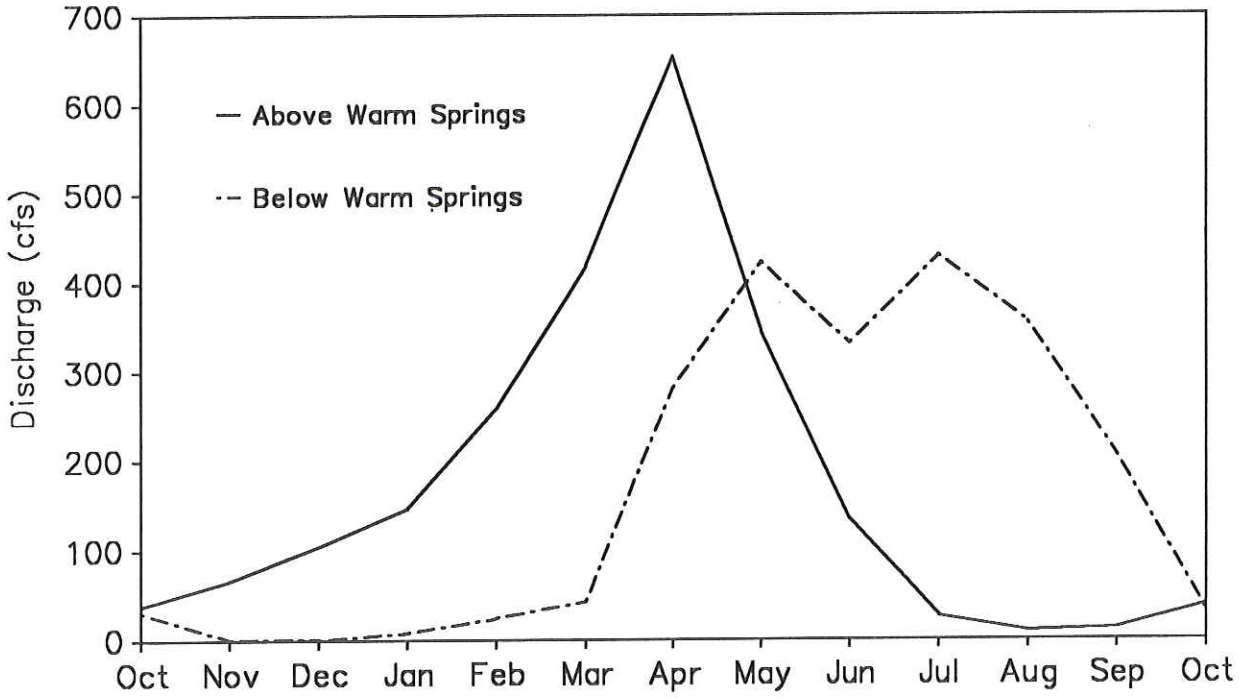


Figure 3. Average annual discharge patterns above and below Warm Springs Reservoir. Periods of record are 45 and 62 years, respectively (Friday and Miller 1984).

no screened diversions. State statute (ORS 498.248 and 509.615) requires screens on all diversions that affect movement of game fish. A two year moratorium on requirements for screens on non-hydro, gravity flow diversion under 30 cfs was passed by the 1989 legislature, and ODFW was directed to prepare a statewide screening plan. The legislature also instituted an income tax credit to cover up to 50% of the costs to install screens and fishways up to a maximum of $5,000. Although implementation rules and standards are currently being drafted, a first step would be to assess all diversions for effects on fish and develop a priority list for those that need screening.

Reservoir Conditions: Factors important to reservoir fisheries throughout the basin include water level fluctuation, minimum pool, turbidity, riparian condition, and amount of structure in the reservoir.

Reservoirs operated to provide irrigation water are drawn down during the irrigation season and store water during the nonirrigation season. This historic pattern of operation is not expected to change. As reservoirs are drawn down the volume of water is reduced dramatically. In some years little or no water remains in late summer to support fish life and no agreements exist with which to maintain minimum pools for fish life.

An adequate minimum pool provides habitat needed to carry over fish and is necessary to prevent die off in the summer from high temperature and low dissolved oxygen and winter die off from low dissolved oxygen. A greater minimum pool would also result in less fish lost out of the reservoir during drawdown. If more water became available because of improved efficiency in the distribution networks and in the use of irrigation water, some of this additional water could be used to benefit aquatic life. Improvements to the existing dam at Malheur Reservoir to allow maximum storage could provide additional water (*see* discussion on page 80). Improvement in minimum pool conditions would require negotiations with the irrigation district that operate the reservoirs.

Turbidity in a reservoir is due to wave action on barren soil banks in the drawdown zone. Turbidity is also caused by runoff that brings sediment from the surrounding watershed. Vegetation in the drawdown zone prevents wave action from stirring up turbidity, traps sediments, and provides cover for fish and other aquatic organisms. The annual drawdown prevents shoreline vegetation from becoming established.

Experiments with several species of willow and sedges native to the Northwest were successful in establishing vegetation in the drawdown zones of several reservoirs in western Oregon. Plants must be able to withstand prolonged periods under water and periods of drying-out as reservoir levels drop and soil moisture is reduced. Better survival occurred in less steep areas where there was better moisture retention. Factors that influence reservoir potential for vegetation establishment are:

1. Length of time the plants are emersed. The shorter the time is better.

2. Reservoir substrate. Less permeable substrate with more organic matter is better. Rocky, gravelly substrates don't hold water as well and too much clay inhibits growth.

3. Seepage. Reservoirs with areas of seepage do better (Telephone interview on 13 June 1989 with Al Smith, ODFW warmwater specialist, Portland, Oregon).

Cover is also provided by structure within the reservoir. This is particularly important during rearing to provide escape cover for young fish. Lack of structure is difficult to address on a large scale, but target areas can be created through the anchoring of objects such as tires, stumps, and junipers. These activities are usually carried out in cooperation with sportsmen's clubs, other volunteers, and ODFW.

At reservoirs constructed to provide livestock water, loss of riparian vegetation often results from livestock trampling the vegetation. Fencing these reservoirs and providing livestock water piped to a trough has been used successfully in the basin to protect fish habitat.

Policies

Policy 1. **Potential losses of fish production from habitat degradation shall be prevented or reduced to the extent possible.**

Policy 2. **ODFW shall coordinate with appropriate land and water management agencies on habitat protection and rehabilitation activities and shall continue to act in an advisory role to such agencies to promote habitat protection.**

Objectives

Objective 1. Develop better communication and coordination with land managers regarding land management activities affecting fish habitat.

Assumptions and Rationale

1. ODFW has no direct authority over habitat except for fish ladders, screens, use of explosives harmful to fish, and certification of habitat projects, but does have an advisory role in land-use issues.

Problems and Recommended Actions

Problem 1. Decisions affecting land management activities do not always reflect a concern for fish habitat and the fish resource.

Action 1.1 Provide new fisheries information to land managers as it becomes available.

Action 1.2 Encourage land managers to take fish into consideration in land management decisions.

Action 1.3 Coordinate with land managers to help identify sensitive habitat areas and help develop management plans for those areas, e.g., bull trout and redband trout habitat.

Action 1.4 Review U.S. Forest Service and BLM management plans and make recommendations related to fish habitat.

Also review local comp plans

Action 1.5 Encourage coordination of land-use activities and restoration projects on a watershed basis.

Action 1.6 Provide a list of high priority streams to land managers, and coordinate with them to update a complete physical and biological surveys of stream habitat.

Action 1.7 Request land management agencies coordinate more closely with ODFW fish biologists on proposed activities affecting fish habitat, such as timber harvest, grazing, road and trail construction, and mining activity.

Action 1.8 Coordinate with land managers to summarize historic information on land-use activities such as livestock grazing, timber harvest, mining, and road building, for each subbasin area in order to identify potential areas of habitat concern.

Action 1.9 Encourage and support participation of volunteers on watershed restoration projects.

Objective 2. Reduce nonpoint source pollution in the Malheur River system.

Assumptions and Rationale

1. Fish production and angling is dependent on habitat conditions.
2. Water quality is influenced by the effects of land-use practices on upland and riparian conditions in the watershed.
3. Good riparian habitat benefits the fish resource by providing shade and cover, stabilizing stream banks, and trapping sediment.
4. Improved riparian conditions may provide perennial streamflow to streams that are now intermittent, but were once perennial.
5. Fish habitat has been altered by dams, diversions, and land-use practices.

Problems and Recommended Actions

Problem 1. Nonpoint source pollution degrades water quality.

Action 1.1 Support activities that will reduce nonpoint pollution from agricultural activities. These may include:

a. Implementation of farming practices that reduce pollution in irrigation return flow.

b. Use of agricultural chemicals that would have no adverse affect on the aquatic community and the environment.

Action 1.2 Encourage the re-establishment of the vegetative cover and better watershed management throughout the basin.

Action 1.3 Encourage land managers to address fish habitat needs in land management activities in the basin.

Problem 2. Riparian areas in poor condition contribute to water quality problems that affect fish life in the Malheur basin.

Action 2.1 Encourage land managers to institute grazing regimes that benefit the riparian habitat and restrictions on timber harvest and mining activities in the riparian zone to protect fish habitat.

Action 2.2 Coordinate with land management entities to identify specific areas of concern and develop cooperative projects to improve riparian habitats.

Action 2.3 Provide information to the landowner on the benefits of healthy riparian conditions and methods to achieve them.

Action 2.4 Aggressively pursue riparian habitat improvement opportunities.

Problem 3. Reduced stream flow because of out-of-stream diversion aggravates poor water quality conditions and dewaters sections of the river.

Action 3.1 Identify stream reaches that would benefit from instream water rights and apply to Water Resources Department for designations.

Action 3.2 Negotiate with irrigators and investigate the feasibility of assisting them in obtaining funding for repair of leaky distribution networks in exchange for minimum flow.

Action 3.3 Encourage the Water Resources Commission to require legal flow measuring devices on diversions and improved supervision and enforcement.

Problem 4. Increased mining activity could effect aquatic life.

Action 4.1 Coordinate with Department of Environmental Quality and Water Resources Department regarding water quality and water quantity issues when reviewing mining permit applications.

DOGAMI also

Action 4.2 Support strengthening of laws and rules governing mining activities to reduce impacts to fish habitat.

Objective 3. Prevent fish losses at unscreened diversions.

Assumptions and Rationale

1. ORS 509.615 requires all diversions on fish bearing streams to be screened.

2. Screens on non-hydro, gravity flow diversions under 30 cfs will not be required until 1992.

Problems and Recommended Actions

Problem 1. Unscreened diversions isolate fish in unsuitable habitat.

Action 1.1 Assess fishery costs from unscreened diversions in the Malheur basin and develop priorities for action. Collect necessary site-specific data on diversions to determine:

a. If a screen is necessary.

b. What kind of screen is appropriate.

Action 1.2 Assist developers in implementing of ODFW rules and standards to comply with ORS 509.615.

Objective 4. Improve reservoir habitat for game fish in the Malheur basin.

Assumptions and Rationale

1. Historic demand for irrigation water from reservoirs is not expected to change.

2. Habitat conditions in each reservoir limits the fish species available for use.

Problems and Recommended Actions

Problem 1. Reservoir drawdown and lack of sufficient minimum pool limits fish production in reservoirs.

Action 1.1 Explore options with irrigation districts to provide increased reservoir areas for fish life, i.e., less reservoir drawdown or greater minimum pool. This could be accomplished by:

a. Increasing reservoir capacity.

b. Using less water from the existing reservoir by improving the water distribution network and efficiencies in water use.

Action 1.2 Assist land management agencies in identification of cost-sharing projects to improve reservoir capacities on public lands.

Problem 2. Turbidity caused by runoff from the surrounding watershed and wave action on the barren shoreline inhibits fish production in reservoirs.

Action 2.1 Encourage habitat projects to improve the watershed and reduce sediment loading in the reservoirs.

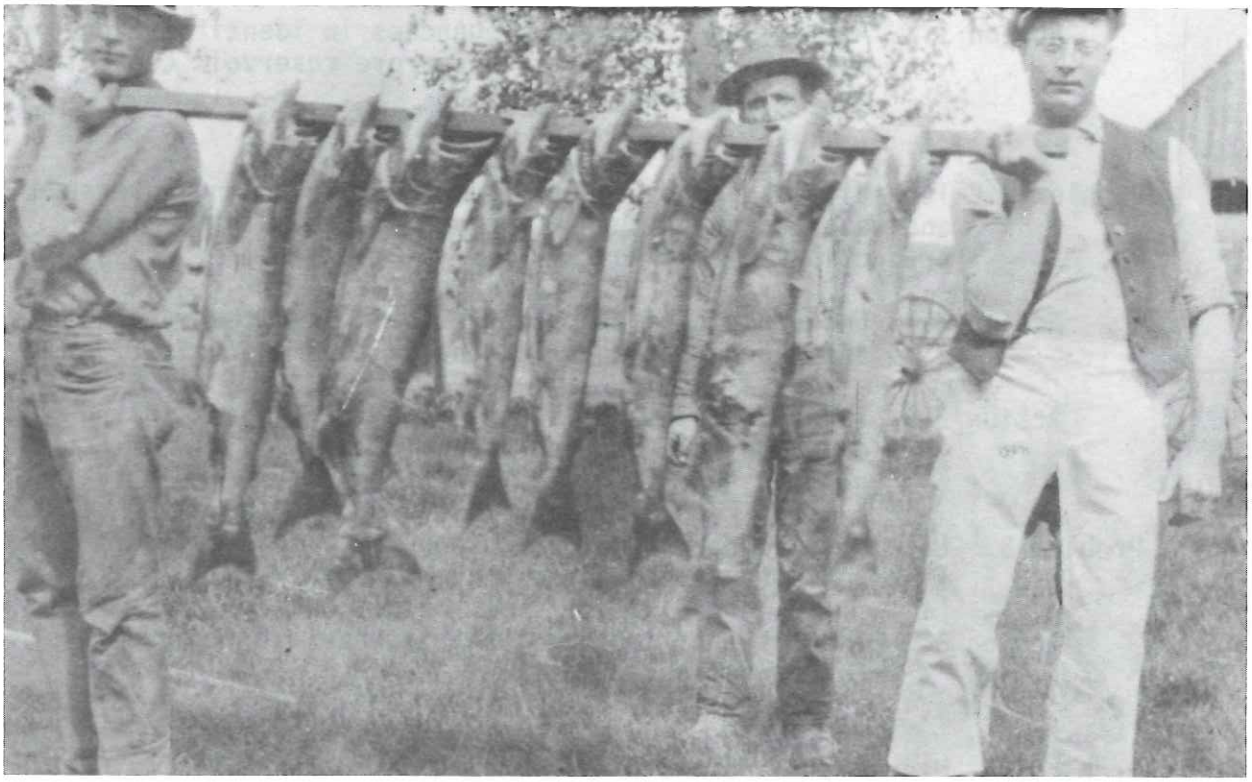
Action 2.2 Investigate establishment of plant species in the drawdown zone of reservoirs.

Problem 3. Lack of adequate structure to provide escape cover for young fish inhibits fish production in reservoirs.

Action 3.1 Identify and implement rearing habitat improvements for game fish.

Problem 4. Many small and medium reservoirs on public land that could support fish lack adequate riparian vegetation.

Action 4.1 Encourage land management agencies to improve vegetation at reservoirs by fencing, seeding, etc.



(Malheur Enterprise)

FISHERY RESOURCE

Background and Status

Historic Fishery

Prior to construction of the reservoirs, the Malheur basin supported large runs of chinook salmon *Oncorhynchus tshawytscha* and steelhead trout *Oncorhynchus gairdneri* that spawned in the upper basin (Fulton 1968, 1970). However, Warm Springs Dam on the lower Middle Fork Malheur, which was constructed in 1919, has no fish passage facilities and ended anadromous runs into that stream. Agency Dam (Beulah), which was built in 1935 on the North Fork Malheur about 12 miles north of Juntura, also blocked migration of anadromous fish. Brownlee Dam, which was constructed on the Snake River in 1958, ended migration of anadromous species to the entire upper Snake River basin (Pribyl and Hosford 1985).

Another anadromous species that may have been present historically in the Malheur River basin is the Pacific lamprey eel *Entosphenus tridentatus*. It is known to have existed in the Owyhee and Snake Rivers and may have been taken

as a food fish by native peoples.

Fish Present

Indigenous and introduced species currently present in the Malheur basin (*see* **APPENDIX E**) reflect the type of habitat available and efforts of fish managers to provide a diversity of game fish for the angling public. Game fishes found in the Malheur basin include several species of trouts and chars, mountain whitefish, largemouth and smallmouth bass, bluegill, yellow perch, brown bullhead, and channel catfish. Bullfrog is also managed as a game fish under Oregon statute (ORS 469.009).

Angling Regulations

New angling regulations are adopted as Oregon Administrative Rules by the Oregon Fish and Wildlife Commission after review of staff recommendations and public input. The process normally takes place every two years; however, emergency regulations may be adopted by the Commission when conditions warrant this action. Angling regulations within the Malheur basin (and the rest of the Southeast Zone) are generally consistent within statewide regulations. The major exception is that the season is open year-round for trout angling in all waters, whereas elsewhere in the state stream trout angling is restricted between October and April.

Occasionally, seining permits are issued for commercial harvest of nongame fish (suckers, northern squawfish) from the lower Malheur River. These are sold as bait or for fertilizer. Redside shiners are also harvested, then frozen and sold as bait for channel catfish.

Chemical treatments

Chemical treatment to control populations of undesirable[2] fish populations is a management technique that has been applied throughout much of the Malheur drainage. This control restores the opportunity for productivity of desired game fish, most often hatchery trout. Programs to control competing fish with chemicals are practiced by virtually all states and have been used in Oregon for the last 40 years (Sousa et al. 1987; ODFW 1988).

The fish toxicant most often used is rotenone, a natural substance derived from the roots of several South American plants. It acts by entering the blood stream of the fish through the gills and preventing oxygen use at the cellular level. In addition to fish, benthic invertebrates, zooplankton, and, to a lesser extent, amphibians are susceptible to rotenone. Mammals, birds, and plants are not directly affected, but may be influenced indirectly by the removal of fish and other organisms from the biological community. Mammals and birds can drink treated water without ill effects (California

---

[2] *Generally nongame species that out-compete game species.*

Department of Fish and Game 1985).

Chemical rehabilitation in the Malheur drainage is not usually intended to permanently eliminate a species of fish, but is targeted at reducing competition for game fish for a period extending from 5 to 10 years after treatment. During this period of reduced competition, hatchery fingerling rainbow trout will have high survival and rapid growth, and will provide an excellent fishery. Populations of nongame fish will eventually rebuild until they again monopolize the habitat, necessitating another chemical treatment.

Permanent elimination of any species is not usually attempted because it would be virtually impossible to successfully treat all areas and because intensive treatment over large parts of the drainage raises concerns about irreversible loss of indigenous stocks of fish. The only area where permanent removal of a fish species is attempted is reservoirs where an illegal or inadvertent introduction of an exotic or undesirable species has occurred.

Situations in which treatment projects are undertaken must have a high expected benefit in relation to the cost of the project (high benefit to cost ratio). Use of chemical control must also be carefully weighed in comparison to other fish management alternatives such as stocking of legal-sized trouts or introduction of warmwater game fish.

The specific year when treatment occurs depends on whether management objectives are being met, the availability of funds, and the availability of water levels low enough in the reservoirs or river to reduce the area treated, thus reducing costs.

(M L Hanson)

MALHEUR RIVER HEADWATERS AND TRIBUTARIES

Background and Status

This section covers areas where wild populations of indigenous coldwater game fish including redband trout, bull trout, and mountain whitefish are the principle fishery management concern. It includes the Middle Fork Malheur above RM 168, the North Fork Malheur above Beulah Reservoir; headwater streams and tributaries of the Middle Fork, North Fork, and South Fork Malheur; and mainstem Malheur tributaries. These areas also may contain hatchery rainbow trout and introduced brook trout as well as several species of nongame fish including longnose and speckled dace, mottled sculpin, redside shiner, northern squawfish, chiselmouth, and bridgelip and largescale suckers.

Most headwater streams and mainstem tributaries of the Malheur basin are managed exclusively for wild populations of coldwater game fish without any hatchery supplementation. The continued existence of healthy populations of the indigenous stock of each species in all areas where they are now present is the primary management direction. Population health is evidenced by high abundance with multiple age classes and the genetic fitness inherent in the stock.

Location and Description of Habitat

Two general types of headwater-stream fish habitat exist in the Malheur drainage. The most prevalent type is desert streams that contain redband trout as the only game fish. The second type occurs on the forested areas of the Malheur National Forest and may contain bull trout, brook trout, and mountain whitefish in addition to redband trout.

Headwater streams in desert areas generally support trout populations where they have year-round flow and instream cover such as a substrate of large boulders or good streamside vegetation. These streams usually head in steep rocky canyon rangelands where small pools are present and the gradient is steep. As they near the main river their gradient flattens and they deposit their bedload of rock and gravel. During the summer these streams have flows of 5 cfs or less, and the lower portions are intermittent. Desert streams in the Malheur drainage that support trout occur at elevations ranging from 3,000 to 5,000 ft.

Streams in forested areas generally support trout throughout their length except for headwater areas where gradient is high and access for fish may be restricted. In contrast to desert streams, streams in forested areas usually maintain year-round flow. Most streams have summer flow that is less than 8 cfs, although the North Fork and Middle Fork have summer low flow between 20 and 40 cfs. These streams tend to have good water quality and moderate-to-steep gradient, but suffer from a lack of pools and instream cover (Pribyl and Hosford 1985). The elevations where trout are present in forest streams range from 4,000 to 7,500 ft. The quality of riparian area varies from good to poor depending on the level of livestock grazing.

Surveys of fish populations and habitat characteristics have been completed for most of the area. The North Fork Malheur above RM 35.5 and its major tributaries were surveyed by the Oregon Game Commission in 1972 for visual observations of fish abundance and habitat characteristics. Similar surveys were made for the forested areas of the Middle Fork Malheur and its tributaries in 1989. Fish populations were sampled in the mainstem of both the North and Middle Forks of the Malheur during 1982 and 1983, and additional sampling was done in the mainstems and tributaries in 1989. **APPENDIX F** contains a summary of inventory information for running waters of the Malheur basin. Fishery information for the Little Malheur River has not been collected, and habitat information has been collected for only 4 miles of the river.

Fish Resources and Biology

Redband trout are the most prevalent indigenous salmonid in the basin having been identified by ODFW in 76 streams. They are found in tributaries of the South Fork Malheur and the Malheur River below Warm Springs Reservoir, in the mainstem North Fork Malheur and Middle Fork Malheur above the reservoirs and their tributaries, and in Bully Creek above Bully Creek Reservoir and its tributaries. **APPENDIX G** presents a summary of coldwater game fish distribution for streams in the basin.

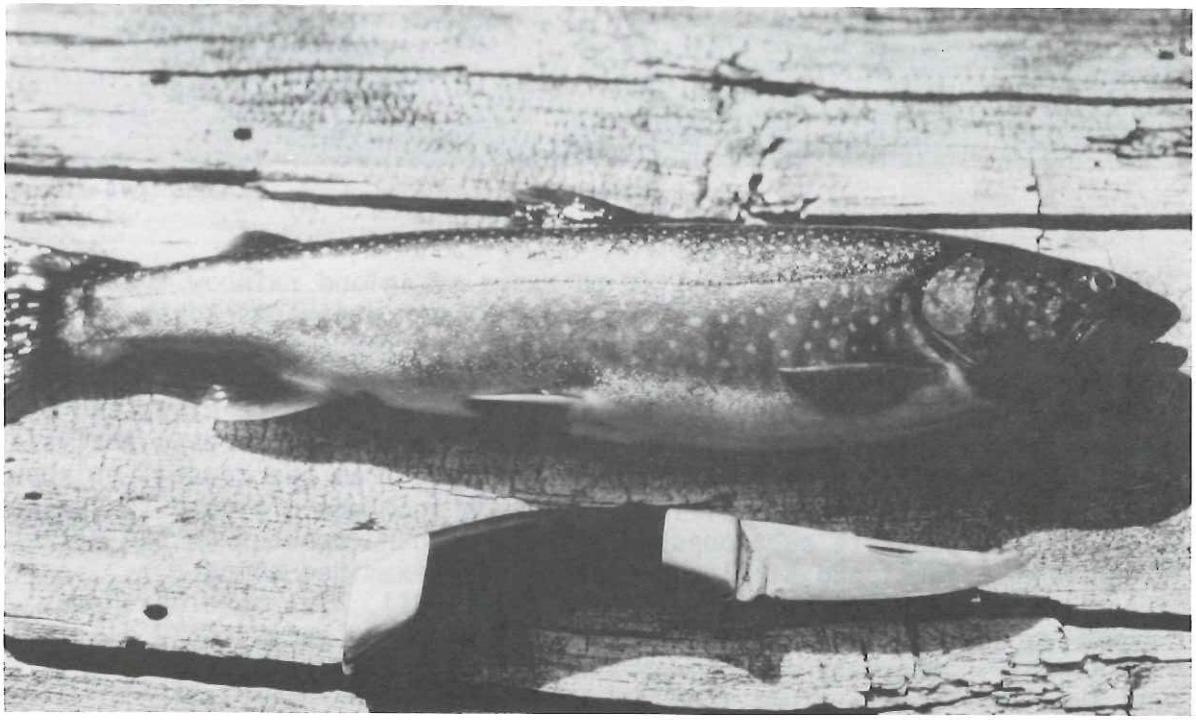
Redband Trout (W E Hosford)

The name redband has been applied to races of inland rainbow trout distributed from the upper Columbia and upper Frazer drainages south to the Kern River system in California. In eastern Oregon these fish are characterized by their high tolerance of the harsh, arid environment (Crouse 1982). Compared with other species of trout, they are able to withstand high temperature and alkalinity, and low oxygen levels. Electrophoretic analysis indicates that this large group of fish is distinct from the coastal rainbow, but populations also differ significantly enough from one drainage to another to be considered separate subgroups. In 1981, redband trout from the Malheur (Wolf and Bear Creeks) and Silvies drainages were examined using electrophoresis and histochemistry (Gall et al. 1981). The conclusion was that these populations have a high probability of being genetically distinct from each other. They share a common ancestry with wild rainbow from the McCloud and Goose Lake systems, but also have unique characteristics.

Several populations of redband trout occur in tributaries that do not have perennial flows in their lower reaches, thus these populations are isolated for most of the year (*see* **APPENDIX G**). We consider these populations distinct breeding populations based on this fact. It is probable that distinct populations of redband trout also occur in other tributaries with perennial flows, but determining their status awaits further genetic analysis.

For purposes of management all tributary populations are treated as distinct breeding populations.

Several investigations of the biological characteristics and life history of redband trout in southeast Oregon (Kunkel 1976; Hosford and Pribyl 1983; Pribyl and Hosford 1985) indicate that in a stream environment they usually mature by the third or fourth year of life at a small size and then die following spawning. Evidence of instream movement of redband from tributary to mainstem in the Middle Fork Malheur and South Fork Malheur and from the North Fork Malheur River to Beulah Reservoir has been documented based on scale analysis (Pribyl and Hosford 1985; S.P. Pribyl, 1984, ODFW unpublished report). Instream migration of redband trout was also identified in the Blitzen and Silvies drainages (Hosford and Pribyl 1983, Hosford and Pribyl in press). The importance of mainstem and reservoir habitat to tributary populations of redband trout is not well understood.



