

MENDOCINO COUNTY SALMON AND STEELHEAD MANAGEMENT PLAN

KING (CHINOOK) SALMON
Oncorhynchus tshawytscha (Walbaum, 1792)



SILVER (COHO) SALMON
Oncorhynchus kisutch (Walbaum, 1792)



STEELHEAD RAINBOW TROUT
Salmo gairdneri gairdneri Richardson, 1826



FEBRUARY 1984

MENDOCINO COUNTY SALMON AND STEELHEAD MANAGEMENT PLAN

ADOPTED BY
MENDOCINO COUNTY BOARD OF SUPERVISORS
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Copies of this Plan are available from:
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I. THE NEED FOR A SALMON AND STEELHEAD MANAGEMENT PLAN



EEL RIVER SPORT

Circa 1897

SKETCH FROM THE OVERLAND MONTHLY

I. THE NEED FOR A SALMON AND STEELHEAD MANAGEMENT PLAN

Purpose

The impetus for developing the Mendocino County Salmon and Steelhead Management Plan came from a mandate in the County's General Plan, Fisheries Policy #e, which states:

"Develop a Fisheries Management Plan for the county by 1983 which will give detailed guidance to the county and provide improved coordination for effectively managing its anadromous fishery resources".

Although the California Department of Fish and Game and not the County is primarily responsible for managing the anadromous fishery, Mendocino County still plays a very active role. It has numerous policies in its General Plan relating to fisheries; the County Fish and Game Advisory Committee makes recommendations to the Board of Supervisors regarding fishery policy and expenditures of the County Fish and Game Preservation Fund; it operates and maintains rearing ponds at Talmage to raise steelhead; the County received state funds to carry out stream restoration projects; and the County also interacts with the many agencies and local groups involved with fisheries protection and restoration work.

With all this diversity of activity, the County's efforts toward protecting and restoring its salmon and steelhead populations needs to be better focused and coordinated. The who-what-where-why-how of anadromous fisheries management must be identified and arranged in one useful reference source. To focus better, the county needs a new goal, objectives, and policies which will provide a unified approach. To be useful, information must be regularly reviewed and updated.

No other means than this management plan is available to serve these purposes. Although the Department of Fish and Game is responsible for producing a statewide Fish and Wildlife Plan, the last one was issued in 1966 and the update has not been completed. When available, the new state plan should provide useful information which can then be incorporated in the county plan. One portion of the county is covered by a current plan, the Summer Steelhead Management Plan for the Middle Fork Eel River, prepared by the Department of Fish and Game and the U.S. Forest Service.

Plan Development

To develop this management plan, a Task Force of active participants in local fisheries work was assembled by the consultant. Included were representatives of sports and commercial fishing organizations, stream restoration groups, timber industry, County Fish and Game Advisory Committee, and the Department of Fish and Game. Five meetings were held to discuss fisheries issues and to develop the goal, objectives and policies recommended in this plan. The consultant compiled the findings and wrote the final report.

Fisheries issues identified in the General Plan and/or by the Task Force are listed in Table I-1. These concerns were then grouped into the following categories: 1) Habitat Protection, 2) Habitat Improvement, 3) Fish Population Protection, 4) Fish Population Improvement, 5) Information. As apparent in later chapters, these five categories formed the basic framework around which all findings and policies are organized in the Plan.

TABLE I-1

ANADROMOUS FISHERIES ISSUES IN MENDOCINO COUNTY

1. Contribution of County's commercial and sport fisheries to local and state economy, and the importance of non-monetary values of anadromous fish.
2. Decline in populations of salmon, steelhead, and resident trout in local streams.
3. Reduced opportunities for sport fishing and tourist-related activities in County's streams.
4. Uncertain future for commercial salmon trolling industry as the result of reduced salmon population and more restrictive fishing regulations.
5. Extent of involvement of County in fisheries management and in influencing management decisions.
6. Damage to fish habitat caused by poor land management practices.
7. Reduction in streamflow due to dams and stream diversions, which adversely affect fish habitat and migration.
8. Potential damage to anadromous fishery by outer continental shelf oil development.
9. Opportunity for fisheries restoration through habitat improvement and artificial propagation.
10. Manipulation of gene pool stocks of native anadromous fish populations.
11. Potential of aquaculture, or "ocean ranching", and its impact upon the natural salmon population and the existing local fishing industry.
12. Increased poaching in streams, partly due to increase development and access roads.