Bull Trout (W E Hosford)

During the surveys conducted in the summer of 1989, bull trout were identified in five tributaries to the North Fork Malheur River (Figure 4). The tributary habitat where these bull trout are found is characterized by extremely low water temperature, high gradient, and abundant instream woody

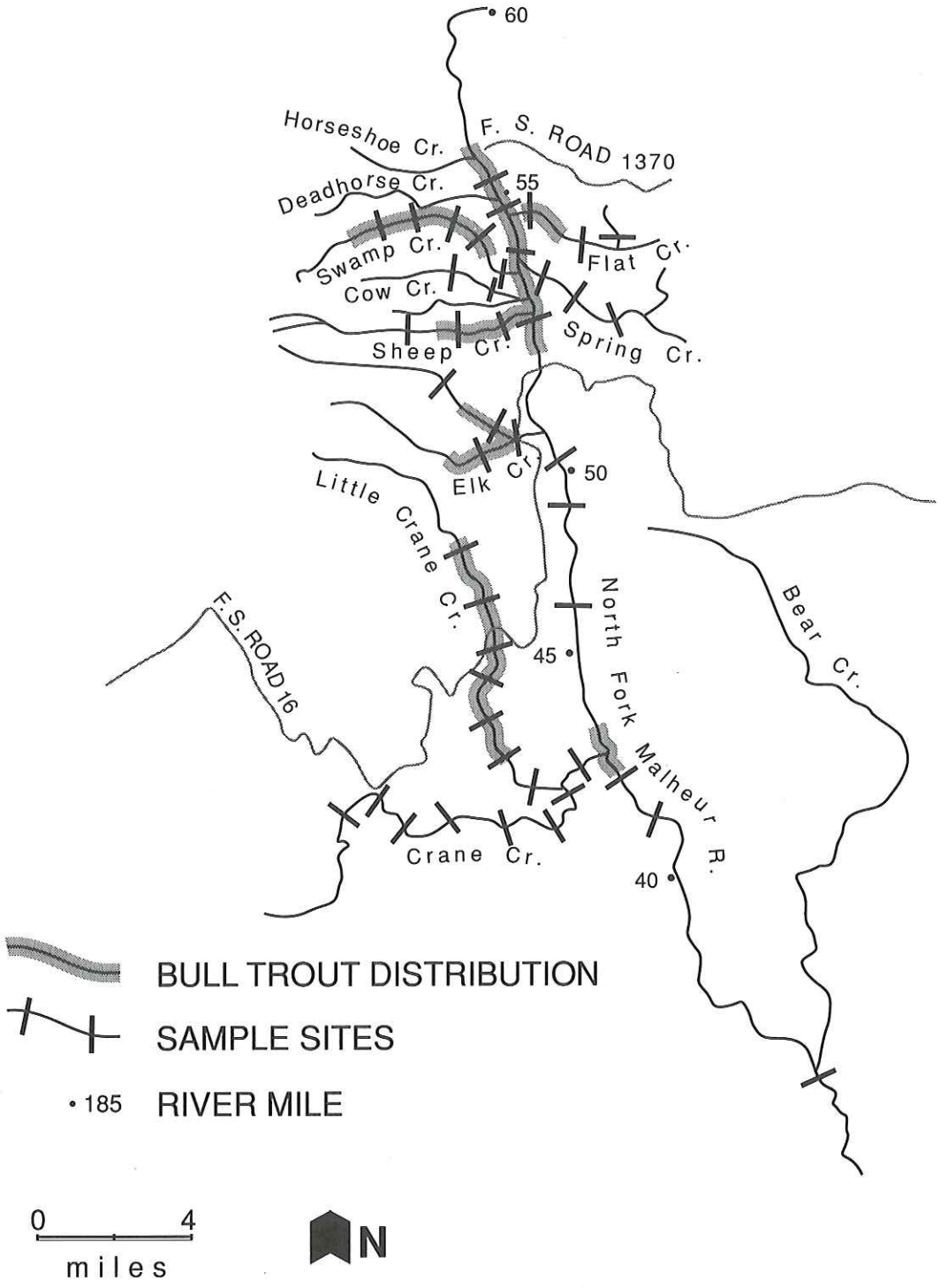


Figure 4. Distribution of bull trout in the North Fork Malheur drainage.

structure. A few bull trout were identified in the mainstem of the North Fork from the mouth of Crane Creek at RM 44 up to RM 56. This distribution was more restricted than that observed in 1982 when bull trout were found in good abundance as far downstream as RM 35. The reduced distribution in 1989 may have resulted from the effect of the 1987-1988 drought. Improved angler access via the North Fork trail completed in 1987 may also have resulted in additional angler removal of bull trout. As late as 1975 a few large bull trout (16-22 inches) were caught in the pool below Beulah Dam on the North Fork Malheur (telephone interview on 11 April 1990 with Cecil Langdon, ODFW District Wildlife Biologist, retired, Ontario, Oregon). A few have also shown up occasionally in inventory nets in Beulah Reservoir, although none have been observed since 1980 (ODFW unpublished data).

A variety of reports indicate that bull trout in the Upper Snake and Columbia River drainage are migratory (Shepard et al. 1984; telephone interviews on 21 February 1989 with Duane West, ODFW District Fish Biologist, LaGrande, Oregon, and Terry Holubetz, Fish Biologist, Idaho Fish and Wildlife, Garden City, Idaho). Young fish spend about two years in the small stream before moving downstream into larger flowing waters, lakes, or reservoirs. They remain in these larger waters until they return to headwaters to spawn or must move into feeder streams to escape areas of poor water quality during mid-summer. The absence of smaller fish in the mainstem North Fork suggests a spawning migration of larger fish from the mainstem into the tributaries (Figure 5). It is not known if these larger fish comprise the entire spawning population or if some of the smaller fish that spend their entire life in tributaries also spawn.

The mainstem Middle Fork does not appear to contain any bull trout based on their complete absence in both the 1982 and 1989 surveys and the apparent unsuitability of the habitat. They were there historically, however. During an extensive treatment project in the Middle and North Fork drainages in 1955, bull trout were observed as far downstream as Wolf Creek on the Middle Fork Malheur (telephone interview on 11 April 1990 with Cal Giesler, ODFW nongame biologist, retired, Arlington, Oregon). The last reliable observation of bull trout in the mainstem Middle Fork Malheur was during the mid-1960s when an angler caught one below Dollar Basin (approximately RM 184) (personal communication on 26 January 1990 with Al Polenz, Wildlife Biologist, ODFW, Roseburg, Oregon). Interchange between the populations in the North Fork and Middle Fork Malheur drainages has been blocked since the early 1900s due to construction of Beulah and Warmsprings Dams. They are now considered distinct breeding populations because of this geographic isolation.

Bull trout were identified in three tributary streams of the Middle Fork Malheur River in the very upper part of the drainage (Figure 6). Most of these fish were small with only a few larger fish observed in and around beaver ponds on Big Creek (Figure 7). Similar to the North Fork it is not known if small bull trout in upper tributaries mature and spawn, or if only the larger fish in habitats such as beaver ponds mature.

Habitat requirements for bull trout include both small stream areas for adult spawning and juvenile rearing and larger waters for adult rearing. Water quality in both areas must be excellent for bull trout to have a

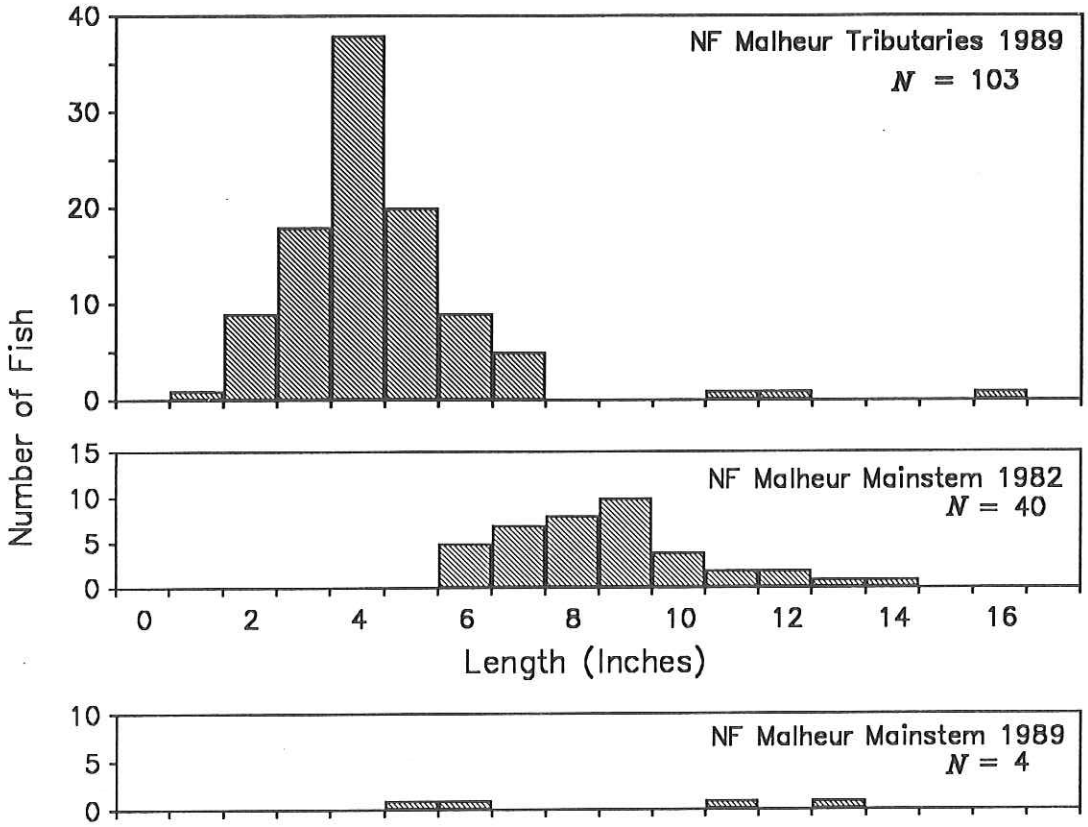


Figure 5. Length-frequency distribution of bull trout observed in electrofishing surveys in 1982 and electrofishing and snorkeling surveys in 1989 in the North Fork Malheur River.

competitive advantage over other fish species that are more tolerant of degraded habitats. Bull trout typically spawn in the early fall in headwater streams with pristine water quality. Spawning and juvenile rearing are associated with streams where the maximum stream temperature is from 59° to 64°F with highest densities occurring in areas where water temperature was 54°F or less (Shepard et al. 1984).

Bull trout habitat has been impacted by a variety of factors. Foremost among these is the diversion of water for irrigation of streamside hay meadows. This activity reduces water volume in the stream thereby leading to warming of the water to temperatures that may be excessive for bull trout. The diversions are unscreened so migrating fish may be lost. The irrigated meadows are also heavily grazed by cattle, so the irrigation water returning to the stream is highly enriched which may be detrimental for bull trout. Cattle grazing in riparian areas also appears to be detrimental to bull trout habitat in some areas. Logging has occurred in much of the upper Malheur drainage resulting in loss of riparian cover and degraded water quality.

In addition to habitat degradation, the introduced brook trout populations in the Middle Fork Malheur are a threat to bull trout. These

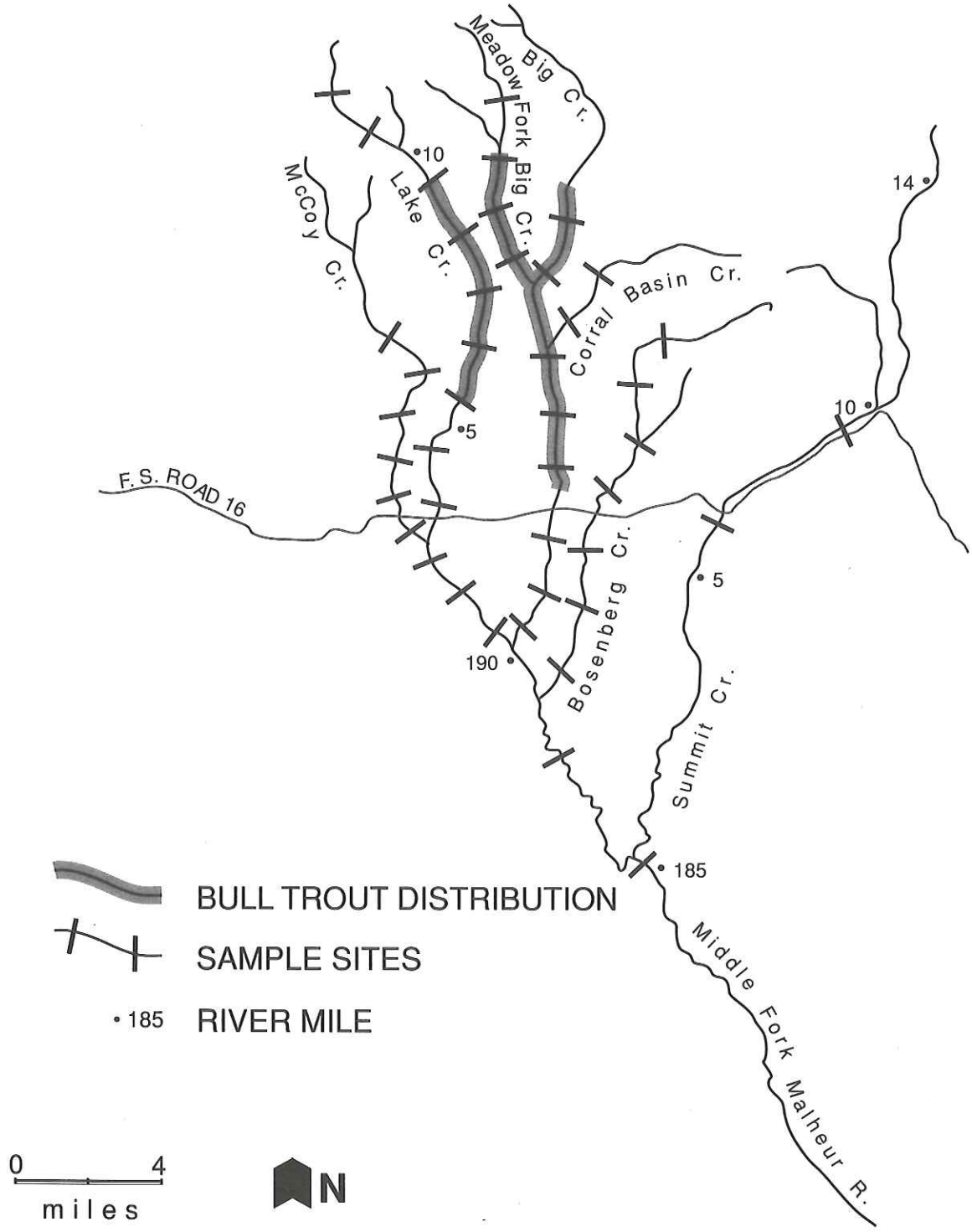


Figure 6. Distribution of bull trout in the Middle Fork Malheur drainage.

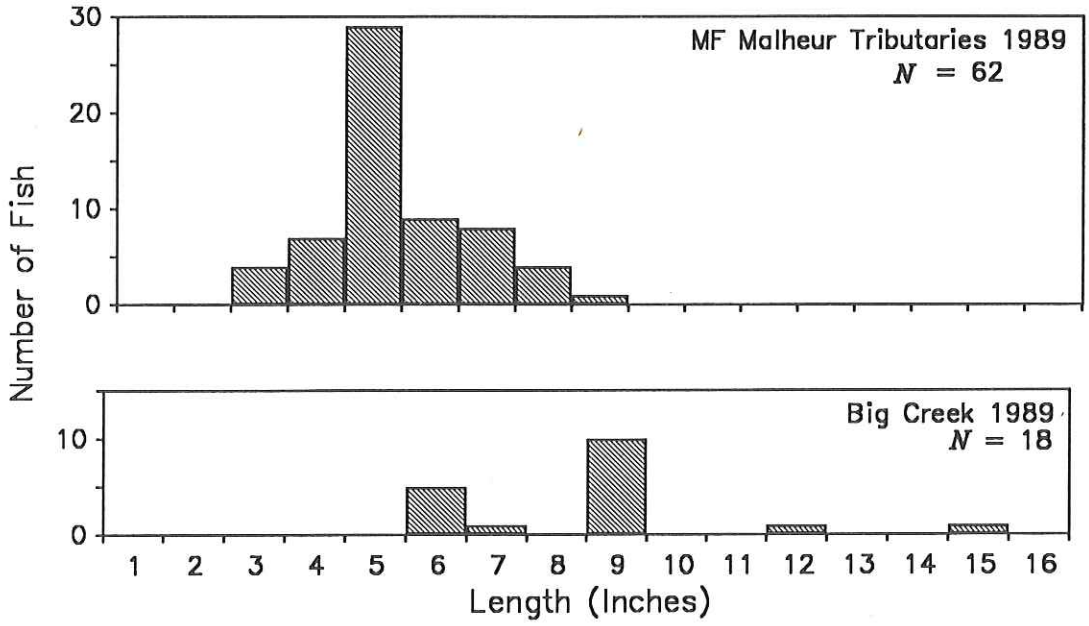


Figure 7. Length-frequency distribution of bull trout observed in electrofishing and snorkeling surveys in 1989 in the Middle Fork Malheur tributaries.

brook trout both compete for habitat and have been identified to hybridize with bull trout (Doug Markle, Oregon State University, unpublished data). Brook trout outnumbered bull trout at four out of five sample sites where both species were found. Overall, brook trout were found at 28 sample sites and outnumbered bull trout in the catch by a factor of six. These brook trout may already be in part responsible for the loss of bull trout in some areas and represent a threat to them throughout most of the remainder of their range in the Middle Fork Malheur drainage.

The Little Malheur has not been inventoried as yet. Throughout much of its length it lacks the extremely cold water required by bull trout and doesn't exhibit other characteristics of bull trout habitat. However, there are reports of bull trout having been caught in the mainstem and one tributary near Forest Service Rd 16 (telephone interview with Cal Giesler on 11 April 1990, ODFW nongame biologist, retired, Arlington, Oregon).

The future for bull trout in the Malheur drainage is uncertain. If the populations in the pristine upper tributary areas contain sufficient mature fish and can thereby function as closed populations, several areas are present where bull trout can be maintained. However, if bull trout that use larger downstream habitats are critical to the population, then the future is much more clouded. These downstream areas are badly degraded and provide marginal bull trout habitat.

Bull trout and redband trout are listed as Category II species under the Threatened and Endangered Species Act (U.S. Fish and Wildlife Service 1985). This means more information is needed on these species before a determination

of threatened or endangered status can be made. Both species are on the review list for Oregon threatened and endangered species compiled by the Oregon Natural Heritage Data Base (1987), the ODFW sensitive species list, and the U.S. Forest Service (Region 6, Oregon and Washington) sensitive species list. According to the U.S. Forest Service Manual (U.S. Forest Service 1986) an analysis of effects of proposed forest management activities on sensitive species and their habitat is required, and special management considerations will be given to them. U.S. Bureau of Land Management policy provides consideration for Category II species directing protection and enhancement of their habitat to prevent them from becoming listed as threatened or endangered (U.S. Bureau of Land Management 1988).

The Malheur National Forest Plan designates bull trout and redband trout where they are currently present as indicator species for non-anadromous fish and riparian habitat on the Forest (U.S. Forest Service 1990). The assumption is that management activities that affect bull trout will affect a variety of other species in the same or similar habitat. Likewise, measures to protect the indicator species will protect other species as well.

Brook trout occupy habitat similar to that occupied by bull trout for spawning and juvenile rearing areas. They tend to stunt at a small size (below 6 inches), so their value to the angler creel is reduced. Since they are an introduced species they are not as high a priority as are indigenous coldwater fish species.

Mountain whitefish occur in sections of the upper North and Middle Fork Malheur, Crane Creek, and Big Creek where the channel is relatively large, deep pools are common, and water quality is still good. The populations in the North Fork Malheur and Middle Fork Malheur are considered distinct breeding populations because of the geographic isolation created by construction of the dams.

The only headwater-type areas of the Malheur drainage that are stocked with hatchery trout are sections of the Middle Fork, North Fork, and Little Malheur Rivers on National Forest land near Forest Service Road 16. A total of about 6,000 yearling rainbow trout (Cape Cod stock) are stocked annually at 11 sites. The entire upper drainage contains very few trout over 8 inches in length (Figure 8), so the stocking program is essential to maintaining the existing fisheries. Creel surveys conducted during the summer of 1989 indicated that 69 and 92 percent of the trout over 8 inches caught in the Middle Fork and North Forks, respectively, were of hatchery origin. Utilization of the hatchery fish appeared to be highest around heavy use areas near campgrounds. Surveys of the river's fish populations indicated that almost all the hatchery rainbow were removed from these areas within a month of the stocking date. In the stocking location on the North Fork that was furthest away from major campgrounds, it did not appear that utilization was complete as evidenced by the presence of much higher abundance of hatchery trout remaining one month after stocking (ODFW unpublished data 1989).

Stocking of yearling trout at these sites has taken place since the mid-1950s. Angler survey results indicated that the majority (62.4%) of respondents favored continued stocking of yearling trout at the present level

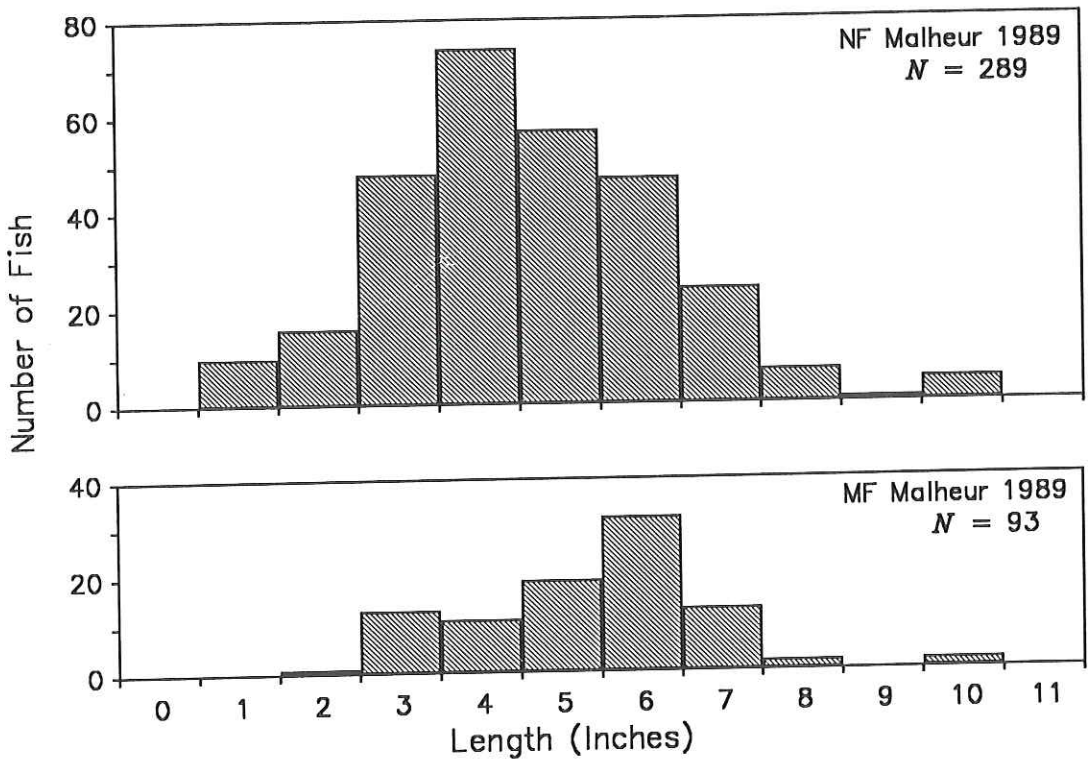


Figure 8. Length-frequency of redband trout sampled in electrofishing and snorkeling surveys in the upper Malheur basin during 1989.

in the southeastern region (*see* **APPENDIX B**).

Hatchery introductions of rainbow trout are not thought to have had a substantial detrimental effect on redband trout. In areas of the Malheur drainage where yearling trout are stocked, ODFW sampling indicates that redband trout are widely distributed and abundant with multiple age classes (Pribyl and Hosford 1985, ODFW unpublished data 1989). The competition with hatchery trout is minimal because the hatchery fish are poorly adapted, and most hatchery fish are caught in the fishery or perish from natural causes. Interbreeding between redband and hatchery rainbow trout is also unlikely because the yearling hatchery fish do not mature until two years after stocking and they spawn in the fall or winter, whereas the redband trout spawn much later in the spring. Hatchery rainbow trout draw increased angling pressure in limited areas near the release sites, while redband trout are widely distributed and appear to be maintaining high abundance.

For similar reasons, other tributary populations of redband are not thought to be in jeopardy from current fingerling hatchery rainbow releases in mainstem sections of the Malheur River and South Fork Malheur. Most of these tributaries are intermittent in their lower reaches for most of the year limiting contact between hatchery and redband trout to periods of high flows during the spring. Behnke (1982) examined redband trout from the Little Malheur River and other small tributaries to the mainstem Malheur and Bully Creek. He concluded that from a morphological and meristic standpoint these trout showed very little evidence of introgression of hatchery trout

characteristics. He attributed this to natural selection strongly favoring the native genotype. In 1988, samples from Dinner and Black Canyon Creeks (mainstem Malheur tributaries) and Cottonwood Creek (Bully Creek tributary) were examined using electrophoresis. Trout from Dinner Creek were genetically similar to the trout from Bear and Wolf Creeks examined in 1981, while trout from Black Canyon and Cottonwood Creeks shared genetic similarities with the coastal rainbow group. This variation could have been caused by genetic drift, natural selection, or hybridization with hatchery rainbow descended from coastal rainbow stocks (Shreck and Currens 1988). Additional genetic and life history work is needed to explain relationships between populations of redband trout in the Malheur basin, their relationship within the rainbow group, and possible interaction with hatchery rainbow trout. It is clear that tributary populations of redband trout have persisted in spite of historical stocking and chemical treatment projects throughout most of the basin, and they continue to display the life history characteristics that have allowed them to survive in an extremely harsh environment.

Indigenous species of nongame fishes are also a consideration in management, although less emphasis is directed toward them. Objectives of ODFW's Nongame Wildlife Plan include maintaining existing indigenous nongame species and restoring indigenous nongame species no longer present in the region (OAR 635-100-015). The status and characteristics of the stocks found in the Malheur drainage are not well understood, but we believe that if overall habitat quality and quantity is maintained, both game and nongame fish will be maintained.

Fishery

Angling for wild trout in Malheur headwater areas and tributaries begins each year following spring runoff and continues through the fall hunting season. Catch rate is high, but the trout are small. Fish over 12 inches are rare. Angler density is usually low because of the vast area, limited access, and extended period of activity. Anglers are drawn to these areas by the opportunity to explore remote areas and catch wild trout in isolation. Anglers that participate in the fisheries are from local areas and from western Oregon and frequently combine their fishing with a camping trip.

Stocking of yearling hatchery trout during the early summer draws concentrations of anglers to localized areas. These anglers tend to be less experienced and are again combining fishing with a camping trip.

A small contingent of anglers is attracted to the upper Malheur during winter months to fish for mountain whitefish, but most are caught incidentally by trout anglers.

Access

Public lands allow access to most streams that support redband trout. Many of the streams are remote without adjacent roads, so a hike is required to reach them. This remoteness reduces angling pressure.

Generally, access to areas in the basin inhabited by bull trout is limited. Changes in U.S. Forest Service designated roadless areas to allow increased trail and road development may have a detrimental impact on bull trout habitat from increased sedimentation, and bull trout mortality may increase from the additional angling pressure. An area of specific concern is the Glacier Mountain roadless areas where semi-primitive motorized recreation will be allowed in drainages where bull trout presently occur.

Habitat Concerns

Degradation of riparian vegetation from livestock grazing is the principle habitat influence that affects coldwater game fish populations of the Malheur drainage. Streams situated in steep canyons have maintained good habitat because they are largely inaccessible to livestock and because the large boulders recruited from canyon walls stabilize the stream channel and provide cover even if livestock have access. Streams in areas of gentle topography are much more sensitive to heavy livestock grazing because animals have easy access and streambank stability is usually dependent on vegetation. Impacts to these areas are particularly severe if grazing is allowed in summer and early fall when the lack of green feed in upland areas and high air temperature cause cattle to concentrate in the riparian zone. Riparian areas remain degraded on many wild trout streams in the Malheur basin.

A habitat management plan for redband trout in the Vale District of the Bureau of Land Management was approved in 1983 by ODFW and the Vale District (M. Crouse, 1982, U.S. Bureau of Land Management, Vale, unpublished report). The plan identifies eight streams in the Malheur basin where redband trout are found, a total of 25.3 miles of habitat, and lists management objectives and planned actions for habitat improvement. Riparian habitat will be improved by changing livestock management (e.g., altering season of use or excluding grazing), fencing, managing beaver populations, and restricting new road development). Habitat improvements have been initiated on all but one of the streams, and periodic reviews of habitat and fish population monitoring results will be used to evaluate progress. The plan will be revised as new inventory information becomes available and other streams with redband trout are identified.

The Burns District BLM is developing information for a redband trout habitat management plan. Inventories of redband trout stream in the district are scheduled to begin in fiscal year 1991 and the expected completion date of the habitat management plan is fiscal year 1994.

Other habitat concerns for coldwater game fish include timber harvest, mining, and water withdrawal. Concerns about timber harvest and mining are similar to concerns about grazing and center on destruction of the riparian zone that results in increases in water temperature, siltation, and loss of desirable channel morphology. These activities can also affect upland vegetation which can result in soil loss and stream siltation. Water withdrawal frequently reduces a stream's ability to support coldwater game fish, particularly during late summer. This is a major concern where bull trout occur.

Policies

Policy 1. The North Fork Malheur River above Beulah Reservoir, the Middle Fork Malheur River above RM 168, and headwater streams and tributaries of the Middle Fork, North Fork, South Fork, and mainstem Malheur River shall be managed for natural production of indigenous populations of wild trout, mountain whitefish, and nongame species with the exception of those areas identified in Policy 2.

Policy 2. The following areas shall be managed for natural production of indigenous populations and harvest of introduced hatchery rainbow trout:

a. Dollar Basin Campground at RM 184 on the Middle Fork Malheur River.

b. North Fork Campground at RM 47.5 on the North Fork Malheur River.

c. Little Malheur River at RM 18 near Forest Service Road 16.

Stocking of hatchery fish shall not exceed a maximum of 3,000 fish per year for all three areas.

Policy 3. Trout management in streams identified in Policies 1 and 2 shall be guided by the statewide Trout Plan under the basic yield alternative except for bull trout which shall be managed as a featured species.

Policy 4. The stocking program shall be curtailed if there is evidence indicates that it adversely affects redband or bull trout.

Objectives

Objective 1. Maintain population health (i.e., high abundance, multiple age classes, and genetic fitness) of bull trout and redband trout.

Assumptions and Rationale

1. Bull trout have a narrow tolerance for changes in water quality.

2. Redband trout and bull trout are federally listed category II species and may be listed as threatened or endangered if additional information on their status justifies their listing.

3. The U.S. Forest Service will give special management considerations to sensitive species and analyze effects of proposed Forest Service activities on sensitive species and their habitat.

Action 2.2 If a regulation to reduce harvest of bull trout is adopted, implement a public outreach, angler education program to assist in identification of bull trout.

Problem 3. Information on redband trout distribution in the basin is incomplete.

Action 3.1 Gather detailed inventory information on redband trout at least every 10 years.

Problem 4. Many of the streams containing redband trout have marginal habitat that will become unsuitable if further degradation occurs.

Action 4.1 Request annual review and updating of habitat management plans from the U.S. Bureau of Land Management Vale and Burns Districts.

Problem 5. Many tributaries in the basin have not been surveyed for physical and biological characteristics.

Action 5.1 Survey streams where data are lacking, e.g., Little Malheur.

a. Survey streams on private and state lands.

b. Cooperate with U.S. Forest Service and Bureau of Land Management to conduct habitat surveys on their lands where needed.

Problem 6. Land management decisions by the U.S. Forest Service (grazing, timber sales, roads and trails) do not always recognize effects of management on sensitive bull trout habitat.

Action 6.1 Request U.S. Forest Service implement manual directives for sensitive species (U.S. Forest Service 1986) that require an analysis of management activities on bull trout activities and their habitat and special consideration of bull trout in land management decisions.

Action 6.2 Review and comment on U.S. Forest Service analysis of effects of management activities on bull trout activities and their habitat.

4. The U.S. Bureau of Land Management will protect and enhance habitat for Category II species.

5. Existing populations of indigenous coldwater game fish are currently limited by available habitat. If habitat improves then production of these fish will improve.

6. If habitat is managed to protect bull trout and redband trout, other indigenous species, game and nongame, will benefit as well.

Problems and Recommended Actions

Problem 1. Information on bull trout life history, population status, and habitat requirements is lacking for streams in the Malheur basin.

Action 1.1 Develop a research project on bull trout, life history, and habitat requirements.

Action 1.2 Once factors limiting bull trout are determined, develop an action plan with the U.S. Forest Service to identify methods and areas to improve bull trout populations.

Action 1.3 Gather detailed inventory information on bull trout at least every 10 years.

Action 1.4 Encourage the U.S. Forest Service to use ODFW inventory information to better aid them in evaluating the potential impacts to bull trout from their land management decisions (e.g., grazing, timber sales, roads and trails).

Action 1.5 Determine the genetic integrity of the Middle Fork Malheur bull trout population.

Action 1.6 Assist the U.S. Forest Service in developing a research project to determine the effects of harvest activities outside the riparian buffer on bull trout habitat.

Problem 2. Recreational harvest of game fishes may cause overharvest of bull trout.

Action 2.1 Recommend adoption of a regulation to reduce harvest of bull trout (e.g., catch and release) in the North Fork Malheur drainage above the mouth of the Little Malheur River and in the Middle Fork Malheur drainage above the mouth of Summit Creek.

Problem 7. Habitat degradation reduces indigenous coldwater game fish populations.

Action 7.1 Achieve basinwide habitat objectives 1, 2, and 3 (pages 24-27).

Action 7.2 Identify habitat improvement projects intended to improve populations of indigenous coldwater game fish populations.

a. Provide a list of potential projects to land managers.

b. Cooperate with land managers on habitat improvement projects.

Problem 8. The importance of mainstem and reservoir habitat to tributary populations of redband trout is not well understood.

Action 8.1 Design and implement a special study to determine the importance of mainstem and reservoir habitat to tributary populations of redband trout.

Problem 9. Information on the genetic and taxonomic status of redband trout populations in the Malheur basin is limited.

Action 9.1 Continue the genetic analysis of redband trout in the Malheur basin.

Action 9.2 Use information gathered in Action 9.1 to review the sensitive status of redband trout in Oregon.

Objective 2. Provide a consumptive fishery on hatchery trout at high use areas identified in Policy 2 by stocking yearling hatchery trout.

Assumptions and Rationale

1. There is a high demand for a consumptive recreational fishery at specific areas in the basin because of historical stocking of yearling rainbow trout.

Problems and Recommended Actions

Problem 1. Wild trout production does not meet angler demand in these areas.

Action 1.1 Stock approximately 3,000 yearling rainbow trout annually at designated areas identified in Policy 1.

Action 1.2 Use information from inventories and research to assess the stocking program's effects on redband and bull trout populations.

Action 1.3 If information shows adverse effects on redband and bull trout, take appropriate action relative to the use of hatchery fish.

MIDDLE FORK MALHEUR RIVER ABOVE WARM SPRINGS RESERVOIR AND MAINSTEM SOUTH FORK MALHEUR RIVER

Background and Status

This section covers the mainstem Middle Fork Malheur between RM 168 and Warm Springs Reservoir (RM 131) and the entire South Fork Malheur mainstem. These segments flow through predominately agricultural land yet are still free flowing. Management emphasis is primarily on natural production of trout and smallmouth bass with limited hatchery trout supplementation (*see* Figure 1).

Middle Fork Malheur

Location and Description of Habitat: The Middle Fork leaves mountainous terrain below RM 168 and flows southeasterly through the Drewsey Valley for approximately 30 miles. The valley floor is quite flat, and the river has a slight-to-moderate gradient. Tributaries that enter the Middle Fork in this region include Wolf, Muddy, Pine, Stinkingwater, and Otis creeks. This section of the Middle Fork supports rainbow trout, mountain whitefish, and smallmouth bass. Numbers of coldwater fishes decrease to virtually none in downstream areas as water quality and quantity decreases during the irrigation season. Trout and mountain whitefish habitat is probably limited by high summer water temperature, low flow, and sedimentation.

Below the U.S. Highway 20 crossing, the Middle Fork flows for another 12 miles through more dissected rangeland terrain before entering Warm Springs Reservoir at RM 131. Smallmouth bass are common throughout this section. During the spring of average water years, smallmouth bass move up the river from Warm Springs Reservoir to spawn. Riffles and the shallow rock substrate are preferred rearing habitat for young-of-the-year smallmouth.

Natural stream runoff is highly variable with high spring flow followed by low flow for the rest of the year. Flooding that sometimes occurs in late winter and early spring results in moderate to severe erosion throughout the area. Naturally occurring low flow in the summer is aggravated by heavy irrigation withdrawal.

Fish Resources and Biology: Game fish inventoried in the mainstem above Warm Springs Reservoir during 1983 and 1986 included redband trout, hatchery rainbow trout, smallmouth and largemouth bass, yellow perch, mountain whitefish, and brown bullhead. Trout density ranged from 130 to 800 per stream mile, and whitefish density ranged from 105 to 900 per mile. Most of the whitefish were less than 6 inches. About 1,500 yearling trout are stocked in headwater tributaries each year, and occasionally some drift into the area.

Density of smallmouth bass numbers increased from 100 per mile in upper areas to 2,000 per mile near Warm Springs Reservoir. Most are yearlings about 3 inches long.

Some brown bullhead, channel catfish, yellow perch, and largemouth bass

are found within this reach of the Malheur, but their contribution to the catch is incidental.

During the 1955 treatment project, 37 miles of the Middle Fork Malheur and 153 miles of tributary stream were chemically treated. The following year yearling rainbow trout (Hagerman National Fish Hatchery, Idaho stock) and fingerling (3- to 5-inch fish) rainbow trout (Roaring River stock) were stocked in the treatment project area (ODFW unpublished data). Channel catfish were introduced the same year, both fingerlings from Ft. Worth, Texas, and fish over 6 inches transplanted from the Snake River. Additional stocking with yearling rainbow trout (Hagerman stock) took place between 1958 and 1963. Smallmouth bass were introduced in 1958 from Snake River stocks and have become self-maintaining. It is unlikely that introduced hatchery trout developed into a self-sustaining population. The probable source of trout is from downstream movement of indigenous fish from areas above the treatment project.

Fishery: This section of the Middle Fork accounts for an estimated 2,500 angler trips annually, most of which occur during the spring as the streamflow clears and recedes following spring runoff. Most of the fishermen are from local areas and are pursuing smallmouth bass and trout in the area upstream from Drewsey or exclusively smallmouth bass in areas below Drewsey. The participants are drawn by the attraction of a springtime fishing experience with the possibility of catching moderate quantities of fish for consumption.

Access: Public land ownership assures access within the 12 miles of the Middle Fork above Warm Springs Reservoir. Private land limits access within the Drewsey Valley; however, many of the ranches allow access if permission is requested.

Habitat Concerns: Low summer flow is the overriding habitat concern for this area. Fish are lost at unscreened diversions. Other habitat concerns include streambank erosion and lack of riparian vegetation.

In 1985 a minimum flow of 15 cfs was proposed for the Malheur River where U. S. Highway 20 crosses it near RM 142. The State Water Resources Board adopted the recommended flow, then rescinded it pending a study of water use in the Drewsey Valley. The study has been completed, but a final decision to reconsider the minimum flow has not been made by the Water Resources Commission. Although an instream flow designation would not provide more water to the stream, it would insure a place for fish life in the succession of water appropriations.

Increased pool habitat would improve fish production by providing holding area during winter when the river freezes over and during summer when flow is low. The resident fish habitat projects approved by the Northwest Power Planning Council (but not funded) are for pool development and bank stabilization on sections of the Middle Fork Malheur between Logan Valley and Van, on Summit Creek, and on the Middle Fork Malheur from U.S. Highway 20 to

Warm Springs Reservoir (*see* discussion under Northwest Power Planning Council on page 16). The projects, which total $1,039,325, include boulder placement, rock jetties, riparian fencing, log and rock weirs, juniper and rock riprap, and streambank re-vegetation. The projects will enhance fish habitat by providing increased pool rearing area and by reducing stream sediment and water temperature. Bonneville Power Administration funding for the projects depends on the level of priority given to the projects by the Columbia Basin Fish and Wildlife Authority.

South Fork Malheur

Location and Description of Habitat: The South Fork Malheur drainage flows in a northeasterly direction off the west side of Indian Creek Butte and the southern portion of the Stinkingwater Mountains, and enters the Malheur River near Riverside (RM 119). The subbasin has about 630 square miles of area and 10 miles of mainstem habitat suitable for game fish production.

Major tributaries include Crane, Deadman, Swamp, Coleman, and Granite creeks. Mean annual discharge from the basin averages 65 cfs or approximately 49,000 acre feet per year. No large storage reservoirs are present, and its discharge can be a significant contributor to flooding in the Malheur basin. High discharge can occur in winter when the basin is snow covered and warm rain melts the snow rapidly.

Fish Resources and Biology: Game fish species collected in the mainstem South Fork Malheur in 1984 included indigenous and hatchery rainbow trout, smallmouth bass, pumpkinseed, brown bullhead, and yellow perch.

Smallmouth bass numbers increased downstream, probably in response to higher water temperature. Brown bullhead, pumpkinseed, and yellow perch are not well adapted to the small stream habitat; consequently, they are not abundant. Trout made up 3% of the fish numbers in upstream areas, and even less downstream in response to poorer water quality and higher water temperature.

The best trout rearing habitat in the South Fork Malheur is around White Bridge between RM 17 and 18 where large springs enter the river. Natural spawning success for trout is thought to be inadequate to fill available rearing habitat so about 5,000 hatchery fingerling (Oak Springs domestic stock) are released annually. These stocked fingerling will use this area or drift downstream and take up residence where suitable habitat is available. During the 1984 inventory, visual inspection of trout in the 4- to 6-inch group revealed that about 75% were of hatchery origin, the result of fingerling releases in the early summer (Figure 9). Suitable habitat would probably be under-seeded without hatchery supplementation.

Trout spawning habitat is limited in the mainstem South Fork Malheur, primarily because of sedimentation. Although some spawning does take place, the origin of the naturally spawned trout found in the mainstem South Fork is not certain. They may move down from tributary streams containing redbands,

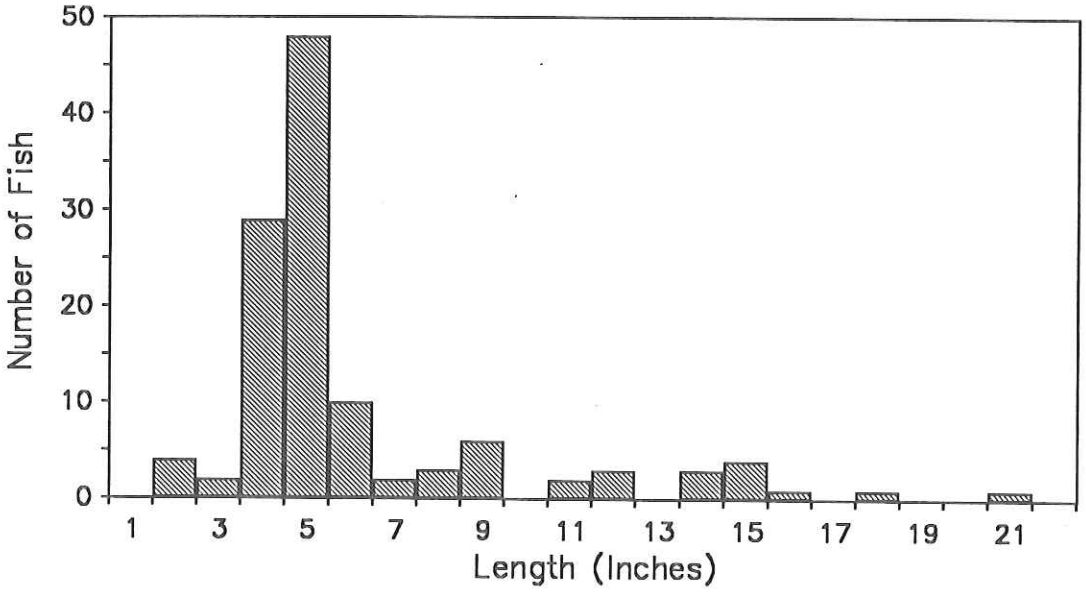


Figure 9. Length-frequency distribution of trout captured in South Fork Malheur River, 1984. (N = 117).

or they may be progeny from spawning by hatchery fish. Also, the South Fork Malheur (Rm 17.5 to the mouth) was chemically treated in 1963 to inhibit migration of nongame fish into the Malheur River. This was done in conjunction with chemical treatment projects on the mainstem. The most recent chemical treatments in the South Fork Malheur included the lower 5 miles in 1974 and the lower 100 yards in 1987. For these reasons we do not believe these trout constitute a wild population as defined by OAR 635-07-501 but, rather, are a fringe of wild tributary populations or progeny of hatchery fish.

Smallmouth bass migrated into the South Fork Malheur from Warm Springs Reservoir via the Malheur River in the late 1960s and have since increased in the lower 10 miles of stream. This appears to be an important spawning and rearing area, because most of the smallmouth bass sampled were 2 to 3 inches long. Average fork length of smallmouth bass collected in the South Fork Malheur compares favorably with other rivers in southeastern Oregon (Table 4).

Fishery: The South Fork Malheur draws low angling pressure because of the low numbers of game fish and predominance of private land. Most angling occurs around the White Bridge for trout and in the lower 2 miles for smallmouth bass.

Access: A County road parallels the stream from Venator to its mouth, but almost all land is in private ownership so access is by permission only.

Table 4. Average fork length (inches) of smallmouth bass in southeastern Oregon rivers at the end of each year of life (1984).

River	*N*	Age in Years[a] 1	2	3	4	5	6	7	8
Middle Fork Malheur	24	2.1	5.4	8.1	10.3	11.6	12.2	-	-
Silvies	45	-	4.0	6.4	8.9	11.8	11.8	14.0	-
South Fork Malheur	16	3.0	5.9	9.8	12.5	-	-	-	-
Owyhee	35	2.2	5.3	7.7	9.0	9.8	10.8	11.7	12.4
Snake	27	1.9	4.3	6.0	7.2	9.2	10.6	11.5	-

[a] *Determined from unpublished ODFW scale data.*

Habitat Concerns: During inventory survey of the South Fork we found that trout did not inhabit the lower 12 miles of the stream. The absence of trout is associated with increasing conductivity levels related to naturally occurring salts (Table 5). High conductivity may indicate water quality that is not suitable for trout. Naturally occurring dissolved solids will continue to limit fish production in some locations.

Table 5. Conductivity in the South Fork Malheur River and Middle Fork Malheur, 1984.

Location	Conductivity
Swamp Creek, RM 18	345
Coleman Creek, RM 14	430
Luce Ranch, RM 10	723
McCray Ranch, RM 5	784
Riverside, RM 0.5	801
Middle Fork Malheur, RM 119	114

As with most other streams in southeastern Oregon, the South Fork Malheur has severe stream bank erosion problems. The riparian corridor as well as the uplands need improvement in order to stabilize the watershed and thereby improve fish habitat.

Policies

Policy 1. Manage the mainstem Middle Fork Malheur River above Warm Springs Reservoir to RM 168 and the mainstem South Fork Malheur River for trout and smallmouth bass.

a. Trout in the mainstem Middle Fork Malheur River shall be managed for natural production of wild fish consistent with the Wild Fish Management Policy.

b. Trout in the mainstem South Fork Malheur River shall be managed for natural production of wild and hatchery produced fish consistent with the Wild Fish Management Policy. Stocking of hatchery fish shall not exceed 5,000 fish per year.

c. Smallmouth bass shall be managed for natural production consistent with the Natural Production Policy.

Policy 2. Trout and smallmouth bass management on the stream sections identified in Policies 1 shall be guided by the statewide Trout Plan and Warmwater Fish Plan, respectively, under the basic yield alternative.

Objectives

Objective 1. Improve production of trout and smallmouth bass in the mainstem Middle Fork Malheur River above Warm Springs Reservoir to RM 168 and in the mainstem South Fork Malheur River.

Assumptions and Rationale

1. Natural production currently maintains trout and smallmouth bass populations in the Middle Fork Malheur and the smallmouth bass population in the mainstem South Fork Malheur River.

Problems and Recommended Actions

Problem 1. Habitat degradation limits production of game fish.

Action 1.1 Achieve basinwide habitat objectives (Objectives 1, 2, and 3, pages 24-27).

Problem 2. Inventory data on fish populations is limited.

Action 1.1 Monitor fish populations on a periodic basis.

Problem 3. Northwest Power Planning Council project work for the Middle Fork Malheur has been approved, but funding has not been released by Bonneville Power Administration.

Action 3.1 Request the Columbia Basin Fish and Wildlife Authority to recommend to Bonneville Power Administration that Malheur basin Northwest Power Planning Council projects be given a higher priority for funding.

Objective 2. Provide a consumptive trout fishery on the mainstem South Fork Malheur River.

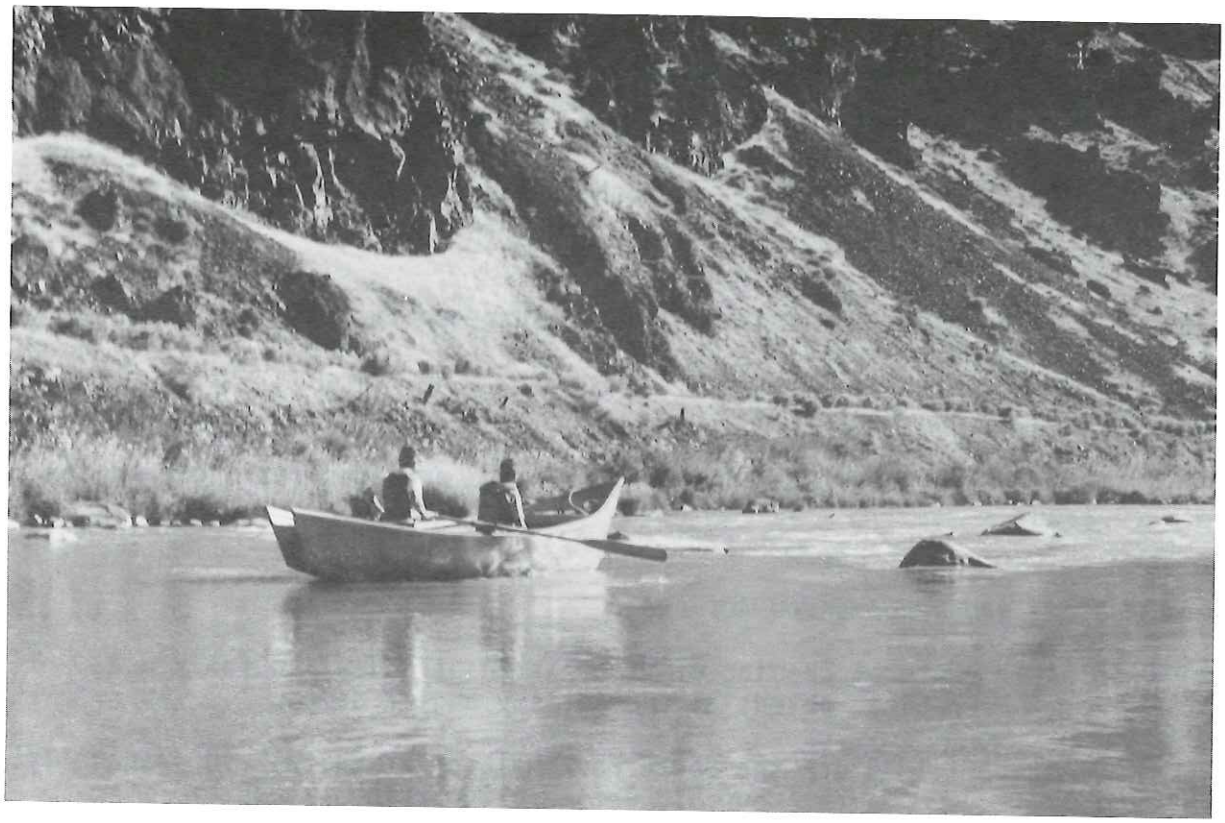
Assumptions and Rationale

1. Habitat in the vicinity of White Bridge provides rearing area for trout.

Problems and Recommended Actions

Problem 1. Natural seeding of trout is insufficient to fully use habitat potential and satisfy angler demand.

Action 1.1 Stock the South Fork Malheur at White Bridge annually with about 5,000 fingerling rainbow trout.



(ODFW Files)

MALHEUR RIVER AND NORTH FORK MAINSTEMS - RESERVOIRS DOWNSTREAM TO NAMORF DAM

Background and Status

The mainstem Malheur from Warm Springs Dam (RM 123) downstream to Namorf Dam (RM 69), the North Fork Malheur from Beulah Dam (RM 18) downstream to its confluence with the mainstem (RM 96), and Willow Creek from Malheur Reservoir Dam (RM 41) downstream to RM 30 above Brogan contain habitat suitable for trout production (*see* Figure 1). This trout habitat results because cold water is discharged from outlets near the base of Warm Springs, Beulah, and Malheur Reservoir dams during the irrigation season.

Management emphasis is on the mainstem Malheur segment where the trout fishery is maintained primarily through annual releases of fingerling rainbow trout. Trout washed out of Beulah Reservoir provide a significant fishery in the North Fork Malheur, while those washed out of Malheur Reservoir provide a limited fishery in the Willow Creek segment.

Location and Description of Habitat

The Malheur River between Warm Springs Dam and Riverside meanders through

several rocky canyons and hay meadows. The gradient is moderate; and long, slow, pools and riffles are common. In the Riverside to Juntura section the river corridor is confined within a narrow, steep-walled, rocky canyon. Within this canyon the river is paralleled by the Union Pacific railroad. This portion of the Malheur provides some of the best trout angling found anywhere in the basin. Much of the remote canyon is accessible only by foot because of a BLM ban on motorized vehicles. From Juntura to Namorf Dam the river valley widens where Highway 20 and the railroad border the river. During highway and railroad construction, portions of the river were channelized. Several ranches that produce hay and winter livestock are situated in the river valley. However, most of the river corridor has been protected from livestock grazing for about 20 years, and the riparian area is in good condition. The highway and railroad limit livestock movement as well. Generally, this part of the Malheur has a moderate gradient that is less steep than in the canyon, and a good pool-riffle ratio. Approximately 54 miles of the mainstem from Warm Springs Dam to Namorf Dam are suitable trout habitat.

Below Beulah Dam the North Fork Malheur meanders downstream along the floor of a narrow valley for approximately 8 miles. Although extremely meandering in nature, the stream maintains good velocity and has short sections of riffles or rapids. At the lower end of the valley the river enters a steep, rocky, canyon. The stream rushes through boulders at a high velocity for the next 4 miles before it enters a second valley. It continues to flow another 6 miles through the widening valley until it reaches the mainstem Malheur near Juntura. Much of the lower 6 miles has been channelized and straightened. Because of the channelization, the stream maintains a moderate to fast velocity. Suitable trout habitat includes all 18 miles of river below Beulah Dam.

Willow Creek below Malheur Reservoir dam flows in a confined canyon through rangeland topography down to about RM 30 where much of the flow is diverted for irrigation of cropland in the valley downstream. Habitat is suitable for trout throughout most of the 11 mile segment below the dam.

Flow below Beulah, Warm Springs, and Malheur reservoirs is regulated for irrigation of downstream areas. A typical discharge pattern at the dams consists of irrigation releases from mid-April through mid-October followed by a complete shut down for the remainder of the year. Seepage from Beulah Reservoir and springs provide 5-10 cfs of flow in the North Fork Malheur channel. In the mainstem Malheur, most of the flow during the nonirrigation season comes from the South Fork Malheur. The situation is similar in Willow Creek where most of the flow in the nonirrigation season is provided by Basin Creek. The typical flow regime in all three stream segments will be modified in years of abnormal precipitation. A low water year will result in an early end of irrigation whereas high water year will result in reservoir spill in late winter or early spring.

Fish Resources and Biology

Recent information on fish populations in the mainstem Malheur between Namorf Dam and Warm Springs Reservoir and in the mainstem North Fork Malheur

from Beulah Reservoir to the confluence with the Malheur includes electrofishing surveys conducted periodically from 1973 to the present, and counts of dead fish following chemical treatment in 1987. These surveys indicated a predominance of nongame fish. For example, Table 6 shows results of the 1985 survey. Game fish counted in the Malheur River included redband and hatchery rainbow trout, Mann Lake cutthroat trout, smallmouth bass, yellow perch, brown bullhead, channel catfish, bluegill, and pumpkinseed.

Table 6. Percent species composition of fish sampled in the Malheur River, October 1985.

Species	N	Sample Site (RM)						% of Total Sample
		117	104	95	88	79	74	
Bridgelip sucker	1,319	64.4	38.5	10.0	7.1	67.5	3.9	47.7
Speckled dace	556	3.6	25.9	20.9	24.1	24.1	62.0	20.0
Redside shiner	347	5.6	22.8	37.5	20.5	1.6	0	12.5
Rainbow trout[a]	132	6.2	2.9	3.7	8.9	3.3	3.1	4.7
Longnose dace	129	0	0.3	12.0	11.6	2.2	26.7	4.6
Chiselmouth	103	0.2	7.3	9.3	22.3	0	1.2	3.7
Coarsescale sucker	72	3.6	1.5	3.3	3.6	1.3	3.1	2.6
Smallmouth bass	68	6.0	0	0	0	0	0	2.4
Squawfish	24	1.5	0.2	1.3	1.8	0	0	0.9
Mottled Sculpin	16	7.8	0.2	2.0	0	0	0	0.6
Pumpkinseed	10	0.9	0	0	0	0	0	0.4
Mann Lake cutthroat	4	0.1	0.5	0	0	0	0	0.1
Yellow Perch	2	0.2	0	0	0	0	0	0
TOTAL	2,782							

[a] *Includes redband and hatchery rainbow trout.*

Rainbow trout occur throughout the North Fork Malheur between Beulah Reservoir and Juntura. Brown bullhead are also found occasionally. Mountain whitefish are found below the dam for a distance of 3 to 4 miles.

The Malheur mainstem below Warm Springs Reservoir and the North Fork mainstem below Beulah Reservoir were chemically treated in 1963, 1973, 1977, and 1987, to reduce nongame fish numbers in order to maintain a high quality trout fishery. Optimally, these treatments are considered desirable about every 7 years, although this schedule is not strictly followed because of the need for a low water year to reduce treatment costs (*see* pages 30-31 for a discussion of chemical treatments).

Rainbow Trout (W E Hosford)

During the spring following treatment the river is re-stocked with fingerling trout that will grow to legal size by the following fall. Yearling trout may also be stocked the first spring after treatment around popular access areas such as Riverside to create an instant fishery. The 2nd to the 5th years after treatment will provide maximum trout production before nongame fish again take over.

The North Fork Malheur between Beulah Reservoir and Juntura is not routinely stocked because land is private and because substantial numbers of trout move downstream from Beulah Reservoir into the area.

The annual stocking rate in the mainstem Malheur is from 80,000 to 120,000 fingerling rainbow trout (Oak Springs domestic stock) released each spring. The fingerling are distributed over 10-20 release sites spread from Warm Springs Dam downstream to about Gold Creek.

During recent years, fingerling from the Mann Lake cutthroat trout and Eagle Lake rainbow trout have been experimentally stocked in the mainstem. These trout are more piscivorous than domestic rainbow, and it was hoped they would use nongame fish populations. After 6 years of stocking, these programs were discontinued because return to the angler was no better and these fish

were more expensive to raise. The experimental strains were stocked as hold-over fingerling at twice the cost to produce as the traditional domestic hatchery rainbow trout. Hatchery rainbow trout again have been used exclusively since 1985.

Trout caught in the intensive electrofishing survey on the Middle Fork Malheur in 1985 appeared to be mostly from stocked hatchery fingerling. The fish ranged in size up to 22 inches in length (Figure 10). Growth of stocked fingerlings is good with fish reaching about 9 inches after one summer in the river.

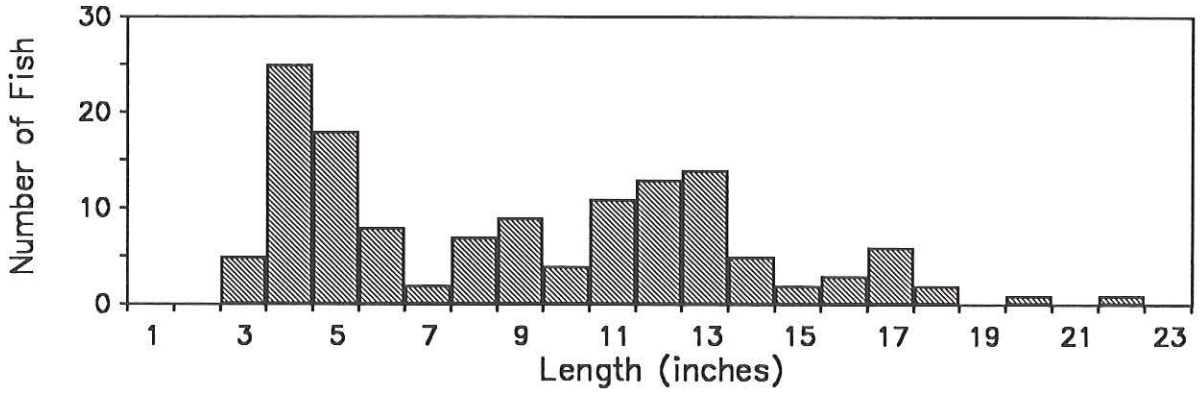


Figure 10. Length-frequency of trout captured in the Malheur River, October 1985. (N = 136.)

Some natural production of trout occurs in the mainstem Malheur as evidenced by trout in the 3-inch to 7-inch size range that composed 43% of the catch. These fish could be progeny of hatchery fish or descendants of endemic races of trout found in tributary streams. Also, because of the extensive chemical rehabilitation of this section of the mainstem Malheur, we do not believe these trout constitute a wild population as defined by OAR 635-07-501.

Warmwater game fish including smallmouth bass and channel catfish are frequently washed downstream into the mainstem from Warm Springs Reservoir and the South Fork Malheur. These species have never been abundant in the upper parts of this section of the Malheur River because of the high, cool summer flow. However, as stream temperature increases below Gold Creek, habitat may have the potential to support smallmouth bass. In 1988, about 15 to 20 smallmouth bass from Bully Creek Reservoir were transplanted into this section of the Malheur River on an experimental basis, but the results of the introduction have not been evaluated.

Willow Creek below Malheur Reservoir has not been inventoried. However, cutthroat trout from Malheur Reservoir were observed near RM 33 in 1986.

Fishery

The Malheur River below Warm Springs Dam is usually a very popular trout fishery. Angling pressure is moderate throughout the summer and peaks in the fall when streamflow drops after the irrigation season. As streamflow drops and the river clears, fish become concentrated in limited pool areas making them more vulnerable to harvest. Western Oregonians frequently combine a hunting trip for mule deer or chukar partridge with fishing in this area. Catch rate in the fishery, which is variable, depends on the time since the last treatment project and on the current balance that exists between populations of trout and nongame fish. Size of trout ranges from a predominance of small fish to an occasional fish over 5 pounds. Limited fisheries for channel catfish and crayfish also exist in the plunge pool immediately below Warm Springs Dam.

The North Fork Malheur below Beulah Reservoir has moderate fishing pressure immediately below the dam and on BLM land near Chukar Park. Angling peaks when irrigation flow is shut down in the fall, and catch rate is largely dependent on the current balance between trout and nongame fish populations.

Angling pressure on Willow Creek is very light, primarily by local residents. The area receiving the heaviest use is between the dam and the mouth of Basin Creek.

Access

Public access to the North Fork below Beulah Reservoir is poor. Public land allows bank access to about one quarter mile immediately below the dam, and then for about one mile of river midway downstream toward Juntura. Beyond this is all land is private, and permission is required to fish. The stream is too small for boats.

The mainstem has much better access because more public land borders the stream and because the river is large enough for boats during the irrigation season. Public land allows bank access to most of the 54 miles of stream between Warm Springs Reservoir and Namorf Dam. The largest areas where private land prevents access are between Warm Springs Dam and the mouth of the South Fork Malheur and around the town of Juntura. Public ownership is intermixed with private land from Juntura to Namorf Dam. The river can be floated with a raft or drift boat from April through October when water is being released for irrigation.

Access to Willow Creek is good upstream to Basin Creek where the road parallels the creek and the land is in public ownership. Above Basin Creek most of the stream corridor is in private ownership and access is by permission only.

Habitat Concerns

The primary factor that influences fish production below Beulah, Warm

Springs, and Malheur reservoirs is the regulation of water discharge for irrigation. This modification of natural flow has the positive effect of providing higher flow, cooler water during the summer thereby allowing the coldwater fishery that now exists.

However, of particular concern is the nonirrigation season when flow is usually shut off completely. Both the mainstem Malheur and North Fork Malheur lack sufficient pool area, a problem that is accentuated during the nonirrigation season. The lack of flow severely reduces protective holding cover, disrupts aquatic insect production, and makes the trout vulnerable to angler harvest. The problem is most severe on the North Fork because of the absence of inflow from tributary streams. The mainstem Malheur is provided some relief because of year-round flow from the South Fork Malheur which enters about 3 miles below Warm Springs Dam.

The irrigation districts that store water in Beulah, Warm Springs, and Malheur reservoirs are not required to maintain any minimum flow for fish life below the impoundments. An assessment of water use for the 23 years ending in 1985 indicated that all available water had been used for irrigation in 5 years for Warm Springs Reservoir and in 7 years for Beulah Reservoir. If water had been provided for minimum fish flow the previous winter in these years, the amount available for irrigation would have been reduced. This occasional shortage of irrigation water will continue to prevent the irrigation districts from voluntarily providing any winter fish flow.

Another habitat problem that has resulted from reservoir construction is extended periods of high turbidity. This turbidity is caused because the reservoirs store turbid water from the spring runoff and because wave action creates turbidity along the shoreline. Flow into the reservoirs will clear following spring runoff, but discharge below the dams may remain turbid all summer because of suspended sediment in the reservoirs.

The riparian area along these sections of the Malheur system also has an influence on fish production. Presently the mainstem has generally good riparian cover. However, scattered throughout this area are some locations in need of improvement.

The North Fork Malheur below Beulah Reservoir has poor riparian habitat throughout; however, landowners along the river have expressed an interest in developing a Coordinated Resource Management Plan to improve riparian conditions. Increased access would also be provided. The project would include most, if not all, of the landowners on this section of the river, as well as the Soil and Water Conservation District, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and ODFW.

Riparian cover along Willow Creek varies from poor to good. Sections on BLM land in exclosures or otherwise being managed to improve the riparian habitat are showing improvement. Water quality in Willow Creek is impacted by turbidity and sedimentation caused by the occasional breaching of sedimentation ponds associated with mining activity on Basin Creek.

Policies

Policy 1. Manage the mainstem Malheur River between Warm Springs Reservoir and Namorf Dam for natural production of smallmouth bass consistent with the Natural Production Policy and a maximum of 120,000 hatchery trout stocked each year.

Policy 2. Manage the North Fork Malheur downstream from Beulah Reservoir and Willow Creek between Malheur Reservoir and RM 30 for hatchery trout.

Policy 3. Management of trout and smallmouth bass on the mainstem Malheur between Warm Springs Reservoir and Namorf Dam and hatchery trout on the North Fork Malheur downstream from Beulah Reservoir and Willow Creek between Malheur Reservoir and RM 30 shall be guided by the statewide Trout Plan and the Warmwater Fish Plan, respectively, under the basic yield alternative.

Objectives

Objective 1. Provide a consumptive trout fishery in the mainstem Malheur River between Warm Springs Reservoir and Namorf Dam, in the North Fork Malheur below Beulah Reservoir, and in Willow Creek between Malheur Reservoir and RM 30.

Assumptions and Rationale

1. Achievement of this objective in mainstem Malheur and North Fork Malheur depends on the successful control of nongame fish populations.

Problems and Recommended Actions

Problem 1. Nongame fish tend to out-compete trout.

Action 1.1 Periodically inventory the mainstem Malheur below Warm Springs Reservoir and the North Fork Malheur below Beulah Reservoir to evaluate the population of fishes.

Action 1.2 Periodically chemically treat the mainstem Malheur below Warm Springs Reservoir and the North Fork Malheur below Beulah Reservoir to control nongame fish.

Action 1.3 Restock fingerling trout and yearling trout in the mainstem Malheur and the North Fork Malheur the year following treatment.

Problem 2. Degraded riparian habitat on the mainstem Malheur between Warm Springs Reservoir and Namorf Dam, the North Fork Malheur below Beulah Reservoir, and Willow Creek between Malheur Reservoir and RM 30 limits fishery development.

Action 2.1 Achieve basinwide habitat objectives, especially Objective 2, page 25).

Action 2.2 Continue to actively support development of a Coordinated Resource Management Plan for this section of the North Fork Malheur River.

Problem 3. Low winter streamflow and lack of adequate pool area limit fish production in the mainstem Malheur and North Fork Malheur below Warm Springs and Beulah reservoirs, respectively.

Action 3.1 Develop a list of habitat improvement projects to create holding pool habitat.

Action 3.2 Work with land Soil Conservation Service and private land owners to design and implement cooperative habitat improvement projects.

Problem 4. Experimental plants of trout strains to control nongame fish have not been successful.

Action 4.1 Continue to seek a trout strain that is long-lived, a voracious predator on nongame fish, and compatible with redband trout in the tributaries.

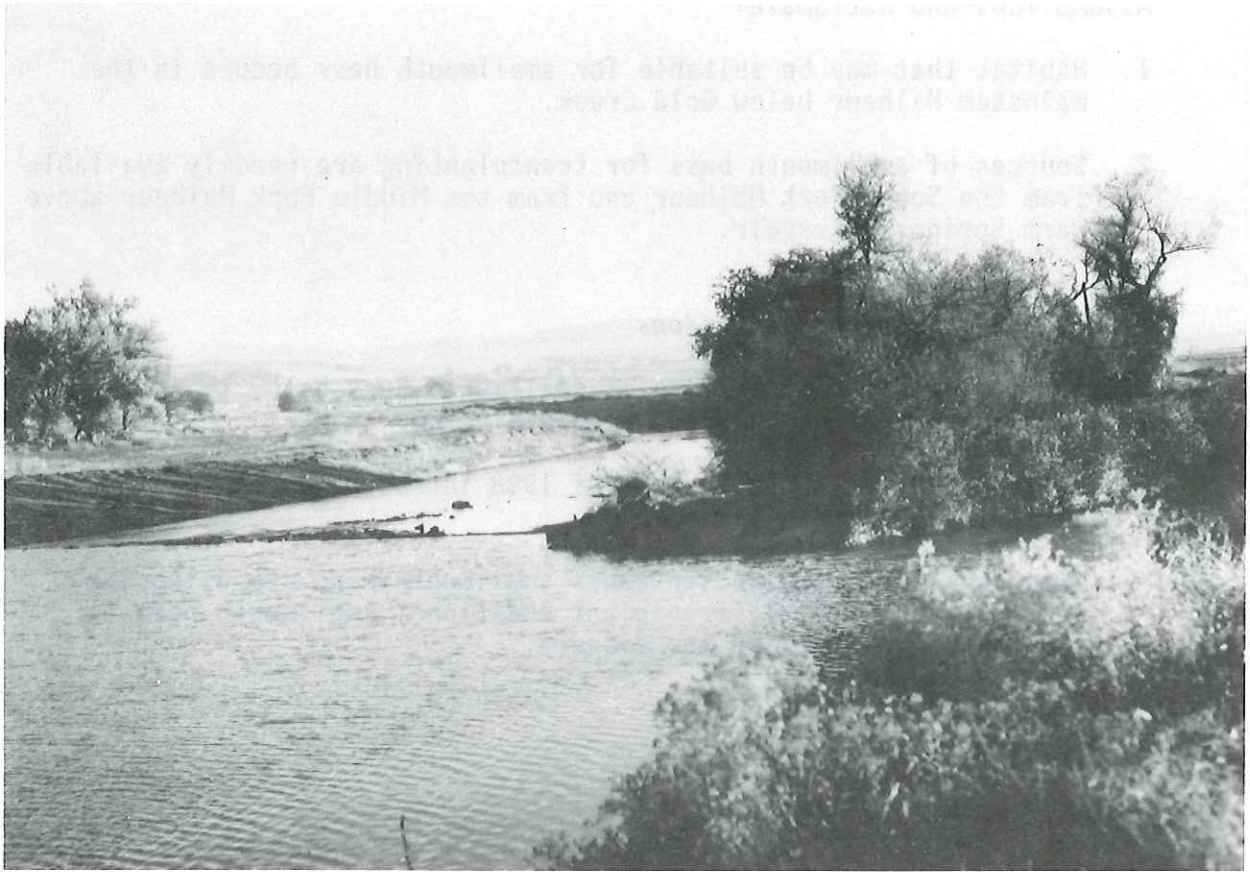
Problem 5. Natural production of trout is not sufficient to fully use rearing areas available and satisfy angler demand.

Action 5.1 Stock the mainstem Malheur between Warm Springs Reservoir and Namorf Dam annually with 80,000 to 120,000 fingerling trout.

Problem 6. Information on habitat, fish populations, and fishery potential in Willow Creek between Malheur Reservoir and RM 30 is limited.

Action 6.1 Inventory habitat and fish populations in Willow Creek between Malheur Reservoir and RM 30.

Objective 2. Establish a smallmouth bass fishery in the mainstem Malheur River below Gold Creek.



(M L Hanson)

LOWER MALHEUR RIVER

Background and Status

The lower Malheur River includes the mainstem from Namorf Dam (RM 69) to its confluence with the Snake River, Bully Creek from Bully Creek Dam to its confluence with the Malheur River (RM 21), and Willow Creek from Brogan to its mouth (RM 20). Fish habitat is poorly suited for game fish production throughout most of these stream segments, and access is limited; therefore, management of the fishery is a low priority. The only game fish that can use the poor habitat are localized populations of channel catfish. Other species, including bass, crappie, and trout, are occasionally washed down from upstream areas, but do not survive because of habitat conditions.

Location and Description of Habitat

In this portion of the basin, the combined effects of upstream irrigation and its effects on quality of return flow; runoff from areas of concentrations of livestock; discharge from food processing; and a flat gradient combine to make the river a turbid, sluggish, heavily enriched (e.g., chemical compounds,

Assumptions and Rationale

1. Habitat that may be suitable for smallmouth bass occurs in the mainstem Malheur below Gold Creek.

2. Sources of smallmouth bass for transplanting are readily available from the South Fork Malheur and from the Middle Fork Malheur above Warm Springs Reservoir.

Problems and Recommended Actions

Problem 1. Recent introduction of smallmouth bass below the mouth of Gold Creek have not been evaluated.

Action 1.1 Evaluate results of 1988 introduction of smallmouth bass.

Action 1.2 If evaluation shows smallmouth bass are using the habitat, transplant additional smallmouth bass to establish the fishery.

sediment, dissolved solids) waterway (SWRB 1969). Flow is low in winter because of irrigation storage. Flow in summer is characterized by high turbidity, high water temperature, and high levels of nonpoint agricultural pollutants (Malheur County 1978).

Most of the contribution to summer flow consists of irrigation return water with a few spring seeps. Flow at any particular location in the lower river depends on upstream and downstream irrigation demands and proximity to dams and pumping stations.

Willow and Bully creeks, which enter the Malheur River from the north near the city of Vale, have been channelized and straightened in many locations to aide farming operations. On Willow Creek, below Brogan, the natural channel has been eliminated and the present creek is in a deep cut that serves as drain and irrigation canal.

Fish Resources and Biology

During the 1978 inventory using electrofishing equipment, 4,223 fish, amphibians, and crustaceans were counted with game fish species making up only 0.9% of the population. Game fish included white crappie, channel and flathead catfish, brown bullhead, smallmouth bass, bluegill, bullfrogs, and crayfish. Based on observations of fish habitat and physical features, the inventory information was grouped according to three different stream sections. Percentage of game fish in these stream sections varied from 0.5% to 4.6%.

Namorf Diversion to Gellerman-Froman Dam (RM 69 to 33): Species composition and number did not change between Namorf and Gellerman-Froman Diversions. Nongame species, predominately bridgelip and largescale suckers, made up most of the population. Game fish composed only 0.5% of the sample. The occurrence of sight feeders (longnose and speckled dace, redside shiners, and northern squawfish) captured is an indication that turbidity is not a prohibitive factor in game fish production. We saw little visible increase in turbidity, although no actual measurements were taken. Low winter flow over a streambed that has little deep pool area for overwintering seems to be the major limiting factor for fish production in this section.

Gellerman-Froman Dam to Nevada Dam (RM 33 to 19.5): The valley in this reach is intensively farmed, and irrigation return water gradually increases the silt load until visibility is near zero. As turbidity increases, a gradual loss of sight feeding fish occurs. The only sight feeders in the lower part of this section were white crappie that had been washed out of Bully Creek reservoir during high water, and they composed most of the 4.6% game fish inventoried. These white crappie were in poor body condition and heavily parasitized with anchor worms. Low flow immediately below Gellerman-Froman Dam also severely limits fish production in that area.

Nevada Dam to Mouth (RM 19.5 to 0): This portion of the stream is also adjoined by intensively farmed lands. Because of the high turbidity, the fish in this section are species that can feed almost entirely by touch and smell, e.g. channel catfish, common carp, and bridgelip and largescale suckers. A few white crappie were the only sight feeders collected. Nevada Dam, the upper boundary of this section, appears to be a migration barrier to the upstream movement of channel catfish, most of which probably move into the Malheur River from the Snake River. Game fish accounted for 1.9% of the fish population in this section.

Nongame fish such as bridgelip and largescale suckers, northern squawfish, and chiselmouth dominate the fish population in both lower Willow and Bully creeks. During years of heavy runoff white crappie, largemouth bass, and rainbow trout are washed down from upstream areas. Occasionally, rainbow trout of uncertain origin will be caught in lower Willow Creek during spring. They could have migrated up from the Malheur River or down from the headwaters of Willow Creek.

Limited fishery collections have been conducted since 1978; however, the data collected parallels the earlier findings.

Fishery

Moderate angling activity place in this area. These anglers are exclusively from local areas and are opportunists. They use unsophisticated gear to catch a few channel catfish and a variety of nongame fish. Results from the angler survey indicated that 17.1% of catfish anglers fish the lower Malheur River (*see* **APPENDIX B**).

Access

Most of the land bordering the lower Malheur River, Bully Creek, and Willow Creek is private, but access is usually allowed for those who ask permission. Bridge crossings throughout this area also provide popular access points for fishermen.

Habitat Concerns

Fishery habitat is limited in the lower Malheur basin because of poor water quality, erosion, and lack of instream cover. Under the present agricultural uses and irrigation practices few fishery management options are available that could be used to maintain a long-term recreational game fish fishery. However, with increasing demand for more recreation, this portion of the basin shouldn't be overlooked for future fishery development.

Policies

Policy 1. **Manage the mainstem Malheur River from Namorf Dam (RM 69) to the mouth; Bully Creek from Bully Creek Dam to its mouth (RM 21), and Willow Creek from Brogan to its mouth (RM 20) for natural production of warmwater species consistent with the Natural Production Policy.**

Policy 2. **Management of warmwater fish in the portions of the lower Malheur basin identified in Policy 1 shall be guided by the statewide Warmwater Fish Plan under the basic yield alternative.**

Objective

Objective 1. Improve the warmwater fishery in the lower Malheur River.

Assumptions and Rationale

1. Improvements in water quality would enhance warmwater game fish potential.

2. Poor habitat conditions relegate management to a low priority. However, given improvement in the habitat, a higher priority may be assigned.

Problems and Recommended Actions

Problem 1. Nonpoint source pollution limits fish production in the lower Malheur River.

Action 1.1 Achieve basinwide habitat objectives, particularly Objective 2 (page 25).

Action 1.2 Assess habitat and fish populations in the lower Malheur River periodically in order to reevaluate the river for potential fish production and fishery projects.

Problem 2. During ODFW review of activities that affect water quality or channel morphology, no fishery value is acknowledged for the lower Malheur river. This may preclude efforts of other agencies to address poor water quality conditions.

Action 2.1 Acknowledge fishery values when commenting on all habitat altering activities including fill and removal applications, water quality standards, water rights applications, etc.

RESERVOIRS

Background and Status

Reservoirs in the Malheur River basin with public access can be grouped according to size and whether they are managed for trout or for warmwater species. Of the four large reservoirs (more than 150 surface acres) Bully Creek and Warm Springs reservoirs are managed for warmwater game species, and Beulah and Malheur reservoirs are managed for trout production. They are discussed individually. Small reservoirs (less than 150 surface acres) are grouped and discussed according to type of fishery.

Bully Creek Reservoir

Location and Description of Habitat: Bully Creek Dam and reservoir are located on Bully Creek about 8 miles upstream from it's confluence with the Malheur River at Vale. The 121-ft-high dam was built in 1963. When full, the reservoir surface elevation is 2,516 ft, and surface area is about 1,000 acres with an active capacity of nearly 30,000 acre-ft. At minimum pool, storage is 1,650 acre-ft. The maximum drawdown is 66 vertical feet. The reservoir drains an area of about 558 square miles (Figure 11). Primary inflow is from Bully Creek, but water from the Malheur River can also be diverted into the reservoir through the Vale Main Canal and the Bully Creek Feeder Canal.

Fish Resources and Biology: Bully Creek Reservoir contains eight species of game fish and at least five species of nongame fish. Game fish species

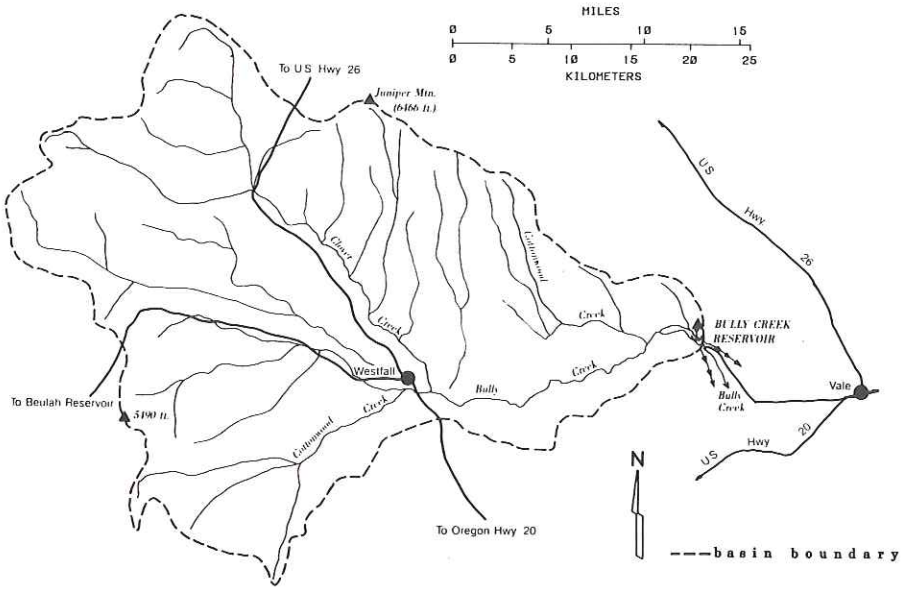


Figure 11. Bully Creek Reservoir and drainage basin (Johnson et al. 1985).

White Crappie (ODFW Files)

most frequently in the angler catch are yellow perch, white crappie, and largemouth bass. Other game fish include smallmouth bass, channel catfish, rainbow trout, bluegill, and brown bullhead. Crayfish are also present.

Fish populations have been inventoried each fall from 1980 to 1986 using trap nets and gill nets. All species present are counted in this inventory, so it provides a record of nongame fish as well as game fish. Additional inventory work includes electrofishing targeted at game fish only during the

summer of 1986, 1987, and 1988. This inventory provides sufficient samples to assess the size distribution of largemouth bass and white crappie populations (Figure 12).

Production of warmwater game fish in Bully Creek Reservoir is considered good based on high overall abundance coupled with good growth rate. In addition, game fish appear to have achieved a balance with nongame fish in the reservoir.

The reservoir was converted to warmwater fish management in 1973 because rapid buildup of nongame fish populations following treatment projects prevented establishment of a productive trout fishery. We anticipated that warmwater fish would be more successful in coexisting with nongame fish populations.

Game fish populations in Bully Creek Reservoir are self-sustaining with the exception of rainbow trout and channel catfish. A limited number of channel catfish stocked in about 1980 had good survival and growth, but no natural production has been identified. Stocking is needed if channel catfish are to be maintained in the reservoir. If stocking of this species is continued it would be at a level similar to that in 1980. A low stocking level would produce some trophy catfish, but would not increase catfish abundance high enough to compete substantially with other game fish. On occasion, excess fingerling rainbow trout are stocked in Bully Creek Reservoir. Returns from the trout stocking are only fair due to heavy competition from warmwater and nongame fish.

The reservoir is not treated on a regular basis because warmwater game fish are able to coexist with nongame fish. Common carp and tui chub are not present, but if either species were to be introduced the balance could be upset and a treatment may then become necessary. The reservoir was chemically treated in 1963, 1969, and 1973 when it was being managed for trout production.

The greatest concern with warmwater game fish in the reservoir is the variable nature of white crappie abundance. These fish will have a strong age class followed by a year or two of much lower production. The reason for this not known, but it is common in waters occupied by white crappie (personal interview on 25 October 1989 with Dick Herrig, ODFW Warmwater Biologist, Ontario, Oregon). The effect on the fishery is boom and bust years. Reservoir drawdown during spawning, plankton production, and predation on young may be contributing factors.

Black crappie may be considered for introduction into this reservoir because of the lower temperature at which they spawn (58° to 64°F compared with 64° to 68°F for white crappie). The lower spawning temperature may enable black crappie to complete spawning and incubation prior to severe drawdown and thus provide a more consistent fishery than white crappie.

Access: Public ownership of most of the shoreline insures public access, and its proximity to the Vale-Ontario area makes Bully Creek Reservoir a

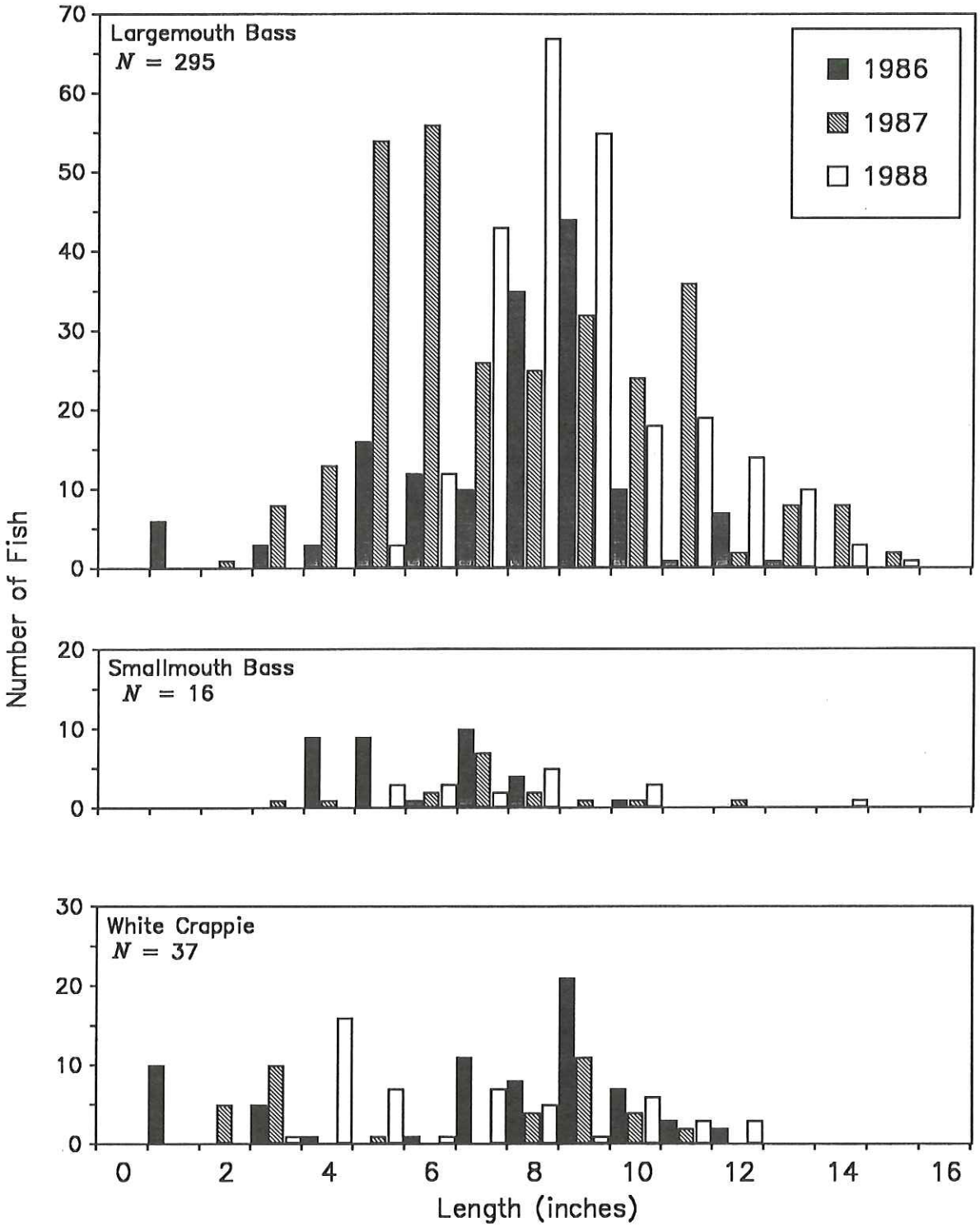


Figure 12. Length-frequency distribution for largemouth bass, smallmouth bass, and white crappie electrofished from Bully Creek Reservoir in 1986, 1987, and 1988.

popular recreation site. Recreation facilities include a campground, swimming beach, and boat launching facilities operated and maintained by Malheur County.

Fishery: Bully Creek Reservoir is among the most heavily fished waters in the drainage. Fisheries for white crappie, yellow perch, and largemouth bass have good catch rates and the opportunity for trophy-sized fish. The majority of anglers target a combination of these species. A principal attraction is their fine eating quality. Boat and bank anglers fish the reservoir about equally. Most anglers are from the Vale-Ontario area or from nearby urban areas in Idaho. The reservoir hosts an occasional small club tournament but no major bass tournaments.

Habitat Concerns: A habitat concern on Bully Creek Reservoir is the annual fluctuation in water level. The reservoir surface level drops an average of about 26 ft each irrigation season, with volume reduced by about two thirds. This fluctuation in water storage and its effects on game fish in Bully Creek Reservoir is not well understood. Concern exists that the drawdown reduces spawning success of white crappie.

During extreme low water years, such as 1977, 1987, or 1988, the reservoir is drawn down to minimum pool of 1,650 acre-ft. This severe reduction in volume reduces fish growth and may cause increased mortality due to excessive crowding.

Turbidity and lack of cover in the reservoir are additional habitat concerns.

Warm Springs Reservoir

Location and Description of Habitat: Warm Springs Reservoir was formed by the construction of Warm Springs Dam on the Middle Fork Malheur River above its junction with the South Fork Malheur River near Riverside. The 106-ft-high dam was built by the Warm Springs Irrigation District, and storage began in 1919. In 1926, one half of the storage in the reservoir was purchased for irrigation use on the Vale Irrigation Project.

Warm Springs Reservoir is at an elevation of 3,406 ft and has about 4,500 acres of surface area when full. Because the reservoir is used primarily for irrigation releases down river, the pool is reduced significantly by late summer. At minimum pool, storage is 1,400 acre-ft. Average drawdown is 26 vertical feet.

The reservoir lies against rolling hills on the eastern side of a broad valley that, prior to reservoir construction, was irrigated by ditches from the Malheur River. It receives drainage from an area of about 1,100 square miles (Figure 13).

Fish Resources and Biology: Game fish present in Warm Springs Reservoir include largemouth and smallmouth bass, yellow perch, brown bullhead, rainbow trout, bluegill, and channel catfish. White crappie and black crappie were re-introduced in 1989. The reservoir contains all the nongame species typical to the upper drainage. The reservoir and most of the basin above the

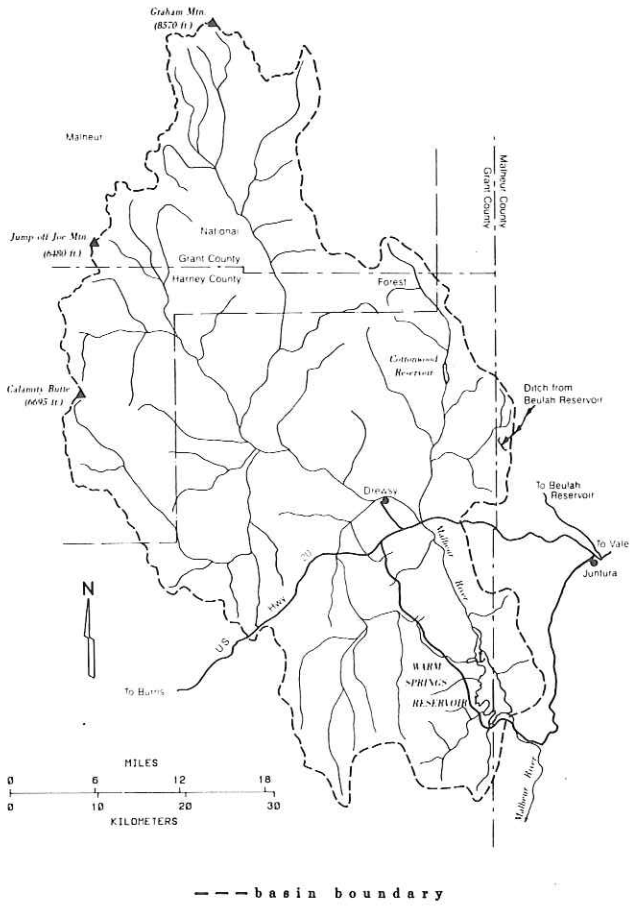


Figure 13. Warm Springs Reservoir and drainage basin (Johnson et al. 1985).

reservoir were chemically treated in 1955 but have not been treated since.

The relative abundance of the different species has fluctuated widely in recent years because of a variety of factors. Game fish populations are frequently at less than optimum levels because of rapid reservoir drawdown during spawning and excessive concentration of fish when the reservoir is at minimum pool.

Brown bullhead and yellow perch have declined substantially since 1980 because of unknown reasons. During the same period bluegill have increased in abundance following introduction from an upstream reservoir on which the dam failed.

Channel catfish rarely spawn successfully in the reservoir. Limited stocking has been needed to maintain the low population level. Although channel catfish are not abundant, they grow well and on occasion reach trophy size.

Largemouth and smallmouth bass concentrate around the limited area where cover is provided from broken rock substrate. Smallmouth bass from the reservoir appear to migrate into the Malheur River above the reservoir to spawn. The high number of fingerling found in the river between U.S. Highway 20 and the reservoir indicate they are spawning successfully and probably drifting downstream and contributing to the reservoir fishery.

Hatchery fingerling trout are stocked periodically in the reservoir if an excess is available. When water conditions and storage are good the trout grow well and attain a length of 18 to 20 inches as 3 year-olds.

Access: Land surrounding Warm Springs Reservoir is almost entirely in public ownership, but the only access is provided by dirt roads that become hazardous during wet weather. The lack of better roads discourages tournament bass anglers from trailering their boats into the reservoir.

Although two concrete slab boat ramps are available, boat launching can be difficult when the reservoir gets extremely low. Lengthening of the boat ramps would improve boat access at low pool. Money for repair of boat launching facilities is obtained from the State Marine Board at the request of the county court. Toilets are the only other facilities at the reservoir.

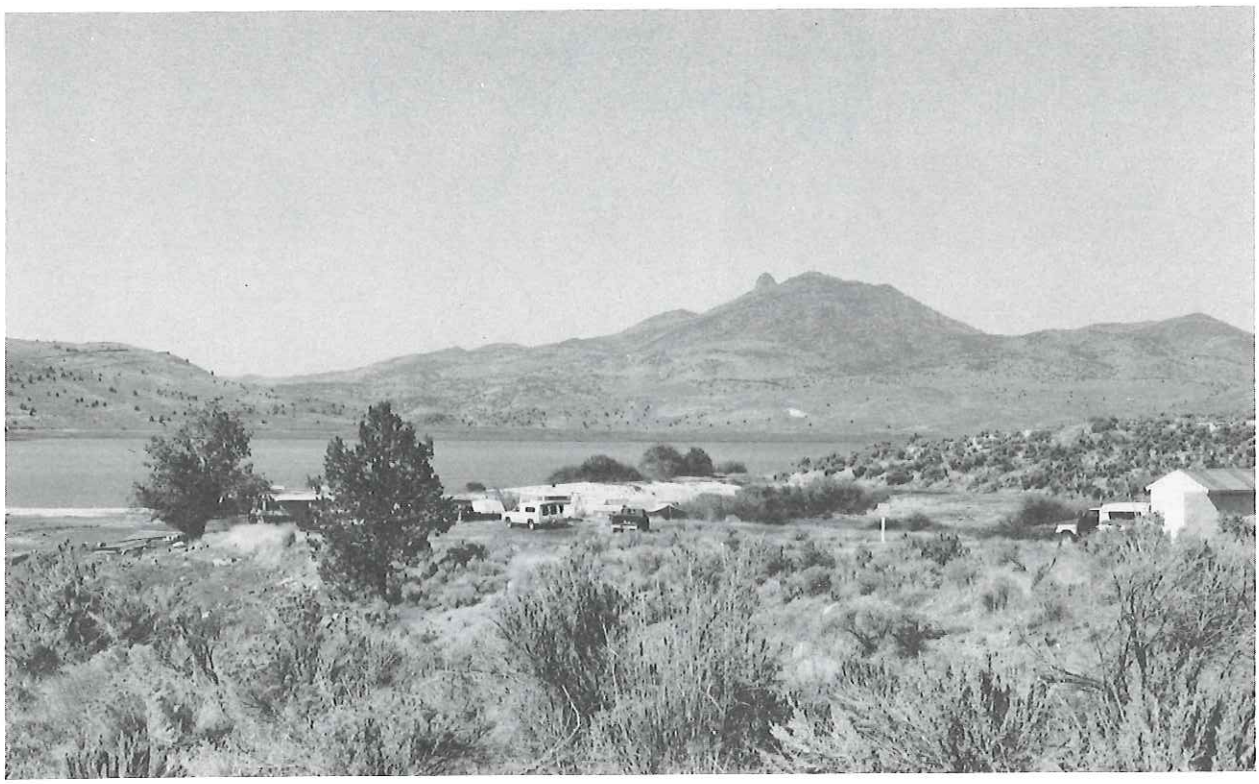
Boat angling is the preferred and most productive method, but the shoreline provides miles of bank angling access. During the early spring boat angling can be very productive for brown bullhead.

Fishery: Warm Springs Reservoir receives moderate angling pressure with most anglers from the Burns-Hines area. The reservoir is attractive to these anglers because it is one of the few warmwater fisheries in Harney County. Highest angler use occurs in the spring and early summer. Principal species caught in the fisheries vary from year to year, but have traditionally been yellow perch, brown bullhead, rainbow trout, and largemouth and smallmouth bass. Catch rate is frequently low, but large fish are occasionally caught.

Habitat Concerns: The irrigation drawdown affects production of game fish in the reservoir by reducing the available habitat and interfering with spawning of some species.

The portions of the reservoir with broken rock substrate are used heavily by game fish. If more structure was available it would have a positive influence on the fishery.

Turbidity is also a problem in Warm Springs Reservoir. Inflow carries high sediment load and wave action in the reservoir contributes to the turbidity.



(M L Hanson)

Beulah Reservoir

Location and Description of Habitat: Beulah Reservoir (formerly known as Agency Valley Reservoir) was formed by the 121-ft-high Agency Valley Dam, which was built in 1935 to impound flow of the North Fork Malheur. It is located 15 miles northwest of Juntura. At full pool the reservoir is at an elevation of 3,340 ft, covers about 2,000 acres and has a storage capacity of over 60,000 acre-ft. At minimum pool, storage capacity is zero. Maximum drawdown is 39 vertical feet.

Beulah Reservoir is situated in Agency Valley, almost filling the small triangular valley. It receives drainage from an area of 440 square miles, most of this from the North Fork Malheur River (Figure 14).

Fish Resources and Biology: The predominant game fish is introduced hatchery rainbow trout. Bull trout, redband trout, and mountain whitefish are indigenous game fish also found in the reservoir on occasion.

A gillnet inventory is conducted each October, and all species caught are counted and measured. During the last 6 years considerable variation has occurred, with all trout ranging from 5% to 22% of the catch. The average annual angler catch rate is also sporadic ranging from 1.1 to 2.7 trout per angler trip.

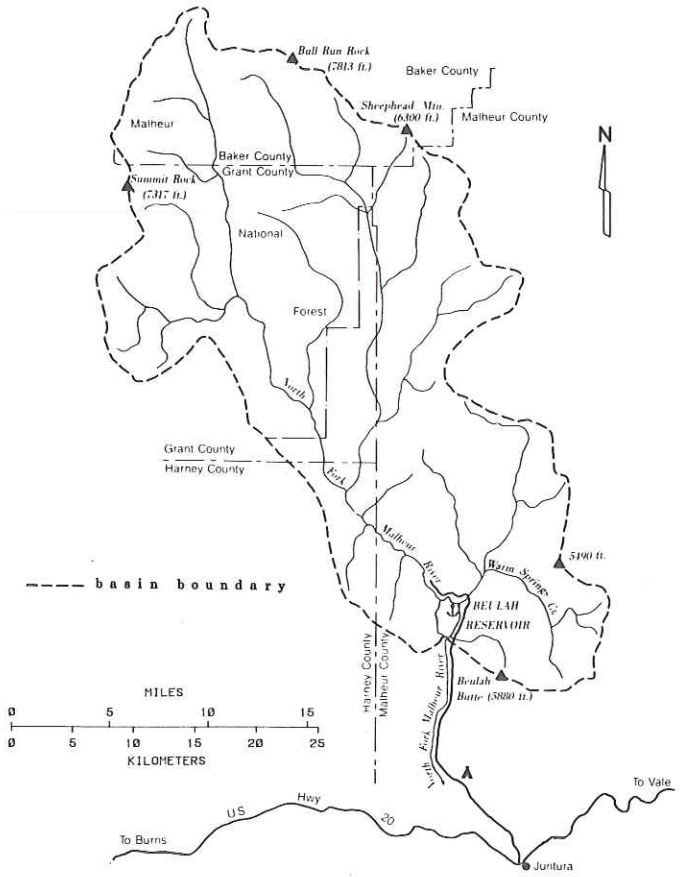


Figure 14. Beulah Reservoir and drainage basin (Johnson et al. 1985).

Fingerling rainbow trout (Oak Springs domestic stock) are stocked annually in late April or May and reach 10 to 11 inches by fall. Three-year-old trout between 18 and 20 inches are common in the catch when the reservoir is in peak production.

Large numbers of nongame fish are a problem, and periodic chemical treatment or draining is necessary to eliminate them and maintain the trout fishery. The reservoir has been treated six times since 1950 with the most recent project completed in September 1987. These projects are generally done on the river channel that remains when the reservoir is at minimum pool. Following treatment, Beulah is stocked with 60,000 to 120,000 fingerling trout annually.

As in the Malheur River, more predacious strains of trout have been tried to see if biological control of nongame fish was possible. Eagle Lake rainbow trout and Mann Lake cutthroat trout have been introduced for this purpose, but neither has shown any benefit over domestic hatchery rainbow.

Access: Access is unrestricted since the perimeter of the reservoir is public land. Malheur County maintains a boat ramp, vault toilets, and a primitive campground near the dam. The boat ramp is in need of repair, and lengthening it would improve boat access as water level drops. Limited camping also occurs near the "hot springs" on the east side of the reservoir and at several other locations along the shoreline.

Fishery: Trout fisheries in Beulah Reservoir have been outstanding in good water years following chemical treatment, but at other times have been poor because of large numbers of nongame fishes or reduced habitat from lack of reservoir storage. When conditions are right, catch rate is high for robust trout that may weigh several pounds. Angler effort has been estimated to vary between 1,500 and 6,000 trips annually with peak activity during the spring and during fall hunting season. Anglers come from throughout Oregon as well as from the Boise area of western Idaho. Both bank and boat angling is popular with highest success for boat anglers.

Habitat Concerns: Annual irrigation drawdown of 20 ft or more affects trout production by reducing the available habitat. Substantial mortality of fish occurs when the reservoir is completely drained.

Malheur Reservoir

Location and Description of Habitat: Malheur Reservoir (also known as Willow Creek Reservoir) is an irrigation and flood control project located at RM 41 on Willow Creek, which enters the Malheur River at RM 20. It was built in the late 1930s by the Orchard Irrigation District and provides water for the irrigation of about 2,300 acres of agricultural land downstream. Inflow to the reservoir is affected by the natural climatic regime and by irrigation demand along Willow Creek upstream from the dam (Figure 15).

Reservoir elevation at full pool is 3,365 ft, volume is nearly 49,000 acre-ft and surface area is about 1,300 acres. Because of instability of the dam, storage has been limited to 20,000 acre-ft at a water surface elevation of about 20 ft below full pool. For much of the year, the water level is even lower because of withdrawals for irrigation. At minimum pool storage is zero.The average drawdown is 15 vertical feet.

Fish Resources and Biology: The two inventory methods used, electrofishing and gillnetting, give different impressions of the relative abundance of trout and nongame fish. Electrofishing during 1986 and 1987 showed 52% and 45% trout, respectively (Table 7). We believe that species composition is more accurately represented by gill net catch because nongame fish were too deep in the water column to be effectively sampled by electrofishing (Table 8).

Because of the drought in 1987 and 1988, Malheur Reservoir was completely drained by late July 1988. It was chemically treated with rotenone in October

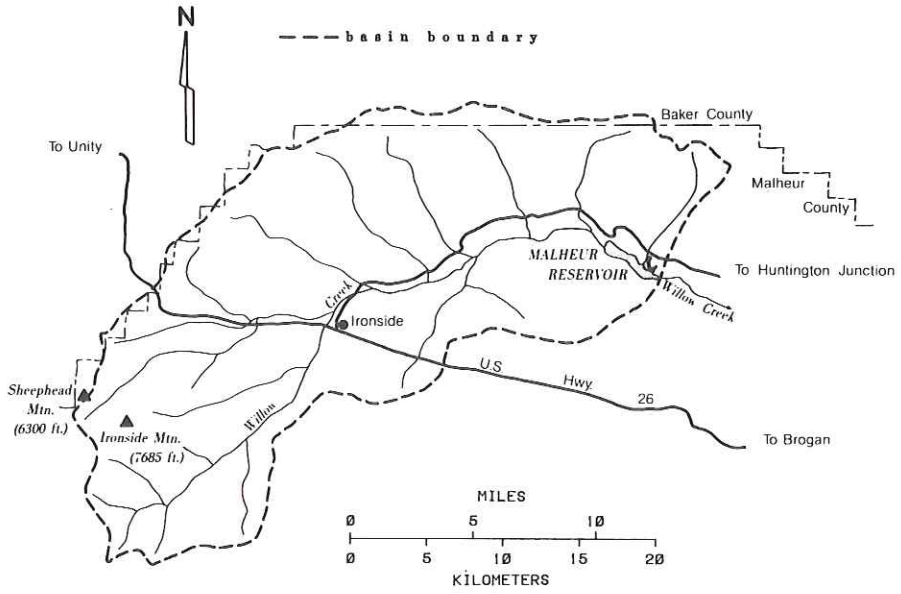


Figure 15. Malheur Reservoir and drainage basin (Johnson et al. 1985).

Table 7. Percent species composition of fish sampled in electrofishing inventories in Malheur Reservoir, 1986-1987.

		Year	
Species	*N*	1986	1987
Rainbow trout	162	48.6	40.1
Bridgelip sucker	137	11.6	51.1
Tui chub	46	26.8	3.8
Redside shiner	14	9.4	0.4
Mann Lake cutthroat	14	3.6	3.8
Speckled dace	2	0	0.8

1988 in an attempt to eliminate tui chub from the system. At the time of treatment no surface flow existed at the upper end of the reservoir, but outflow was about 2 cfs as a result of springs that emerge from the bed of the reservoir. The treatment area also included Willow Creek for about 3 miles above the reservoir. Tui chub were not observed during or following the treatment project so they may have been flushed downstream or died prior to treatment. However, some may have escaped by being submerged in the springs or by migrating to the creek above the reservoir. Presence or absence of tui chub will not be conclusively determined for several years.

Table 8. Percent species composition of fish sampled in gill net inventories in Malheur Reservoir, 1980-1987.

Species	*N*	Year 80	81	82	83	84	85	86[a]	87[b]
Tui chub	945	0	26.5	72.7	70.5	81.0	67.6	-	94.4
Rainbow trout[c]	193	100.0	69.1	15.2	12.1	8.0	6.3	-	0.5
Bridgelip sucker	113	0	4.4	10.1	11.1	6.9	22.2	-	4.8
Mann Lake cutthroat	35	0	0	2.0	6.3	4.2	4.0	-	0.3

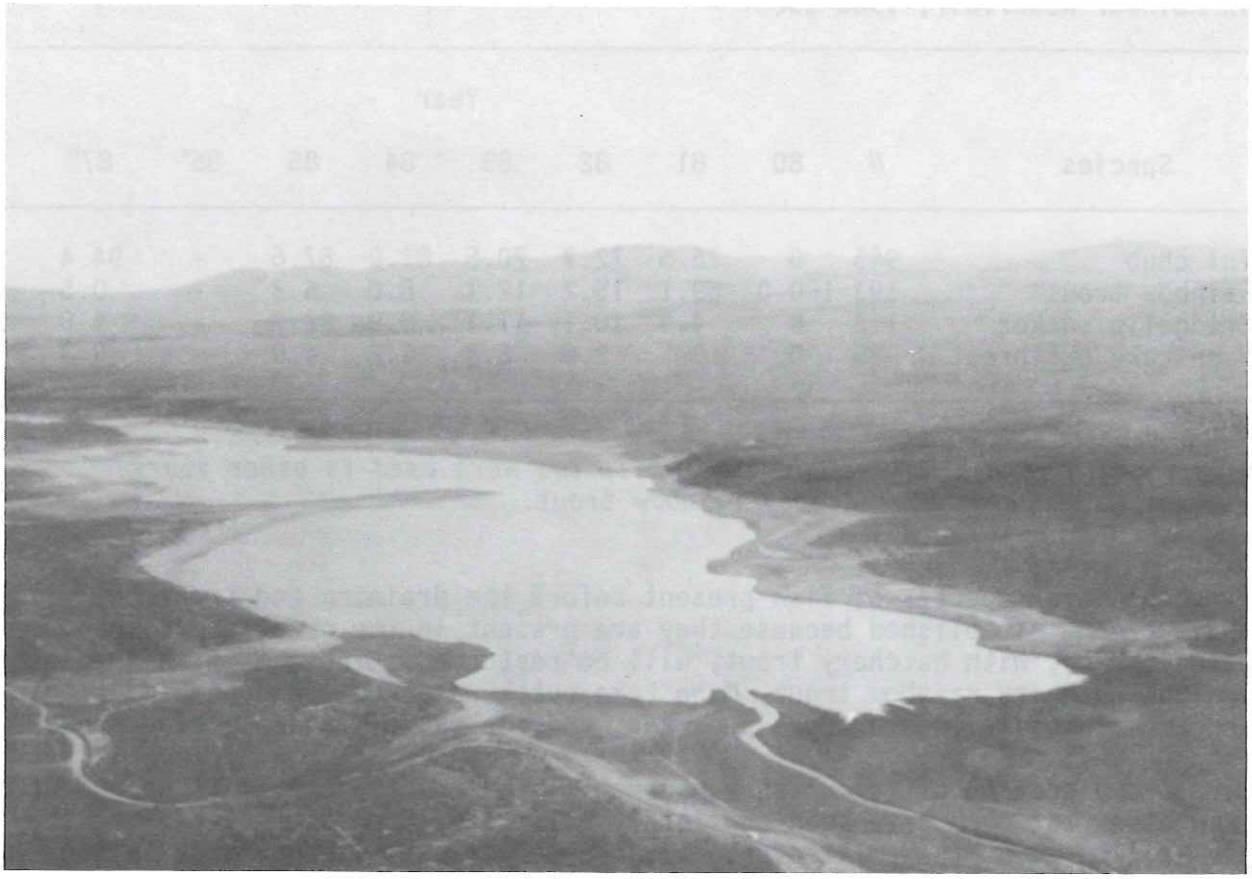
[a] *Not sampled.*
[b] *Only one gill net was set in 1987 while two were used in other years.*
[c] *Includes redband and hatchery rainbow trout.*

The other species of fish present before the draining and treatment will again become established because they are present in the creek above the reservoir or, with hatchery trout, will be restocked. The game fish species include hatchery rainbow trout, Mann Lake cutthroat trout, and redband trout. Nongame fishes include bridgelip sucker, redside shiner, and speckled dace.

The direction of game fish management in Malheur Reservoir is dependent on whether tui chub have been completely eliminated from the system. If they are still present they will eventually become dominant as they have in the previous years. Gillnet inventories first indicated that tui chub were present in 1981 and that their numbers increased to 94% of the catch by 1987. Tui chub will inhibit the survival and growth of other fish species, including fingerling hatchery rainbow trout, probably through competition for zooplankton, the principal item in the diet of small fish.

If tui chub have been eliminated, trout populations could be similar to those prior to 1981. During that period, rainbow trout production was generally good; however, species of nongame fish would periodically build up leading to some reduction in production of rainbow trout.

Malheur Reservoir has traditionally been stocked each spring with about 100,000 fingerling rainbow trout (Oak Springs domestic stock). In recent years the reservoir has also been stocked with several races of more predacious trout to see if they would use the tui chub as a source of food. Stocking regimes tested have included fingerling California rainbow trout, fingerling redband trout, and fingerling Mann Lake cutthroat trout. The only encouraging results came from the fingerling Mann Lake cutthroat, which preyed heavily on tui chub and grew to a large size (10 pounds). Adult cutthroat trout transported from Mann Lake in Harney County were also stocked in 1987, but the draining of Malheur Reservoir in 1988 prevented full evaluation of this release.



(ODFW files)

Malheur reservoir had been previously treated during low water years in 1950, 1955, 1962, 1977, and 1988.

Access: The only guaranteed access to Malheur Reservoir is through private land owned by the Orchard Irrigation District. In 1951, the irrigation district entered into an agreement with the Oregon Game Commission giving permanent road access to the reservoir including 1 acre of land for boat launching and parking. The 1 acre of land provided was not adequate, however, to meet access needs an additional agreement was worked out between ODFW and the irrigation district in 1970. This agreement provided that for a 25 year period (1970-1995) ODFW would pay the irrigation district $150.00 annually. In return the district would allow an expanded area for public access with Malheur County providing sanitary and camping facilities.

The county attempted to renegotiate this agreement in 1987. They wanted to expand camping, picnicking, and boat launch facilities and guaranteed public access beyond 1995, the end of the present agreement. The irrigation district indicated they would renegotiate the agreement if ODFW substantially increased the annual payment. Negotiations have not been resumed.

Fishery: Fisheries in Malheur Reservoir have recently been only fair because of reduced trout populations. Moderate boat and bank angling effort, including a small ice fishery, occur with most anglers coming from the Ontario area and western Idaho. Catch rate is generally low, but occasionally a large Lahontan cutthroat trout is caught. Historically, when the populations of nongame fish was lower, this reservoir provided one of the most outstanding trout fisheries in Oregon.

Malheur Reservoir also has a very good recreational crayfish fishery with excellent catches of large crayfish being made during the summer and fall.

Habitat Concerns: Game fish production in Malheur Reservoir is affected by annual loss of volume as a result of irrigation withdrawals. Drawdown to zero storage sometimes causes large mortalities of fish. The fishery would benefit from additional structure in the reservoir for fish habitat.

Small Reservoirs

Location and Description of Habitat: The Malheur River drainage contains numerous small reservoirs or ponds with public access that contain game fish. Rainbow trout are currently stocked in 15 of these on an annual basis, and another 4 contain warmwater game fish (Tables 9 and 10).

All waters listed in Tables 9 and 10 are entirely on BLM land except Granite Creek Reservoir, Murphy Reservoir, Jones Pond, and Pole Creek Reservoir. Granite Creek Reservoir and Murphy Reservoir are partially under BLM ownership, Jones Pond is partially on state land and partially on private land, and Pole Creek Reservoir is entirely private.

The small reservoirs on BLM land were constructed to provide water for livestock and to improve livestock distribution on the rangelands with secondary benefits for fish and wildlife. The four largest reservoirs are used for irrigation. Jones Pond was formed when construction of U.S. Highway 20 cut off an oxbow of the Malheur River.

All land surrounding these waters is desert-type rangeland with the exception of some irrigated cropland bordering Pole Creek Reservoir.

Fish Resources and Biology--Rainbow Trout: Limited natural production may occur some years in a few reservoirs. Most tributary feeder streams do not have spawning habitat suitable for trout. Stocking is provided from domestic strains of rainbow trout reared at ODFW hatcheries in central Oregon. Fingerling are stocked in May and June at an average size of about 3 to 5 inches or about 100 fish per pound.

Growth varies from fair to excellent. Under good conditions fish stocked as a 3-inch fingerling will be 12 inches by the following May. Under poor growing conditions they would average only 8 inches. Conditions that favor good growth are clear, cool, stable water level with low to moderate trout

Table 9. Small reservoirs in the Malheur River drainage with public access that are stocked with fingerling rainbow trout. T = township, R = range, S = section.

Reservoir	Location T	R	S	Surface acres	Fishery description[a]
Allotment No. 3	19S	40E	12	1.3	Good
South Cottonwood	20S	40E	5	0.5[b]	Good
Pence Springs	19S	40E	18	0.5[b]	Fair
Peavine	20S	39E	1	0.4[b]	Poor
South Mountain	19S	40E	32	0.4[b]	Poor
Vines Hill	20S	43E	8	1.5[b]	Good
Big Twin	20S	43E	21	1.0[b]	Good
Squaw Creek	21S	41E	30	3.3	Fair-Good
Morrison	17S	43E	7	4.1	Fair
Bull Springs	17S	42E	30	0.2	Good
Hope Butte	17S	43E	19	0.3[b]	Poor
Twin Spring	23S	35E	33	6.0	New
Murphy	18S	38E	20	57.0	Fair
Cottonwood	19S	36E	9	118.0	Fair
Pole Creek	15S	42E	22	40.0	Good

[a] *Subjective evaluations by ODFW.*
[b] *Estimate by ODFW.*

Table 10. Small reservoirs or ponds in the Malheur River drainage with public access that contain warmwater game fish. T = township, R = range, S = section.

Reservoir	Location T	R	S	Surface acres	Fish description
Ryefield	22S	43E	1	0.4	Stunted bluegill
Sagebrush	21S	44E	37	0.3	Stunted bluegill
Granite Creek	23S	38E	32	52.0	Largemouth bass-bluegill
Jones Pond[a]	20S	38E	28	2.0	Largemouth bass-white crappie

[a] *Chemically treated September 10, 1987.*

density and an absence of nongame fish.

Survival of stocked fingerling is generally good because predators and naturally produced fish that would compete are usually not present. Good water quality promotes higher survival. Some predation on fingerling from older-aged trout occurs, so survival declines if a high number of large trout is present.

Trout can grow to 5 pounds or larger in these small reservoirs, but fish of this size are not common because angling pressure results in most being caught by their second year. Growth to large size is also inhibited by a tendency for fish over 15 inches or 3 years old to mature, which directs energy into sexual development.

Trout growth and survival often declines sharply if other fish species become established. Illegal introductions of nongame fish or warmwater game fish are a continual problem. The natural spread of nongame species, particularly the bridgelip sucker, is also a problem in some areas. Chemical treatment to eliminate the competing fish populations is necessary in order to return the reservoirs to maximum trout production.

Annual stocking rate in each trout reservoir is determined based on an estimate of the reservoir's carrying capacity. The general rule is 400 fingerling trout per surface acre. Observations of fish growth and condition are used to adjust this stocking rate. Reservoirs with intense angling pressure are stocked more heavily. Annual precipitation, runoff, and reservoir storage also influence stocking rate. During low water years fewer or no trout are stocked in some waters.

Fish Resource and Biology--Warmwater Game Fish: Spawning success is usually good, particularly for bluegill. Density induced stunting of these fish may occur because of high reproductive potential, an absence of predators, and light angling pressure. Pressure is light also as bluegill are not as popular as other warmwater game fish because of their small average size. When these factors combine, as has occurred at Sagebrush and Ryefield reservoirs, bluegill overpopulate, compete with each other for available food, and stunting results.

Access: Public land and landowner agreements for Pole Creek and Granite Creek reservoirs allow access to all waters listed in Table 9 and 10. Road access is available to all waters, although road conditions are sometimes poor because of inclement weather. A four-wheel-drive vehicle is required to reach some reservoirs even when roads are dry. Muddy conditions in the fall, winter, and spring limit access to most reservoirs for long periods.

Fishery: Fishery quality varies greatly between the different reservoirs and between years. Fishing can be outstanding when a reservoir has good water conditions for several years and has not been publicized. In others, poor water storage can completely eliminate fish populations. Anglers from

throughout Oregon and western Idaho are attracted to these reservoirs by good catches and by the opportunity to explore remote desert areas. These reservoirs also receive increased use during hunting season. Unlike the desert solitude characterizing most of these waters, Pole Creek Reservoir is on agricultural land near a population center so it receives heavy use. The majority of anglers bank fish these reservoirs using bait, but a small contingent fly fish from float tubes. During recent years ice fishing has become increasingly popular.

Habitat Concerns: Lack of riparian vegetation and high turbidity are habitat concerns common to most of the small reservoirs in the basin (see the discussion of these concerns on pages 22-23).

Private Waters

Numerous private reservoirs and ponds containing fish are spread throughout the Malheur River drainage (Table 11). Public access to these reservoirs is either not allowed or allowed by permission only. ODFW does not participate in fisheries development on private land unless the landowner signs a Memorandum of Understanding granting public access for a 10 year period. However, ODFW does provide regulatory and fishery information upon request. Fish for stocking private reservoirs are available for purchase by the landowner from private hatcheries.

The principal concern ODFW has with management of private waters is regulating fish introductions so species that we would consider undesirable in adjoining waters are not introduced, or only introduced where escape is impossible. Introductions are regulated by the requirement to obtain an ODFW permit to transport live fish.

South Fork Reservoir was chemically treated in the fall of 1979 to remove nongame fish. The former owner had a verbal agreement with the State to use the reservoir for warmwater game fish brood production and to allow access by permission only. It was stocked with 50 adult largemouth bass and 150 adult white crappie in the spring of 1980. These fish produced an active fishery by 1983. A change in ownership eliminated the verbal agreement, and access remains limited. The largemouth bass are stunted as a result of the limited harvest.

Table 11. Partial listing of private reservoirs or ponds in the Malheur River drainage that contain fish or have the potential to hold fish. T = township, R = range, S = section.

Reservoir	Location T	R	S	Surface acres	Fishery description
Altnow Ponds	20S	36E	4	8	Largemouth bass-bluegill
Lamb Ranch Reservoir	22S	35E	20	47	Wild trout
Miller Reservoir	20S	33 1/2E	10	30	None?
Butler's Reservoir	18S	37E	26	25	Trout
Star Reservoir	25S	39E	8	-	-
Vaughan Reservoir	18S	39E	15	-	-
South Fork Reservoir	27S	36E	7	35	Largemouth bass-white crappie
Alder Creek Reservoir	25S	35E	19	27	Rainbow trout-largemouth bass
Hunter Creek Reservoir	25S	35E	3	7	Few wild trout
Swords Reservoir	19S	34E	28	52	Nongame fish and a few wild trout
Sitz Reservoir	19S	35E	26	-	Nongame fish and a few wild trout.

Policies

Policy 1. Manage Bully Creek and Warm Springs reservoirs for natural production of the current combination of warmwater species consistent with the Natural Production Policy. Channel catfish stocking shall be maintained to the extent this species does not adversely affect other warmwater game fish populations.

Policy 2. Manage Beulah and Malheur reservoirs for trout by annually stocking with domestic hatchery trout or other appropriate trout species.

Policy 3. Manage reservoirs less than 150 surface acres for trout or for warmwater species. Trout shall be managed by annually stocking with domestic hatchery trout, or other appropriate trout species. Warmwater species shall be managed for natural production consistent with the Natural Production Policy.

Policy 4. The species mix currently present in reservoirs less than 150 surface acres may be altered to better use the reservoir production potential or to meet changing public demand.

Policy 5. Participation by ODFW in fishery development in private waters is contingent on the availability of public benefits.

Policy 6. **Fish management in reservoirs in the Malheur River basin shall be guided by the statewide Trout Plan and the Warmwater Fish Plan under the basic yield alternative and shall be consistent with the Wild Fish Management Policy.**

Objectives

Objective 1. **Improve warmwater game fish production in Bully Creek and Warm Springs reservoirs. Emphasize largemouth bass, white crappie, and yellow perch in Bully Creek Reservoir. Emphasize largemouth bass, yellow perch and brown bullhead in Warm Springs Reservoir, and give secondary consideration to channel catfish in both reservoirs.**

Assumptions and Rational

1. Demand for warmwater fishing opportunities will continue.

Problems and Recommended Actions

Problem 1. Information on warmwater game fish production in Bully creek and Warm Springs reservoirs is limited.

Action 1.1 Inventory Bully Creek and Warm Springs reservoirs a minimum of once every 3 years.

Problem 2. Warmwater game fish populations in Bully Creek and Warm Springs reservoirs fluctuate widely with no known cause.

Action 2.1 Investigate and compare variability in drawdown with annual spawning success of warmwater game fish.

Action 2.2 Introduce and evaluate the potential of black crappie in Bully Creek Reservoir.

Action 2.3 Monitor and evaluate introductions of black and white crappie in Warm Springs Reservoir.

Problem 3. Habitat degradation affects game fish production in Bully Creek and Warm Springs reservoirs.

Action 3.1 Achieve basinwide habitat objectives, particularly Objectives 2 and 4 (pages 32-35).

Problem 4. Poor reproduction limits the channel catfish population in Bully Creek and Warm Springs reservoirs.

Action 4.1 Supplement channel catfish in Bully Creek and Warm Springs reservoirs with wild transfers when fish are available.

Problem 5. Rainbow trout are not self-sustaining in Bully Creek and Warm Springs reservoirs.

Action 5.1 Stock Bully Creek and Warm Springs reservoirs with fingerling rainbow trout when an excess is available.

Objective 2. Improve trout production at Beulah and Malheur reservoirs.

Assumptions and Rationale

1. Rainbow trout from natural spawning do not contribute substantially to the reservoir population.

2. Nongame fish in Beulah Reservoir can be controlled with chemical treatment projects because of frequent drawdown.

3. Tui chub and other nongame fish in Malheur Reservoir can only occasionally be effectively controlled with chemical treatment because of infrequent drawdown.

4. Mann Lake cutthroat trout appear to use tui chub more successfully than do other trout species.

Problems and Recommended Actions

Problem 1. Buildup of nongame fish populations in Beulah and Malheur reservoirs affects rainbow trout production.

Action 1.1 Inventory the fish populations of Malheur and Beulah reservoirs on an annual basis.

Action 1.2 Periodically chemically treat Beulah Reservoir when the reservoir is drained and when nongame fish abundance is high and rainbow trout abundance is low. Chemically treat Malheur Reservoir to control nongame fish when water conditions permit. Stock both reservoirs with trout the spring following treatment.

Action 1.3 Stock Malheur Reservoir with fin-clipped Mann Lake cutthroat trout transplants from Mann Lake. Evaluate the success of Lahontan cutthroat trout transplants.

Action 1.4 Evaluate the effectiveness of a catch and release regulation for Malheur Reservoir on Mann Lake cutthroat trout, no change on other species.

Problem 2. Habitat degradation affects trout production in Beulah and Malheur reservoirs.

Action 2.1 Achieve basinwide habitat objectives, particularly Objectives 2 and 4 (pages 25-28).

Objective 3. Improve game fish production in small reservoirs in the Malheur River basin that have public access.

Assumptions and Rationale

1. Reservoirs offer opportunities to establish either trout or warmwater fisheries depending on habitat potential, access, and angling demand.

Problems and Recommended Actions

Problem 1. Additional demand exists for warmwater fisheries in the Burns area.

Action 1.1 Evaluate new reservoirs for introduction of warmwater game fish species.

Action 1.2 Chemically treat Cottonwood reservoir, which has access but only a fair trout fishery, and restock with warmwater species.

Problem 2. Habitat degradation reduces fish production in small reservoirs.

Action 2.1. Achieve basinwide habitat objectives, particularly Objectives 2 and 4 (pages 25-28).

Problem 3. Bluegill are stunted in Ryefield and Sagebrush reservoirs.

Action 3.1 Chemically treat Ryefield and Sagebrush reservoirs and restock with largemouth bass and bluegill.

Objective 4. Use South Fork Reservoir as a source of largemouth bass brood stock.

Assumptions and Rationale

1. South Fork Reservoir has a population of largemouth bass suitable for release in other southeast Oregon reservoirs.

Problems and Recommended Actions

Problem 1. ODFW has no formal agreement with the owners of South Fork Reservoir to collect largemouth bass for transplanting.

Action 1.1 Continue to negotiate with current owners for permission to collect largemouth bass from the reservoir.

CRAYFISH

Background and Status

Crayfish are present throughout the Malheur River drainage. The highest abundance occurs in Malheur Reservoir following extended periods when the reservoir has not been drained. Other areas with moderate size populations include the Middle Fork Malheur between the Drewsey Valley and Harper. Recreational fisheries for crayfish occur at Malheur Reservoir and in the plunge pool below Warm Springs Dam. Other areas occasionally receive some recreational use, but the widely dispersed crayfish population prevents consistent fisheries from developing.

In general, habitat factors affecting fish species also affect crayfish. The major factors affecting crayfish abundance are chemical treatment projects and draining of reservoirs for irrigation. These events will temporarily reduce populations, but enough survive to allow numbers to build back up in a few years.

The recreational harvest is limited to 100 crayfish daily which may be taken at any time all year long by a variety of gear. No license is required. The commercial harvest is limited by season (April 1 through October 31), gear (crawfish pots or rings), and size (3 5/8 inch minimum). A commercial license is also required.

Commercial harvest of crayfish was essentially eliminated from the drainage when Malheur Reservoir was closed to commercial harvest in 1986. During the three years since this closure, commercial landings of crayfish in all of Malheur County have averaged 150 pounds per year. It is thought these landings occurred in areas of the county outside the Malheur River drainage along the Snake River. The purpose of the closure at Malheur Reservoir was to assure that the crayfish resource was available exclusively to the recreational fishery.

The task force expressed concern that commercial harvest of crayfish could jeopardize recreational crayfish harvest opportunities in areas of the basin other than Malheur Reservoir. About four percent of the sport fishermen responding to a question in the angler survey about crayfish management suggested that commercial crayfish harvest should be eliminated. It was not clear if the concern related to the Malheur drainage or to the Snake River impoundments where substantial commercial crayfish harvest occurs.

The merits of a regulation to eliminate commercial crayfish harvest in the entire Malheur drainage is debatable. It is unlikely that a commercial fishery will develop because of low abundance and limited distribution, so the regulation will probably not serve any purpose. In the event that a commercial fishery developed, it is not known if it would reduce crayfish production and how it would effect recreational harvest.

Policy

Policy 1. Crayfish in the Malheur River basin will be managed for the recreational fishery.

Objectives

Objective 1. Maintain production of crayfish in the Malheur River basin for recreational harvest.

Assumption and Rationale

1. A limited number of crayfish is available for harvest in the Malheur River basin.

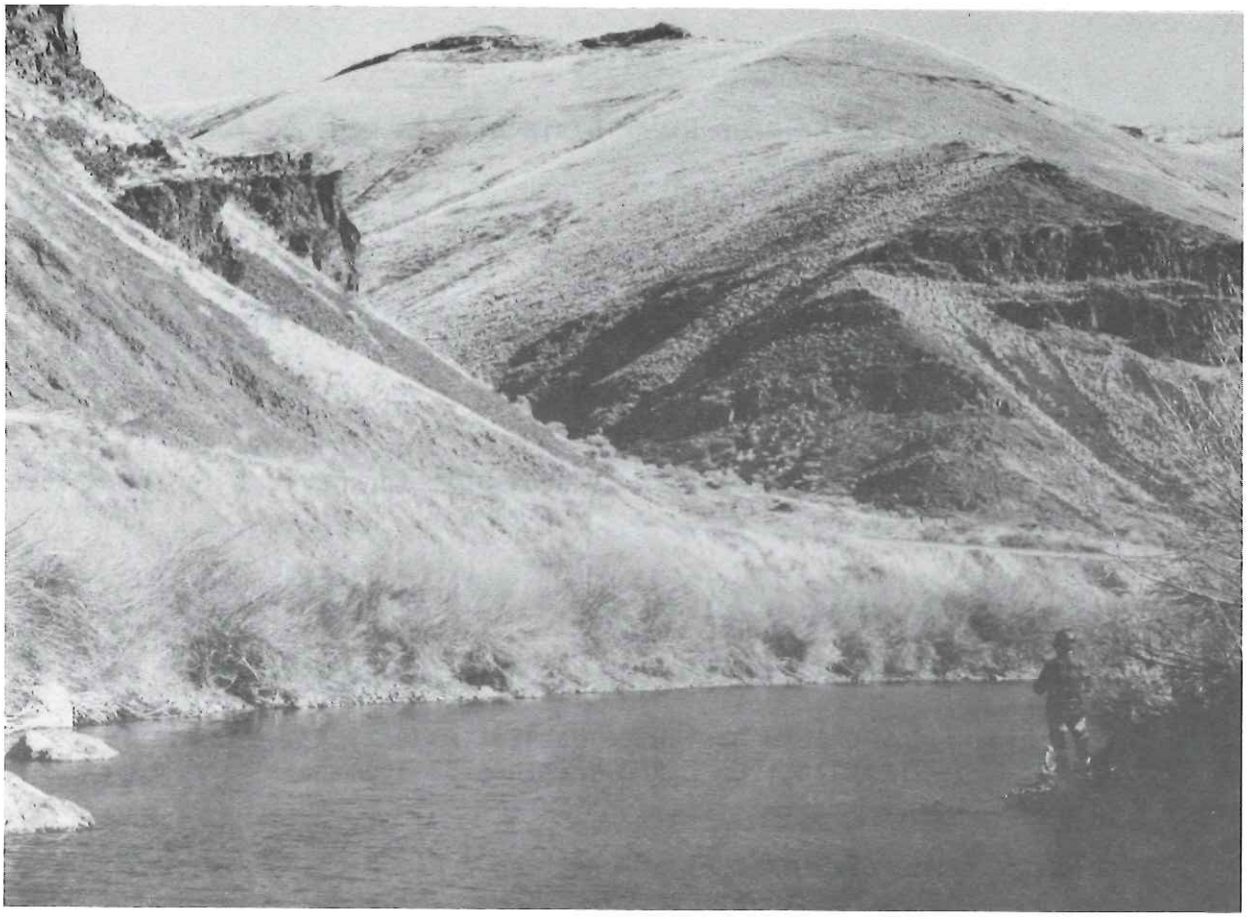
Problems and Recommended Actions

Problem 1. Habitat degradation affects crayfish populations.

Action 1.1 Achieve basinwide habitat objectives, especially objectives 2 and 4 (pages 32-35).

Problem 2. Commercial harvest of crayfish could develop and reduce the recreational harvest.

Action 2.1 Monitor commercial landings to determine if commercial harvest is increasing.



(M L Hanson)

ACCESS

Background and Status

The large amount of public land in the Malheur basin assures public assess to most of the streams and reservoirs. Many private landowners allow fishing by permission only. Results of the angler opinion survey indicate that access in the southeast region (Malheur, Owyhee, and Malheur Lake basins) is considered adequate for boat and bank angling (*see* **APPENDIX B**).

Most of the access objectives addressed in this section pertain to specific reservoirs. Primary concerns include obtaining public access to private land and improving road and boat access. Angler survey respondents indicated the most concern for limited access at Warm Springs, Malheur, and Beulah reservoirs.

Sites in the Malheur river system where anglers felt access could be most improved included the North Fork Malheur below Beulah Dam, the mainstem Malheur below Juntura, and Willow Creek above Malheur Reservoir. These areas are predominantly private land.

Although ODFW will continue to seek cooperation with private landowners to allow public access to both the streams and reservoirs on private land, landowners cite many reasons why they will not allow public access. These include off-road vehicle traffic, litter, discourteous behavior by the public, gates being left open, theft and vandalism. Many simply wish to maintain their privacy.

Occasionally, access is acquired as a result of land exchanges between private land owners and the federal government, or by purchase of private land by private interest groups.

Policies

Policy 1. ODFW shall seek to provide access for boat and bank angling to satisfy public need for a variety of angling opportunities and a dispersion of angling effort throughout the basin.

Policy 2. Acquisition and development of angler access sites shall be consistent with policies and objectives for management of fish species and habitat.

Objectives

Objective 1. Improve public access at Malheur Reservoir.

Assumptions and Rationale

1. Malheur Reservoir is presently not filled to capacity each year because of needed safety repairs to the dam. Consequently, fisheries in the reservoir are not used to their potential.

2. Malheur County wishes to expand recreation facilities and guarantee public access beyond 1995.

Problems and Recommended Actions

Problem 1. Expansion of access and recreation facilities will not occur unless Malheur County, ODFW and the Orchard Irrigation District can negotiate an agreement.

Action 1.1 Continue negotiations with the Orchard Irrigation District and Malheur County.

Action 1.2 Investigate a proposal to support the irrigation district in obtaining public assistance funds to repair the dam if expanded public access can be assured.

Objective 2. Improve boat access at Beulah and Warm Springs reservoirs.

Assumptions and Rationale

1. Money to repair boat launching facilities is obtained from the State Marine Board at the request of the county court.

Problems and Recommended Actions

Problem 1. The boat ramp at Beulah Reservoir is in need of repair, and boat ramps at Beulah and Warm Springs Reservoirs should be lengthened.

Action 1.1 Work with Malheur County to upgrade the boat ramp for improved angler access at Beulah Reservoir.

Action 1.2 Work with Harney County to upgrade the boat ramp for improved angler access at Warm Springs Reservoir.

Objective 3. Increase public access to additional private waters.

Assumptions and Rationale

1. Acquiring access to additional private waters will increase fishery recreation within the basin.

Problems and Recommended Actions

Problem 1. Private landowners are reluctant to grant access because of concern for property damage and privacy.

Action 1.1 Periodically contact owners of private waters regarding public access and obtain access agreements where possible.

Action 1.2 Work with federal land managers and private interest groups to enhance public access opportunities.

Objective 4. Secure public access to South Fork Reservoir.

Assumptions and Rationale

1. Access to South Fork Reservoir would provide a warmwater fishery close to Burns.

Problems and Recommended Actions

Problem 1. ODFW has no formal agreement with the owners of South Fork Reservoir to allow public access.

Action 1.1 Continue to discuss and advocate for public access to South Fork Reservoir with the owners and manager.

Objective 5. Improve road access to Warm Springs Reservoir.

Assumptions and Rationale

1. Road access to Warm Springs Reservoir can be difficult, particularly in wet weather.

Problems and Recommended Actions

Problem 1. The county road into Warm Springs Reservoir needs to be improved.

Action 1.1 Investigate options with Harney County for improving road access to Warm Springs Reservoir.

REFERENCES

Behnke, R.J. 1982. Evaluation of redband trout collections from Malheur River drainage Malheur County, Oregon. (Unpublished contract report to the U.S. Bureau of Land Management, Vale Oregon.)

Bowers, W., W.E. Hosford, A. Oakley, and C. Bond. 1979. Wildlife habitats in managed rangelands--Great Basin of southeastern Oregon. Native trout. U.S. Forest Service, General Technical Report PNW-84, La Grande, Oregon.

California Department of Fish and Game. 1985. Draft programatic environmental impact report. Rotenone use for fisheries management. DFG Pesticides Investigations Unit, Rancho Cordova, California.

Carrels, P. 1989. A new gold rush? Going for the gold. Outdoor America, Winter 1989: 23-29.

Cockle, R. 1989. Expert warns of effects of using cyanide method to leach gold from soil. Oregonian (3rd Edition), April 21, 1989:D6.

Crouse, M. 1982. Vale District native redband trout habitat management plan. U.S. Bureau of Land Management, Vale, Oregon. (Unpublished report.)

Fulton, L.A. 1968. Spawning areas and abundance of chinook salmon (Oncorhynchus tshawytscha) in the Columbia River basin--past and present. U. S. Fish and Wildlife Service, Special Scientific Report, Fisheries 571, Washington, D.C.

Fulton, L.A. 1970. Spawning areas and abundance of steelhead trout and coho, sockeye, and chum salmon in the Columbia River basin--past and present. National Marine Fisheries Service, Special Scientific Report, Fisheries 618, Washington, D.C.

Friday, J. and S.J. Miller. 1984. Statistical summaries of streamflow data in Oregon. Volume I. Eastern Oregon. U.S. Geological Survey Open-file Report 84-454, Portland.

Gall, G.A.E., M. Brown, and B. Bently. 1981. Native trout in the Silvies and Malheur drainages of eastern Oregon. University of California at Davis, California. (Unpublished report to the Malheur National Forest, John Day, Oregon.)

Hosford, W.E. and S.P. Pribyl. 1983. Blitzen River redband trout evaluation. Oregon Department of Fish and Wildlife, Information Reports (Fish) 83-9, Portland.

Hosford, W.E. and S.P. Pribyl. In press. Silvies River fishery evaluation. Oregon Department of Fish and Wildlife, Information Report (Fish), Portland.

Johnson, D.M., R.R. Petersen, D. R. Lycan, J.W. Sweet, M.E. Newhaus, A.L. Schaedel. 1985. Atlas of Oregon Lakes. Oregon State University Press, Corvallis.

Kunkel, C.M. 1976. Biology and production of the redband trout (*Salmo* sp.) in four southeastern Oregon streams. Masters thesis. Oregon State University, Corvallis.

Malheur County. 1978. Malheur County non-point source water quality management planning program. Inventory. Malheur County Comprehensive Planning Office, Vale, Oregon.

Oregon Department of Environmental Quality. 1988. 1988 Oregon statewide assessment of nonpoint sources of water pollution. Oregon Department of Environmental Quality, Portland.

ODFW (Oregon Department of Fish and Wildlife). 1982. A department guide for introduction and transfers of fin fishes into Oregon waters. Oregon Department of Fish and Wildlife, Portland.

ODFW. 1977. Manual for fish management. Oregon Department of Fish and Wildlife, Portland.

ODFW. 1988. Statewide chemical rehabilitation of lakes and streams (Oregon). Environmental assessment. Oregon Department of Fish and Wildlife, Portland.

Oregon Natural Heritage Data Base. 1987. Rare, threatened and endangered plants and animals of Oregon. Portland.

Pribyl, S.P. and W.E. Hosford. 1985. Malheur basin wild trout evaluation. Oregon Department of Fish and Wildlife, Information Report (Fish), Hines.

Sahagun, L. 1988. Environmentalists attack plans to use cyanide in gold-mining operations. Los Angeles Times, 23 May 1988: 3.

Shepard, B.B., K.L. Pratt, and P.J. Graham. 1984. Life histories of westslope cutthroat and bull trout in the upper Flathead River basin, Montana. U.S. Environmental Protection Agency Contract No. R008224-01-5, Denver, Colorado.

Shreck, C.B. and K.P. Currans. 1988. Taxonomic analysis of rainbow trout (Oncorhynchus mykiss) from streams in the Malheur River basin. Oregon State University, Corvallis. (Unpublished contract report to the U.S. Bureau of Land Management, Vale, Oregon.)

Sousa, R.J., F.P. Meyer, and R.A. Schnick. 1987. Re-registration of Rotenone: A state/federal cooperative effort. Fisheries 12(4):9-13.

SWRB (State Water Resources Board). 1969. Malheur-Owyhee Basins. Salem, Oregon.

Thompson, K.E. and J.D. Fortune, Jr. 1967. The Fish and wildlife resources of the Malheur River basin and their water requirements. Oregon State Game Commission, Fish Management Project F-69-R-5, Progress Report. Portland.

U.S. Bureau of Land Management. 1988. 6840-Special status species management. Bureau of Land Management Manual, September 16, 1988, Rel. 6-116, Washington, D.C.

U.S. Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants: Review of Vertebrate Wildlife; Notice of Review. Federal Register 50(181):37958-37967.

U.S. Forest Service. 1986. Title 2600-Wildlife, fish, and sensitive plant habitat management. Forest Service Manual, October 1986, Amendment 52, Washington, D.C.

U.S. Forest Service. 1990. Final environmental impact statement. Land and resource management plan. Malheur National Forest, John Day, Oregon.

APPENDIX A

Plans and Policies that Guide Fish Management in Oregon

Oregon's Trout Plan--OAR 635-500-100 to 120[3]

Management Guidelines--OAR 635-500-105

The following guidelines by management option apply to the management of trout:

(1) Option (1)(a) of the Wild Fish Policy - Manage exclusively for wild fish.

  (a) No hatchery trout will be stocked.

  (b) Habitat protection, rehabilitation, and enhancement are the primary management activities.

  (c) Harvest and angling effort will be regulated in accordance with the management alternative selected.

(2) Option (1)(b) of the Wild Fish Policy - Manage for wild and hatchery fish.

  (a) Habitat protection, rehabilitation, and enhancement are essential to maintaining wild trout production.

  (b) Hatchery stocks shall be used for target fisheries. When hatchery stocks are released to supplement, rehabilitate, or enhance the existing wild stock, they should be as genetically similar to the existing wild stocks as possible.

  (c) Introduction of non-native stocks and species must be approved through the Stocking Policy Review Process. This review is a very detailed procedure, used by anyone who proposes to introduce a stock or species into Oregon waters where they do not or have not existed in the past.

  (d) Harvest and angling impact will be regulated in accordance with the management alternative selected.

---

[3] *The Trout Plan and Warmwater Fish Plans do not reflect changes in the Wild Fish Management Policy adopted 24 January 1990.*

(3) Option (1)(c) of the Wild Fish Policy - Manage for hatchery fish.

(a) Introduction of non-native stocks must be approved through the Stocking Policy Review Process.

(b) Special harvest regulation may be applied to maximize the catch of hatchery trout.

(4) There are three general guidelines for use of hatchery trout common to Options (1)(b) and (1)(c) of the Wild Fish Policy.

(a) Yearling rainbow trout will not be stocked in streams that are not presently stocked unless approved by the Commission in a subbasin management plan.

(b) Stocking of yearling rainbow trout will be discontinued or modified where the return to the angler is consistently less than 40% of the number released.

(c) Brood stocks selected to contribute to natural production in streams managed for Option (1)(b) of the Wild Fish Policy will contain a sufficient number of adults (i.e. effective population size) so that the genetic fitness of the wild stock can be maintained.

Management Alternatives - OAR 635-500-115

In addition to the three broad management options in the Wild Fish Policy the following six management alternatives will be used in the management of trout.

(1) Wild Fish - Management under the wild fish alternative is exclusively for wild fish Option (1)(a) of the Wild Fish Policy.

(2) Featured Species and Waters - Emphasize species or stocks that are uncommon or unique and waters that have historical benefit or potential for unique natural beauty, water quality, aesthetics or recreational capabilities. Species, stocks, or waters under this alternative can be managed as Options (1)(a), (1)(b) or (1)(c) of the Wild Fish Policy.

(3) Trophy Fish - Certain waters are capable of producing large "bragging-size" trout. This alternative does not include publicizing all trophy trout waters in the state. Many anglers fish secret and favorite waters that produce some trophy fish. Waters that have limited access or capability to produce large fish without special habitat protection, regulation, or stocking procedures will be placed in other alternatives to preserve angler diversity. Management Options may be (1)(a), (1)(b) or (1)(c) of the Wild Fish Policy.

(4) Basic Yield - These waters are managed under Options (1)(a), (1)(b) or (1)(c) of the Wild Fish Policy to use their natural productivity and grow trout to a harvestable size with or without addition of fingerling

or yearling hatchery trout. Although trophy trout and unique fish species may be available, the major fisheries are of a general, consumptive nature without special regulations. Most of the trout available to the angler are from either naturally produced or from releases of hatchery fingerlings. Other species may be present and have fishery values equal to or greater than trout.

(5) Intensive Use - These waters are managed under Options (1)(a), (1)(b) or (1)(c) of the Wild Fish Policy. Waters managed for this alternative are apt to be near large population centers or attract intensive angler use because of easy accessibility or location of other water-oriented recreational facilities. Many of these waters can be used heavily by anglers for short periods (April, May, and June) and afterwards be used for sailboating, water skiing, swimming, and camping. Other waters can support fisheries year-round. Some of these waters are stocked with yearling rainbow trout on a regular basis.

(6) Private Waters and Reservations - ODFW generally does not participate in the direct management of these waters except regarding the enforcement of applicable state statutes, policies, and administrative rules pertaining to stocking permits, fish diseases, prohibited species, and other factors that may affect the welfare of the state's natural resources.

Warmwater Fish Plan--OAR 635-500-045 to 060

Management Guidelines - OAR 635-500-045

Management options for protection and enhancement of wild stocks are contained in OAR 635-07-525 (Wild Fish Policy). In addition, the following guidelines by management option apply only to management of nonendemic warmwater game fishes:

(1) Option (1)(a) - Manage for wild fish.

(a) The intent of management under this option is to insure that the adaptability of wild stocks is not diminished by hatchery stocks.

(b) Wild stocks will be used to establish populations. Donor stocks that show life history or behavioral characteristics believed to improve survival and growth of populations in the basin must be used.

(c) Any nonlocal stock proposed as a donor will be reviewed for (1) life history characteristics in comparison to local stocks, (2) goals of the introduction, (3) estimated costs, and (4) possible consequences on the fish management objectives for all species in the basin.

(d) If production of wild fish in the basin is believed to be limited by some existing habitat condition, attempts to increase abundance of fish will consist of improvements to habitat.

(e) If production of wild fish in the basin is believed to be lower than the present habitat can support, short-term stocking of fry, fingerling, or adults may be used in an attempt to achieve maximum sustained production. Under these circumstances, the stocking program will not exceed five years. During the stocking period, an evaluation procedure will be established to determine the effectiveness of the stocking program. Donor stocks must meet the criteria listed in (b) and (c).

(2) Option (1)(b) - Manage for wild and hatchery fish.

(a) The intent of management under this option is to insure that the range of biological characteristics, adaptability, and production of the wild stock are not reduced by interactions with hatchery fish.

(b) Habitat protection and enhancement are essential to maintaining production for wild fish in the system.

(c) Hatchery fish may be used on a routine, ongoing basis in order to increase the abundance of adults over the number that would be present under reliance on natural production alone.

(d) Hatchery programs will use fish believed adapted to survival, growth, and adaptability in the basin. The best adapted or acceptable donor stock will be used. Nonlocal stocks will meet the criteria of guideline (c) under Option (1)(a).

(e) If beneficial alteration of genetic adaptability of the wild population is desired, hatchery fish will be released in sufficient numbers and over a sufficient time period to substantially alter life history characteristics.

(f) Special restrictions may be imposed to protect hatchery stocks released for the purpose of breeding with stocks currently present.

(3) Option (1)(c) - Manage for hatchery fish.

(a) The intent of management under this option is to (1) achieve the maximum possible benefits from production of hatchery fish, and (2) maintain natural production at the highest level possible without restricting the hatchery program.

(b) Habitat protection and enhancement are essential to maintaining the productive capacity of wild fish in the system.

(c) The hatchery program must use a well adapted local or other stock believed able to survive and grow in the basin as a basis for developing a hatchery population that will achieve goals of the hatchery program. Nonlocal stocks will meet the criteria of guideline C under Option (1)(a).

(d) The magnitude of the hatchery program may be limited to regulating the effects on wild stocks of the same species within the basin. The magnitude of the hatchery program may be limited to regulating the effects on other fish species in the basin, depending on management objectives for those species.

Management alternatives are found in OAR 635-500-055 (1) under the objective to provide diversity of angling opportunities:

(a) Trophy angling. Emphasize low harvest and maintenance of large fish in the population.

(b) Quality angling. Provide above average sizes and moderate regulation.

(c) High yield angling. Promote harvest for consumption.

(d) Basic yield angling. Angling will be low key, with minimal regulation and little intervention in natural processes.

APPENDIX B

Southeast District 1987 Angler Survey Summary

Introduction

During 1987 an angler opinion questionnaire (*see* page 109) was developed for use in ODFW's southeast region, which includes the Malheur River, Owyhee River, and Malheur Lake drainages (Water Resources Department designations). One of the purposes of the questionnaire was to survey angler opinion on a variety of fishery issues that would be used in the development of fish management plans for the region's river basins.

Since the early planning effort focused on the Malheur River basin, distribution of the questionnaire was concentrated in this basin, although it was also distributed to anglers in the Owyhee basin. An effort was made to canvas all representative fisheries and angler types in the basin. The percentages of various angler types that received the questionnaire were general bass angler 4%, tournament bass angler 10%, general warmwater angler 45%, general trout angler 37%, fly fisherman 4%.

Results

Percentages are calculated on the basis of the number of respondents that answered the question, not on the number of questionnaires distributed.

Of the 367 questionnaires distributed, 50% were completed and returned. Approximately two thirds of those returned had been distributed at reservoirs and one third had been distributed to anglers along streams.

Type of Angler: Most (62%) of the respondents were boat anglers, and the majority (52%) preferred to use a combination of angling methods (bait, lures, and flies) rather than a single method.

Half of the respondents fished the region's lakes and reservoirs from 1 to 10 times in 1986, and another 28% fished 10 to 20 times that year. The majority of respondents fished streams and rivers fewer than fewer than 10 times (41%) or not at all (41%).

Over half of the respondents fished for channel catfish in 1986 an average of 6.3 times. The Snake River was the most popular location (47%). Channel catfish angling also occurred at Owyhee Reservoir (27%), in the lower Malheur River (12%), and in the Owyhee River (7%). Other waters in the region where catfish were taken were also mentioned (7%).

Only 10% of the respondents indicated they harvested crayfish an average

of 1.3 times in 1986. Various sites in the Malheur River and Malheur Lake basins yielded crayfish.

Place of Residence: Most of the respondents (71%) were from Oregon (38% from eastern Oregon and 33% from western Oregon). The next largest contingent were from Idaho (24%). Washington (3%) and other states (2%) provided the remainder of the anglers.

Angling Experience: The stream fisheries were rated fair for trout, bass, and catfish. Lake and reservoir fishing was rated mostly fair for trout, bass, and catfish. The rating for white crappie fishing was almost evenly divided between good, fair, and poor. The majority of respondents (81%) did not feel that angling pressure was too high in southeastern Oregon.

Access: Access was generally considered adequate for bank anglers and for boat access. Comments were received regarding areas where access is considered limited, primarily Owyhee Reservoir, Warm Springs Reservoir, and the Snake River.

Angling Regulations: Respondents favored restrictive size limits and fewer bass tournaments and opposed restrictive bag limits and a catch-and-release only regulation for bass in Owyhee Reservoir. A special bass regulation on waters in addition to Owyhee Reservoir was opposed by 69% of the respondents. The majority (84%) did not favor restrictions on the use of bait at areas in addition to the Little Blitzen River and Mann Lake, and 83% did favor more restrictive bag or size limits for trout angling.

Rainbow trout stocking: Continuation of the current stocking program (legal size trout) in the upper Malheur River, lower Blitzen River, and Emigrant Creek was favored by 62% of the respondents. Answers were evenly divided on whether other waters should be stocked with legal-sized trout, and a wide variety of suggestions was received for other waters that respondents felt should be stocked.

Species Mix: When asked if more southeastern Oregon waters should be managed for trout, crappie, bass, or other species, most respondents indicated no. However, the margin was less for bass (45% yes and 55% no) than for either trout or crappie. Waters where anglers felt management was most needed included Owyhee Reservoir and Bully Creek Reservoir for bass ; generally throughout the region for trout; and primarily Owyhee Reservoir for crappie. Suggestions were also made for walleye, catfish, and perch.

Questionnaire

SOUTHEAST OREGON ANGLER OPINION SURVEY

1. Do you prefer angling with bait, with lures, with flies, or some combination ? (Circle one number)

   1 BAIT
   2 LURES
   3 FLIES
   4 PREFER A COMBINATION

2. Generally do you prefer angling from the bank or from a boat? (Circle one)

   1 ANGLING FROM THE BANK
   2 ANGLING FROM A BOAT

3. In your opinion is the access to reservoirs and streams in Southeastern Oregon for boat and for bank fishermen adequate or inadequate? (Circle one number for each)

	ADEQUATE	INADEQUATE	NO OPINION
a. For boats.....	1	2	3
b. For bank fishing.....	1	2	3

   3a. Please list any areas where access is inadequate.

4. Please indicate whether or not you think more Southeastern Oregon waters should be managed for each species listed below. If you think more should be managed, please indicate the bodies of water. (Circle one number for each)

	More waters managed? NO	YES	Where needed? BODIES OF WATER
a. Trout.....	1	2	_____
b. Bass.....	1	2	_____
c. Crappie.....	1	2	_____
d. Others (specify _____)	1	2	_____

5. Below is a list of possible management strategies that have been suggested for management of bass at Owyhee Reservoir. Please indicate whether you would favor or oppose each strategy. (Circle one number for each)

	FAVOR	OPPOSE	NO OPINION
a. Restrictive bag limits designed to produce more large bass (2 fish daily bag limit).....	1	2	3
b. Restrictive size limits designed to produce increased numbers of bass (12 inch minimum length).....	1	2	3
c. Catch and release only.....	1	2	3
d. Fewer bass tournaments.....	1	2	3
e. Other (specify_____).....	1	2	3

6. Would you like to see "special bass regulations" imposed on other waters? (Circle one)

1 NO
2 YES
└——> Please list the water and suggested regulation.

7. Presently, the upper Malheur River, lower Blitzen River, and Emigrant Creek are the only streams in the area stocked with legal-sized trout. How do you feel about this practice? (Circle one number)

1 SHOULD BE CONTINUED AT PRESENT LEVELS
2 SHOULD BE INCREASED
3 SHOULD BE DECREASED
4 SHOULD BE ELIMINATED

8. Would you like to see other waters stocked with legal size trout? (Circle one)

1 NO
2 YES
└——>Where?_____

9. A regulation that has been suggested for trout angling in selected Southeastern Oregon waters is prohibiting the use of bait. Such regulations are now in effect in Mann Lake and the LIttle Blitzen River. Should the use of bait be restricted in any additional areas? (Circle one)

1 NO
2 YES
└——> List additional waters where you feel the use of bait should be prohibited.

10. Other regulations that have been suggested for trout angling in selected waters are m ore restrictive bag limits and/or size limits. Do you favor more restrictive bag limits and/or size limits in any area? (Circle one)

1 NO
2 YES
└——>List water and suggested regulation.

11. About how many times, altogether, did you fish Southeastern Oregon <u>lakes and reservoirs</u> last year? (Circle one number)

1 DID NOT FISH LAKES OR RESERVOIRS
2 ONE TO TEN TIMES
3 11 to 20 TIMES
4 21 to 40 TIMES
5 OVER 40 TIMES

11a. Please rate last year's fishing on lakes and reservoirs as good, fair or poor for each species listed. (Circle one number for each)

	GOOD	FAIR	POOR	NO OPINION
a. Trout.....	1	2	3	4
b. Bass.....	1	2	3	4
c. Crappie.....	1	2	3	4
d. Catfish.....	1	2	3	4

11b. Briefly explain your rating of lake and reservoir fishing.

12. About how many times, altogether, did you fish Southeastern Oregon streams and rivers last year? (Circle one number)

1 DID NOT FISH IN STREAMS LAST YEAR
2 ONE TO TEN TIMES
3 11 to 20 TIMES
4 21 to 40 TIMES
5 OVER 40 TIMES

12a. Please rate last year's fishing on Southeastern Oregon streams for each species listed. (Circle one number for each)

	GOOD	FAIR	POOR	NO OPINION
a. Trout.....	1	2	3	4
b. Bass.....	1	2	3	4
c. Catfish.....	1	2	3	4

12b. Briefly explain your rating of rivers and stream fishing.

13. Do you fish for Channel catfish? (Circle one)

1 NO
2 YES

—>How many times last year? (Fill in number)

_____ NUMBER

—> Did you fish for catfish in the Snake River, Owyhee Reservoir, Owyhee River, lower Malheur River, or other water? (Circle one number for each)

	YES	NO
a. Snake River.....	1	2
b. Owyhee Reservoir.....	1	2
c. Owyhee River.....	1	2
d. Lower Malheur River.....	1	2
e. Other Water (Specify____ _____)		

13a. Any suggestions regarding this fishery?

14. Do you harvest crayfish? (Circle one)

1 NO
2 YES
- ->How many trips last year? (Fill in number)
  - _____NUMBER
- ->What waters did you crayfish?

14a. Any suggestions regarding this fishery?

15. Do you feel angling pressure is too high on Southeastern Oregon waters? (Circle one)

1 NO
2 YES
- ->Please explain briefly.

16. Do you have any other suggestions pertaining to fish management in Southeastern Oregon?

17. What is your place of residence?

CITY_____

STATE_____

Survey Results

Questionnaires distributed 367
Questionnaires returned 184 (50%)

Angler type	*N*	Percent receiving questionnaire
General bass	15	4.1
Tournament bass	38	10.4
General warmwater	164	44.7
General trout	137	37.3
Fly fisherman	13	3.5

1. **Preferred Angling Method:**

Bait	13.2%
Lures	24.7%
Flies	9.9%
Combination	52.2%

2. **Bank or Boat Angler:**

Bank	38%
Boat	62%

3. **Access rating:**

	Boats	Bank Fishing
Adequate	76.6%	86.3%
Inadequate	23.4%	13.7%

3a. **Areas Where Access is Limited.** Although access was judged adequate by the majority of respondents, 26% provided comments where they felt access was limited. Responses were categorized according to river basin as follows:

Number of Responses

19 Owyhee basin, primarily Owyhee Reservoir, but Antelope Reservoir, Diamond Lake, and Cow Lakes also mentioned.

18 Malheur basin, 12 mentioned Warm Springs Reservoir. Malheur and Beulah Reservoirs were also mentioned, as were sites on the Malheur River below Beulah Reservoir, below Juntura, and on Willow Creek above Malheur Reservoir.

11 Snake River including Brownlee Reservoir and the boat ramp at Farewell Bend.

3a. (continued)

1 Krumbo Reservoir in the Malheur Lake basin.
5 General responses. These varied from "all" to a response indicating improved access would be a detriment.

4. Should More Waters be Managed For:

	Trout	Bass	Crappie
Yes	37.7%	45.0%	30.1%
No	62.7%	55.0%	69.9%

Bodies of Water Where Management Needed. Responses numbered were categorized according to species.

Number of Responses

Bass waters identified and included:
27 Owyhee basin, primarily Owyhee Reservoir. Cow Lakes also mentioned.
9 Malheur basin, mostly Bully Creek Reservoir. Warm Springs and
2 Chicahominy and Moon reservoirs in Malheur Lake basin.
2 Gerber and Phillips reservoirs outside the study area.
3 General responses, e.g., "streams," "largemouth where you have smallmouths."

Trout waters identified and included:
10 Owyhee basin, river and reservoir.
13 Malheur basin, divided between reservoirs and the river, particularly the North Fork Malheur.
6 General category, e.g., "stock ponds," "reservoirs," "feeder streams."
4 Malheur Lake basin.

Crappie waters identified and included:
15 Owyhee basin, mostly Owyhee Reservoir, also Cow Lakes and Antelope Reservoir.
4 Bully Creek Reservoir in the Malheur basin.
2 Brownlee Reservoir on the Snake River.
2 Silvies River reservoirs and Moon Reservoir in the Malheur Lake basin.
1 Phillips Reservoir outside the study area.

General response that varied from all inclusive, e.g., southeast Oregon, to "no opinion."

4. (continued)

Other Species That Should be Managed and in What Body of Water.
Responses were categorized according to species.

Number of Responses

5 Walleye were suggested for Brownlee Reservoir, Owyhee Reservoir, and the Snake River.
4 Catfish with one indicating the Snake River.
3 Perch (Yellow) recommended for Owyhee Reservoir and Warm Springs Reservoir.
3 Did not specify species or water, rather made an observation, e.g., pan fish established at expense of trout, some areas better managed for species other than trout.

5. **Possible Management Strategies for Bass in Owyhee Reservoir:**

	Restrictive Bag Limits	Restrictive Size Limits	Catch-and Release	Fewer bass Tournaments
Favor	38.3%	80.5%	6.4%	59.8%
Oppose	61.7%	19.5%	93.6%	40.2%

Other Management Strategies for Bass Management at Owyhee Reservoir.

Number of Responses

6 Tournament restrictions primarily "no tournaments during spawning", but "smaller tournaments" was also mentioned.
6 Size limit from 10-inch limit to a slot limit of under 12 inches and over 18 inches.
6 Combination size and bag limit varying from a limit of 5 to 10 fish, minimum length 12 inches, limited take over 17 inches.
4 Bag limit of 5.
3 Habitat improvement suggestions included special breeding planters, structure, and trash fish management.
1 Access improved in south end.
1 Gear restriction, pinched or cut off barbs on hooks.
1 Release unharmed.
1 Nonspecific response.

6. **Prefer Special Bass Regulations on Other Waters:**

Yes 30.7%
No 69.3%

6. (continued)

List Water and Suggested Special Bass Regulation.

Number of Responses

16 All waters with a 2-6 fish bag limit and a 10- to 12-inch minimum, limit take over 17 inches.

8 Bully Creek Reservoir in the Malheur basin with bag limits from 5-10 fish per day, catch and release during tournaments to no tournaments, a 10- to 12-inch minimum, limit take over 17 inches.

7 Owyhee Reservoir, Owyhee River, and Cow Lakes in the Owyhee basin, bag limit of 2-10 fish per day, 10- to 12-inch minimum, limit take over 17 inches.

3 Waters outside the study area, Phillips Reservoir, bag and size limits; Scappoose Bay, no tournaments.

4 Other comments included keeping bass out of trout streams and lakes, using biological criteria, and identifying the problem before addressing regulations.

7. **Trout Stocking in the Upper Malheur River, Lower Blitzen River and Emigrant Creek:**

Should be continued at present level	62.4%
Should be increased	28.0%
Should be decreased	3.2%
Should be eliminated	6.4%

Three respondents added comments after selection of the "should be eliminated" response. The suggestions ranged from stocking only fingerling to stating a preference for naturally spawning or wild fish.

8. **Would Like to See Other Waters Stocked With Legal-sized Trout:**

Yes	50%
No	50%

Where Would You Like to See Other Waters Stocked With Legal-sized Trout. Responses were categorized geographically:

Number of Responses

17 Comprehensive varying from "anywhere," "all waters," to "most fishable streams."

16 Owyhee basin, primarily the Owyhee River but including Antelope Reservoir, Cow Creek and Lakes, and the Jordon Valley-McDermitt area.

15 Malheur basin including Warm Springs, Beulah, Malheur, Bully Creek, and Pole Creek Reservoirs, and Malheur River, North Fork Malheur, South Fork Malheur, and Middle Fork Malheur.

8. (continued)

8 Other basins outside the study area, Burnt River, John Day River, Imnaha River, Powder River.
2 Snake River.
1 Silvies River in the Malheur Lake basin.
3 Other responses indicating no to stocking of legal-sized fish, preference for fingerling, and an opinion that warmwater fish were a better investment.

9. **Prefer Restricting the Use of Bait for Trout Angling in Areas in Addition to Little Blitzen River and Mann Lake.**

Yes 16.3%
No 83.8%

List Additional Waters Where You Feel the Use of Bait Should be Prohibited.

Number of Responses
8 Comprehensive responses, e.g., all waters, also a request for exception for kids under 12 and handicapped persons.
9 Malheur basin mostly Malheur Reservoir, but included Beulah Reservoir, Bully Creek, and the upper Malheur River.
4 Malheur Lake basin including Blitzen River, Bridge Creek, East Canal (of the Blitzen River), Tudor Lake, and Chickahominy Reservoir.
3 Owyhee basin lakes and streams.
3 Other comments suggested live bait restrictions rather than gear restrictions, exemption for children, and what was necessary to maintain a healthy population of spawning trout.

10. **Prefer More Restrictive Bag Limits and Size Limits for Trout Angling.**

Yes 17.6%
No 83.4%

List Water and Suggested Regulation for Trout Angling.

Number of Responses
8 All waters, bag limits from 2 to 10 fish per day, size restrictions from 10- to 12-inch minimum, 14-inch maximum size limit.
5 Malheur Lake basin including Blitzen River, Bridge Creek, East Canal, Malheur Lake, and Silvies River with restrictions such as no bait, catch and release, 3 to 5 fish limit, and size limits from 6- to 12-inches.
4 Malheur basin including Warm Springs and Beulah reservoirs and the mainstem and upper river with 5 fish bag limit, 12- to 15-inch minimum lengths.

10. (continued)

4	Owyhee basin including the river and Owyhee and Antelope reservoirs with a 10-inch minimum size limit specified, children under 12 exempt.
5	No water specified but various regulations suggested, e.g., "no restrictive bag limits," "discourage out of area fishermen," change season, quit winter ice fishing, 10 fish per day bag limit, present regulations okay.
2	Other comments, e.g., "stock more fish," identify the real problem before suggesting regulations.

11. Times Fished Southeastern Lakes and Reservoirs.

None	7.7%
1-10 times	50.3%
11-20 times	27.6%
21-40 times	8.3%
More than 40 times	6.1%

11a. Last Years Fishery Ratings:

	Trout	Bass	Crappie	Catfish
Good	29.8%	15.4%	29.8%	32.5%
Fair	57.3%	57.7%	37.5%	18.2%
Poor	12.9%	26.9%	32.7%	18.2%

11b. Briefly Explain Your Rating of Lake and Reservoir Fishing.

Number of Responses	
46	Explained their rating based on number or size of fish caught, time of year, number of fish caught per hour fished, type of gear used, where they fished, species fished, or the quality of the experience.
39	Repeated their responses as in ratings above, and ratings ranged from excellent to poor.
19	Other comments that did not explain the rating. Some suggested regulations and restrictions, increased stocking, or trash fish control.

12. Times Fished Southeastern Streams and Rivers:

None	40.7%
1-10 times	40.7%
11-20 times	14.3%
21-40 times	2.2%
More than 40 times	2.2

12a. Last Years Fishery Ratings:

	Trout	Bass	Catfish
Good	37.0%	14.0%	38.1%
Fair	44.6%	50.0%	47.6%
Poor	18.5%	36.0%	14.3%

12b. Briefly Explain Your Rating of River and Stream Fishing.

Number of Responses

31 Explained their rating based on number or size of fish caught, time of year, number of fish caught per hour, where they fished, species fished, quality of the experience, or compared with previous experience.

18 Repeated their responses as in ratings above and ratings ranged from great to poor.

13. Fish for Channel Catfish:

Yes 59.1% Number of trips averaged 6.3 in 1986.
No 40.9%

Waters Fished:

Snake River	46.8%
Owyhee Reservoir	27.0%
Owyhee River	7.1%
Lower Malheur River	12.0%
Other	7.1%

Other Water Where Fished for Catfish: Respondents numbered 9 (5%) and listed Warm Springs Reservoir (6), Cow and Antelope Reservoirs (1), Silvies River (1), and McKay Reservoir (1).

13a. Suggestion Regarding the Catfish Fishery:

Number of Responses

8 Recommendations that included no limits on catfish, improvement needed, more waters managed for catfish, more access on Snake River (Oregon), reduce trash fish, and keep Brownlee Reservoir at full pool.

7 Rated the fishery from "excellent" to "hit-and-miss."

6 Observations such as "fluctuating water a factor," "fish smaller," "where are catfish in Snake River," "caught bullheads but no catfish."

2 Expressed a desire for more catfish.

14. Harvest Crayfish:

Yes 10.1% Average number of times last year: 1.3
No 89.9%

Waters Crayfished:

Number of Responses
- 5 Malheur basin including Beulah and Malheur reservoirs and the Malheur River.
- 3 Malheur Lake basin at Fish Lake, Camp Creek (Silvies tributary), and Emigrant Creek.
- 3 Unity Reservoir outside the study area.
- 1 Snake River

14a. Suggestions Regarding the Crayfish Fishery:

Number of Responses
- 13 Restriction or elimination of harvest, many cited the crayfish as an important prey species for game fish.
- 6 Identified a concern with commercial harvest of crayfish.
- 5 Other comments that suggested the current limit was adequate, the fishery should be studied, or shouldn't bother with management.

15. Feel Angling Pressure is Too High on Southeastern Waters:

Yes 18.7%
No 81.3%

Please Explain Briefly (Angling Pressure Too High).

Number of Responses
- 13 Reasons given related to management, e.g., limits too high or too low, too many tournaments, increase out of state licenses, and not enough fish stocked.
- 10 Did not agree angling pressure was too high.
- 8 Cited specific areas such as Owyhee River, Mann Lake, Blitzen River, Bully Creek Reservoir, Chickahominy Reservoir, and some streams.
- 5 Too many out of state anglers.
- 5 Other reasons such as supply and demand as factors, too much water released from Warm Springs Reservoir, easy access, increased popularity of southeastern Oregon.
- 1 No opinion but expressed a desire to keep off-road vehicles off the North Fork Malheur trail.

16. **Other Suggestions Pertaining to Fish Management in Southeastern Oregon.**

Number of Responses

27 Regulations or restrictions on bass tournaments, ice fishing, season on lakes, gear, size and bag limits, out of state licenses, and reservoir drawdown.

9 Other management suggestions such as better tagging of bass, encourage a diverse age structure in fish population, monitor Idaho's bass program, provide information on filleting (similar to Alaska), post boat regulations at ramps, and more education on fisheries and fish conditions.

8 Complimented the Department.

7 Indicated a particular species such as more largemouth and fewer smallmouth, promote crappie, stock striped bass, brown trout, and walleye, farm native fish for stocking, and keep bass out of trout streams and Bully Creek Reservoir.

7 Suggestions for stocking such as more legal-sized fish, more fish, more bass ponds, increase stocking native trout.

5 Suggestions for habitat improvement such as raise water at Delintment Lake, more structure for warm water species, more small reservoirs constructed, and more protection from grazing.

3 Treatment projects suggested for Little Malheur River, and Malheur and Beulah reservoirs.

3 Suggested greater enforcement effort.

2 Access including improve access to streams and leave access unimproved at Warm Springs Reservoir.

Comments Not Related to Fish Management. Responses related to improving the fishing areas (clean up garbage, better or more toilets). One suggested restricting water skiers, another suggested no shooting near fishing areas.

17. **Place of Residence.**

Oregon	71%
Idaho	24%
Washington	3%
Other states	2%

Oregon:

East of Cascades	62%
West of Cascades	38%

APPENDIX C

Malheur Basin Fish Management Policies and Objectives

Organization of Rules

635-500-285 Administrative rules for the Malheur basin are organized as follows:

(1) OAR 635-500-290 through 635-500-300 apply to all waters of the Malheur basin.

(2) OAR 635-500-305 through 635-500-325 apply to specific areas of the Malheur basin and appear in order beginning in headwater areas and proceeding downstream, with reservoirs listed last. **Adopted 7-18-90; ef. 8-6-90**

Habitat

635-500-290 (1) The following policies apply to the Malheur basin:

(a) Potential losses of fish production from habitat degradation shall be prevented or reduced to the extent possible.

(b) The dyepartment shall coordinate with appropriate land and water management agencies on habitat protection and rehabilitation activities and shall continue to act in an advisory role to such agencies to promote habitat protection.

(2) In accordance with these operating principles, it is the objective of the Department to:

(a) Develop better communication and coordination with land managers regarding land management activities affecting fish habitat.

(b) Reduce nonpoint source pollution in the Malheur River system.

(c) Prevent fish losses at unscreened diversions.

(d) Improve reservoir habitat for game fish in the Malheur basin. **Adopted 7-18-90; ef. 8-6-90**

Access

635-500-295 (1) The following operating principles apply to access in the Malheur basin:

(a) The Department shall seek to provide access for boat and bank angling to satisfy public need for a variety of angling opportunities and a dispersion of angling effort throughout the basin.

(b) Acquisition and development of angler access sites shall be consistent with statewide policies, operating principles and objectives for management of fish species and habitat contained in department rules.

(2) In accordance with the above operating principles, it is the objective of the department to:

(a) Improve public access at Malheur Reservoir.

(b) Improve boat access at Beulah and Warm Springs reservoirs.

(c) Increase public access to additional private waters.

(d) Secure public access to South Fork Reservoir.

(e) Improve road access to Warm Springs Reservoir. **Adopted 7-18-90; ef. 8-6-90**

Crayfish

635-500-300 (1) The following policy applies to crayfish management in the Malheur River basin:

(a) Crayfish in the Malheur River basin shall be managed for the recreational fishery.

(2) In accordance with the above policy, it is the objective of the department to:

(a) Maintain production of crayfish in the Malheur River basin for recreational harvest. **Adopted 7-18-90; ef. 8-6-90**

Malheur River Headwaters and Tributaries

635-500-305 (1) The following operating principles apply to the Malheur River headwaters and tributaries:

(a) The North Fork Malheur River above Beulah Reservoir, Middle Fork Malheur River above RM 168, and headwater streams and tributaries of the Middle Fork, North Fork, South Fork, and mainstem Malheur River shall be managed for natural production of indigenous populations of wild trout, mountain whitefish, and nongame species with the exception of those areas identified in section (1)(b) of this rule.

(b) The following areas shall be managed for natural production of indigenous populations and harvest of introduced hatchery rainbow trout:

(A) Dollar Basin Campground at RM 184 on the Middle Fork Malheur River.

(B) North Fork Campground at RM 47.5 on the North Fork Malheur River.

(C) Little Malheur River at RM 18 near Forest Service Road 16.

(c) Stocking of hatchery fish shall not exceed a maximum of 3,000 fish for all three areas described in (1)(b) of this rule..

(d) Trout management in streams identified in sections (a) and (b) of this rule shall be guided by the statewide Trout Plan under the basic yield alternative except for bull trout which shall be managed as a featured species.

(e) The stocking program shall be curtailed if there is evidence that it adversely affects redband and bull trout.

(2) In accordance with these operating principles, it is the objective of the department to:

(a) Maintain population health (i.e., high abundance, multiple age classes, and genetic fitness) of bull trout and redband trout.

(b) Provide a consumptive fishery on hatchery trout at high use areas identified in section (1)(b) of this rule. **Adopted 7-18-90; ef. 8-6-90**

Middle Fork Malheur Above Warm Springs Reservoir and Mainstem South Fork Malheur River

635-500-310 (1) The following policies apply to the mainstem Middle Fork Malheur River above Warm Springs Reservoir and the mainstem South Fork Malheur River.

(a) The Middle Fork Malheur River above Warm Springs Reservoir and the mainstem South Fork Malheur River shall be managed for trout and smallmouth bass.

(b) Trout in the Middle Fork Malheur shall be managed for natural production of wild fish consistent with the Wild Fish Management Policy.

(c) Trout in the mainstem South Fork Malheur River shall be managed for natural production of wild and hatchery produced fish consistent with the Wild Fish Management Policy. Stocking of hatchery fish shall not exceed 5,000 fish

per year.

(d) Smallmouth bass shall be managed for natural production consistent with the Natural Production Policy.

(e) Trout and smallmouth bass management on the stream sections identified in sections (1)(a) through (d) of this rule shall be guided by the statewide Trout Plan and Warmwater Fish Plan, respectively, under the basic yield alternative.

(2) In accordance with these operating principles, it is the objective of the department to:

(a) Improve production of trout and smallmouth bass in the mainstem Middle Fork Malheur River above Warm Springs Reservoir to RM 168 and in the mainstem South Fork Malheur River.

(b) Provide a consumptive trout fishery on the mainstem South Fork Malheur River. **Adopted 7-18-90; ef. 8-6-90**

Malheur River and North Fork Mainstems-Reservoirs to Namorf Dam

635-500-315 (1) The following operating principles apply to the Malheur River and North Fork mainstems-reservoirs to Namorf Dam:

(a) The mainstem Malheur River between Warm Springs Reservoir and Namorf Dam shall be managed for natural production of smallmouth bass consistent with the Natural Production Policy and a maximum of 120,000 hatchery trout stocked per year.

(b) The North Fork Malheur River downstream from Beulah Reservoir and Willow Creek between Malheur Reservoir and RM 30 shall be managed for hatchery trout.

(c) Management of trout and smallmouth bass on the mainstem Malheur River between Warm Springs Reservoir and Namorf Dam and hatchery trout on the North Fork Malheur River downstream from Beulah Reservoir and Willow Creek between Malheur Reservoir and RM 30 shall be guided by the statewide Trout Plan and the Warmwater Fish Plan, respectively, under the basic yield alternative.

(2) In accordance with these operating principles, it is the objective of the department to:

(a) Provide a consumptive trout fishery in the mainstem Malheur River between Warm Springs Reservoir and Namorf Dam, in the North Fork Malheur River below Beulah Reservoir, and in Willow Creek between Malheur Reservoir and RM 30.

(b) Establish a smallmouth bass fishery in the mainstem Malheur River below Gold Creek. **Adopted 7-18-90; ef. 8-6-90**

Lower Malheur River

635-500-320 (1) The following operating principles apply to the Lower Malheur River:

(a) The mainstem Malheur River from Namorf Dam (RM 69) to the mouth; Bully Creek from Bully Creek Dam to its mouth (RM 21), and Willow Creek from Brogan to its mouth (RM 20) shall be managed for natural production of warmwater species consistent with the Natural Production Policy.

(b) The management of warmwater fish in portions of the lower Malheur basin identified in section (1)(a) of this rule shall be guided by the statewide Warmwater Fish Plan under the basic yield alternative.

(2) In accordance with these operating principles, it is the objective of the Department to:

(a) Improve the warmwater fishery in the lower Malheur River. **Adopted 7-18-90; ef 8-6-90**

Reservoirs

635-500-325 (1) The following operating principles apply to reservoirs in the Malheur basin:

(a) Bully Creek and Warm Springs Reservoirs shall be managed for natural production of the current combination of warmwater species consistent with the Natural Production Policy. Channel catfish stocking shall be maintained to the extent this species does not affect other warmwater game fish populations.

(b) Beulah and Malheur Reservoirs shall be managed for trout by annually stocking with domestic hatchery trout or other appropriate trout species.

(c) Reservoirs less than 150 surface acres shall be managed for trout or for warmwater species. Trout shall be managed by annually stocking with domestic hatchery trout, or other appropriate trout species. Warmwater species shall be managed for natural production consistent with the Natural Production Policy.

(d) The species mix currently present in reservoirs less than 150 surface acres may be altered to better use the reservoir production potential or to meet changing public demand.

(e) Participation by the department in fishery development in private waters is contingent on the availability of public benefits.

(f) Fish management in reservoirs in the Malheur River basin shall be guided by the statewide Trout Plan and the Warmwater Fish Plan under basic yield alternative and shall be consistent with the Wild Fish Management Policy.

(2) In accordance with these operating principles, it is the objective of the department to:

(a) Improve warmwater game fish production in Bully Creek and Warm Springs Reservoirs; emphasize largemouth bass, white crappie, and yellow perch in Bully Creek Reservoir; emphasize largemouth bass, yellow perch and brown bullhead in Warm Springs Reservoir, and give secondary consideration to channel catfish in both reservoirs.

(b) Improve trout production at Beulah and Malheur reservoirs.

(c) Improve game fish production in small reservoirs in the Malheur River basin that have public access.

(d) Use South Fork Reservoir as a source of largemouth bass brood stock. **Adopted 7-18-90; ef. 8-6-90**

APPENDIX D

Recommended Minimum Flows (cfs) For the Malheur River Basin (Thompson and Fortune 1967)

Stream and location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Malheur River												
River Mile 1.0	40	40	50	60	60	60	60	50	45	40	40	40
River Mile 4.0	40	40	50	60	60	60	60	50	45	40	40	40
Malheur Butte near Vale	40	40	40	50	50	50	50	50	40	40	40	40
Just upstream from Bully Creek at Vale	40	40	40	50	50	50	50	50	40	40	40	40
Just downstream from Highway 20 Bridge at Hope	40	40	40	50	50	50	50	50	40	40	40	40
USGS Gage 13-2200	25	25	30	40	40	40	30	30	30	25	25	25
3.5 miles upstream from Cottonwood Creek	25	25	40	45	45	45	40	40	40	30	25	25
5.4 miles downstream from Squaw Creek	20	20	30	40	40	40	40	35	30	20	20	20
4.0 miles downstream from Pole Creek	20	20	25	40	40	40	40	35	30	25	20	20
2.0 miles upstream from confluence with North Fork Malheur	25	25	25	35	40	40	40	35	30	25	20	20
Just downstream from confluence with South Fork Malheur	25	25	25	35	40	40	40	35	30	25	20	20
South Fork Willow Creek 1.0 mile upstream from Bridge Creek	3	6	6	6	6	5	4	3	3	3	3	3
Bully Creek at mouth	0	10	10	12	12	12	12	10	10	10	10	10
Calamity Creek just downstream from Wolf Creek	2	9	9	9	9	9	5	3/2[a]	2	2	2	2
1.0 mile upstream from Wolf Creek	1	5	5	5	5	5	3	2/1	1	1	1	1
Calf Creek at mouth	0.5	0.5	0.5	1	1	1	1	1	0.5	0.5	0.5	0.5
Middle Fork Malheur River												
USGS Gage 13-2140	30	40	40	40	40	40	30	15	15	15	15	15
0.8 mile downstream from Coyote Creek	35	50	50	50	50	50	50	35	35	35	35	35
1.0 mile downstream from Summit Creek	35	50	50	50	50	50	50	35	35	35	35	35
Big Creek at mouth	20	20	20	20	20	50	15	15	15	15/20	20	20
Bosenberg Creek at mouth	5	5	5	5	5	5	3	3	3	3/5	5	5
Lake Creek at mouth	15	15	15	15	15	15	10	10	10	10/15	15	15
McCoy Creek at mouth	4	4	4	4	4	4	2	1	1	1/4	4	4
Pine Creek 2.3 miles upstream from Dry Creek	2	6	6	6	6	6	3	2	2	2	2	2
Just upstream from West Fork Pine Creek	1	4	4	4	4	4/3	2	2	1	1	1	1
West Fork Pine Creek at mouth	1	3	3	3	3	3/2	1	1	1	1	1	1
Summit Creek at mouth	15	15	15	15	15	15/12	6	6	6	6/15	15	15
1.2 miles upstream from Basket Spring at Summit Prairie	8	8	8	8	8	6	4	3	3	3/8	8	8
North Fork Malheur at mouth	10	10	15	30	30	30	30	30	30	10	10	10
USGS Gage 13-2165	50	70	70	70	70	70	60	50	50	50	50	50
Just upstream from Little Malheur River	40	50	50	50	50	50	40	40	40	40	40	40
Just upstream from Crane Creek	35	35	35	35	35	35	30	30	30	30/35	35	35
Crane Creek at mouth	25	25	25	25	25	20/15	15	15	15	15/25	25	25
Little Crane Creek about 5.2 miles above the mouth	10	10	10	10	10	8/4	4	3	3	3/10	10	10
Elk Creek at mouth	8	8	8	8	8	8	6	5	5	5/8	8	8
Little Malheur River at mouth	10	25	25	25	25	25	15	10	10	10	10	10
0.5 mile upstream from Anderson Creek	30	30	30	30	30	20	10	8	8	8/30	30	30
Pole Creek at mouth	0.5	0.5	0.5	1	1	1	1	1	0.5	0.5	0.5	0.5
South Fork Malheur at mouth	10	10	15	15	15	15	15	10	10	10	10	10
2.7 miles upstream from Granite Creek	4	4	4	6	6	6	4	4	4	4	4	4
0.8 miles downstream from Swamp Creek	3	3	3	4	4	4	4	3	3	3	3	3
0.5 miles upstream from Swamp Creek	2	2	2	3	3	3	3	2	2	2	2	2
Swamp Creek at mouth	0.5	0.5	1	2	2	2	1	1	1	0.5	0.5	0.5
Willow Creek at mouth	15	15	15	15	20	20	15	15	15	15	15	15

[a] *Flows with "/" indicate that the quantity changes on the 15th of the month.*

APPENDIX E

Fish Species[a] Found in the Malheur River Basin

Common name	Scientific name
GAMEFISH	
Trouts--Family Salmonidae	
Redband trout	*Oncorhynchus* sp.
Rainbow trout	*Oncorhynchus mykiss*
(Oak Springs Hatchery strain)[b]	
(Cape Cod Hatchery strain)[b]	
(Eagle Lake Hatchery strain)[b]	
Cutthroat trout	*Oncorhynchus clarki*
(Mann Lake Lahontan strain)[b]	
Brook trout[b]	
Bull trout	*Salvelinus confluentus*
Mountain whitefish	*Prosopium williamsoni*
Sunfishes--Family Centrarchidae	
Largemouth bass[b]	*Micropterus salmoides*
Smallmouth bass[b]	*Micropterus dolomieui*
Black crappie[b]	*Promoxis nigromaculatus*
White crappie[b]	*Promoxis annularis*
Warmouth[b]	*Lepomis gulosus*
Bluegill[b]	*Lepomis macrochirus*
Pumpkinseed[b]	*Lepomis gibbosus*
Perches--Family Percidae	
Yellow perch[b]	*Perca flavescens*
Bullhead catfishes--Family Ictaluridae	
Channel catfish[b]	*Ictalurus punctatus*
Brown bullhead[b]	*Ictalurus nebulosus*
Flathead catfish[b]	*Pylodictis olivaris*

[a] *Common and scientific names of fishes based on: Robins, C.R., Chairman. 1980. A list of common and scientific names of fishes from the United States and Canada, 4th edition. American Fisheries Society (Committee on Names of Fishes) Special Publication 12, Bethesda, Maryland.*

[b] *Introduced species.*

Common name	Scientific name
Crayfishes--Family Asticidae	
Crayfish	*Pacifasticus gambeli* *Pacifasticus leniusculus*
Bullfrogs--Family Ranidae	
Bullfrog	*Rana catesbeiana*
NONGAME FISH	
Suckers--Family Catostomidae	
Bridgelip sucker	*Catostomus columbianus*
Largescale sucker	*Catostomus macrocheilus*
Minnows--Family Cyprinidae	
Common carp[b]	*Cyprinus carpio*
Chiselmouth	*Acrocheilus alutaceus*
Redside shiner	*Richardsonius balteatus*
Longnose dace	*Rhinichthys cataractae*
Speckled dace	*Rhinichthys osculus*
Northern squawfish	*Ptychocheilus oregonensis*
Tui chub	*Gila bicolor*
Sculpins--Family Cottidae	
Mottled sculpin	*Cottus bairdi*

APPENDIX F

Summary of Inventory Information For Streams in the Malheur Drainage

Drainage area	Date of inventory	Remarks
Malheur mainstem	1966	ODFW stream survey between Vale (RM 20) and the mouth.
	1978	ODFW made complete survey of physical features with observations of fish present from Namorf Dam (RM 69) to the mouth.
	1973, 1980, 1982, 1984, 1985, 1987, 1988	ODFW sampled fish populations at six standard sites between RM 74 and 117.
Bully Creek	1961	Complete inventory by ODFW prior to construction of Bully Creek Reservoir. Includes physical and biological features.
	1980	BLM inventory of physical and biological features of selected streams on BLM land.
	1988	Fish from Cottonwood Creek sampled for electrophoresis.
	1989	Fish from South Fork Indian Creek sampled for electrophoresis.

Drainage area	Date of inventory	Remarks
Malheur mainstem and tributaries below Juntura	1979-1985	BLM has inventoried physical and biological features of most streams in this area, although several streams that probably contain redband trout have not been inventoried.
Malheur mainstem and tributaries below Juntura	1988	Fish sampled for electrophoresis in Black Canyon and Dinner Creeks.
	1989	Fish from Cottonwood Creek sampled for electrophoresis.
South Fork Malheur	Circa 1976	BLM has inventoried physical and biological features of some of the tributaries on their land. Most on BLM land and private land have not been inventoried.
	1984	ODFW sampled three sites for fish populations.
Middle and North Fork Malheur between Juntura and the Malheur National Forest boundary	1978 or 1979	Major streams on BLM land have been inventoried for physical and biological features. Other streams, which compose about half the total, have not been inventoried.
North Fork Malheur	1972	ODFW made complete survey of physical features with observations of fish present in the mainstem from RM 35.5 to RM 59.5 and Bear, Spring, Flat, Swamp, Sheep, Crane and Elk Creeks.

Drainage area	Date of inventory	Remarks
North Fork Malheur (continued)	1973	ODFW sampled fish populations in the mainstem below Beulah Dam.
	1982-1983	Fish populations sampled at six sites on the mainstem by ODFW.
	1980	Fish populations sampled at sampled at nine sites on Bear Creek by ODFW and USFS.
	1981	Fish sampled from Bear Creek for electrophoresis and histochemistry.
	1989	ODFW sampled fish populations at sites on the mainstem, Crane, Little Crane, Elk, Sheep, Cow, Swamp, and Flat Creeks. Physical and biological features surveyed at above sections except for the mainstem.
	1989	U.S. Forest Service surveyed about 44 miles of stream habitat in the mainstem, Bear, Crane, Little Crane, Buttermilk, Halfway Creeks, Slate Gulch, Little Malheur River, and Camp Creek on the Malheur National Forest.
Middle Fork Malheur	1969	ODFW physical and biological stream survey on Summit Creek.
	1973-79	ODFW sampled fish populations in Pine, Calamity, Wolf, and Bluebucket Creeks.

Drainage area	Date of inventory	Remarks
Middle Fork Malheur (continued)	1981	Fish Sampled in Wolf Creek for electrophoresis and histochemistry.
	1982-83	ODFW sampled fish populations at five sites on mainstem between Drewsey and headwaters.
	1986	ODFW sampled fish populations in Lake, Bosonberg, McCoy, and Big Creeks.
	1989	ODFW sampled fish populations in the mainstem, Bosonberg, Big, Coral Basin, Lake, McCoy Creeks, and the Meadow Fork of Big Creek. Physical and biological features surveyed at Bosonberg, Big, Corral Basin, Lake, McCoy Creeks, and the Meadow Fork of Big Creek.
	1989	U.S. Forest Service surveyed about 24 miles of stream habitat on the mainstem, Bluebucket, Lee, Skookum, Black Canyon, Cliff, Cottonwood, Tamarack, Alder, and Cat Creeks on the Malheur National Forest.

APPENDIX G

Summary of Streams in the Malheur Drainage Where Coldwater Game Fish Have Been Identified

Drainage, stream	Species Present				
	Redband trout	Bull trout	Mountain whitefish	Brook trout	Hatchery Rainbow trout
Willow Creek:					
Basin Creek	X				
Alder Creek	X[a]				
Grouse Creek	X[a]				
Fish Creek	X[a]				
Rose Creek	X				
North Fork Willow Creek	X				
South Fork Willow Creek	X[a]				
Bully Creek:					
Mainstem above Bully Creek reservoir	X				
Cottonwood Creek	X[b,c]				
Ng Creek	X				
Clover Creek	X				
North Fork Clover Creek	X				
South Fork Clover Creek	X				
West Fork Cottonwood Creek	X				
Indian Creek	X				
South Fork Indian Creek	X[b,c]				
Tributary A	X				
North Fork Bully Creek	X				
Malheur River mainstem tributaries:					
Cottonwood Creek	X[b,c]				
South Fork Cottonwood Creek	X[c]				
Squaw Creek	X				
South Fork Squaw Creek	X[c]				
Hog Creek	X[a,c]				
Gold Creek	X				
Black Canyon Creek	X[a,b]				
Pole Creek	X[a,c]				

Drainage, stream	Species Present				
	Redband trout	Bull trout	Mountain whitefish	Brook trout	Hatchery Rainbow trout
Malheur River mainstem tributaries (continued)					
Calf Creek	X[a,c]				
Hunter Creek	X[a]				
Dinner Creek	X[a,b]				
Bull Creek	X				
North Fork Malheur:					
Above Beulah Reservoir	X	X[d]	X[e]		X
Bendire Creek	X				
Warm Springs Creek	X				
Little Malheur River	X		X		
Lost Creek	X				
Bridge Creek	X				
Squaw Creek	X				
Bear Creek	X[b]				
Crane Creek	X	X	X		
Little Crane Creek	X	X			
Elk Creek	X				
North Fork Elk Creek	X	X			
South Fork Elk Creek	X	X			
Fopian Creek	X				
Sheep Creek	X	X			
Cow Creek	X				
Little Cow Creek	X	X			
Swamp Creek	X	X			
Spring Creek	X				
Flat Creek	X	X			
Huckleberry Creek	X				
South Fork Malheur:					
Granite Creek	X				
Coleman Creek	X[a]				
Swamp Creek	X[a]				
Crane Creek	X				
Little Crane Creek	X				
Deadman Creek	X				
Middle Fork Malheur:					
Above RM 168	X		X[e]		X
Cottonwood Creek	X				
Stinkingwater Creek	X				

Drainage, stream	Species Present				
	Redband trout	Bull trout	Mountain whitefish	Brook trout	Hatchery Rainbow trout
Middle Fork Malheur (continued)					
Griffin Creek	X				
Pine Creek	X				
Alkali Creek	X				
Little Muddy Creek	X				
Muddy Creek	X				
Calamity Creek	X				
Gunbarrel Creek	X				
Wolf Creek:					
Middle Fork Wolf Creek	X[b]				
East Fork Wolf Creek	X			X	
Bluebucket Creek	X				
Black Canyon Creek	X				
Summit Creek	X			X	
Bosonberg Creek	X			X	X
Big Creek	X	X	X	X	X
Meadow Fork of Big Creek	X	X			
Coral Basin Creek	X			X	
Lake Creek	X	X		X	
Crooked Creek	X				
McCoy Creek	X			X	

[a] *Population isolated geographically.*
[b] *Fish sampled for electrophoresis.*
[c] *Fish sampled for merestic analysis*
[d] *Bull trout populations in the Middle Fork and North Fork Malheur drainages are considered distinct breeding populations.*
[e] *Mountain whitefish populations in the Middle Fork and North Fork Malheur drainages are considered distinct breeding populations.*