Goal and Objectives

While the General Plan presently contains two anadromous fisheries goals for the county, the Task Force believed that a more realistic and practical goal statement was needed. "Goal" is here defined as "an enduring statement of purpose" and "objective" means "the specific attainable ends toward which effort is directed". (See the Glossary for other definitions.)

GOAL: Achieve and maintain optimum natural production of salmon and steelhead in each Mendocino County watershed.

OBJECTIVES: (in order of priority)

- 1) Protect the remaining quantity and existing quality of salmon and steelhead habitat in each watershed.
- 2) Improve the quantity and quality of salmon and steelhead habitat in each watershed.
 - a) Remove barriers to at least 100 miles of habitat each year until all potential habitat is available.
 - b) Restore and improve at least 150 miles of anadromous fish habitat each year.
 - c) Rehabilitate at least 100,000 acres of watershed each year.
- 3) Protect and maintain, as a minimum, the existing level of salmon and steelhead populations in each watershed.
- 4-A) Emphasize the natural system as the primary means of restoring, improving and maintaining salmon and steelhead population levels.
- 4-B) Encourage the artificial propagation of salmon and steelhead only as a temporary measure to augment a population in a stream until it reaches an optimal or self-sustaining level.
- 4-C) Retain the genetic integrity and diversity of wild stocks in the county's streams.
- 5) Improve our understanding of the salmon and steelhead resource through better educational, research, and data collection efforts.

Additional policies to carry out these objectives and to supplement the existing policies were also recommended by the Task Force. These policies are listed in the appropriate chapter.

State-of-the-Resource

Description

Mendocino County's streams provide a significant amount of habitat for the three anadromous species found here. Based on the 1966 California Fish and Wildlife Plan, the total habitat amounted to:

Chinook (King) salmon	-	950 miles
Coho (Silver) salmon	-	1350 miles
Steelhead trout	-	2423 miles

Recent habitat restoration work has probably added many more miles to these figures.

In the State rankings, the Eel River is second for coho salmon and steelhead production, first in chinook salmon habitat and third in chinook production, and second in the North Coast for sport fishing. The Middle Fork Eel River contains the state's largest population of adult summer steelhead. Of the county's coastal streams, the Navarro River has the most anadromous habitat and production.

The county can be divided into 17 major watersheds, as depicted in Figure I-1. Each of these river systems supports anadromous fish populations, some of only one species and others of two or three.

Status

Populations of salmon and steelhead have declined dramatically in the county from their historic levels. Although no useable measurements are available from before the 1930's, descriptions of the historical fish runs by older residents and fishermen confirm that the numbers were far greater than recent decades. In Carpenter's History of Mendocino County (1914), the author mentions the "countless thousands" of salmon and steelhead coming up local streams at the turn of the century.

Between 1933 and 1978, the steelhead numbers in the Eel River (as measured at Van Arsdale station) reveal an average decline of 86% (see Figure V-2). Chinook salmon population levels decreased 70% and coho salmon levels 64% in the South Fork Eel River (at Benbow Dam) from the 1940 decade to the end of the 1960 decade. The decline in salmon and steelhead numbers is generally attributed to the continued effects of fishing pressures and of human impacts on the aquatic habitat.

Economic Value

Noyo Harbor at Fort Bragg contributes about 25% of the state's total salmon catch annually. In 1982, the harbor was second in the state for the total value of its catch (\$4,770,500) and for total numbers (192,600 chinook and coho) (CDFG, 1983). The year 1982 was an unusually bountiful year for the salmon trollers operating out of Fort Bragg, producing record catches. This good year, however, was followed by an exceedingly bad one, caused mainly by the warm El Nino current which periodically occurs.

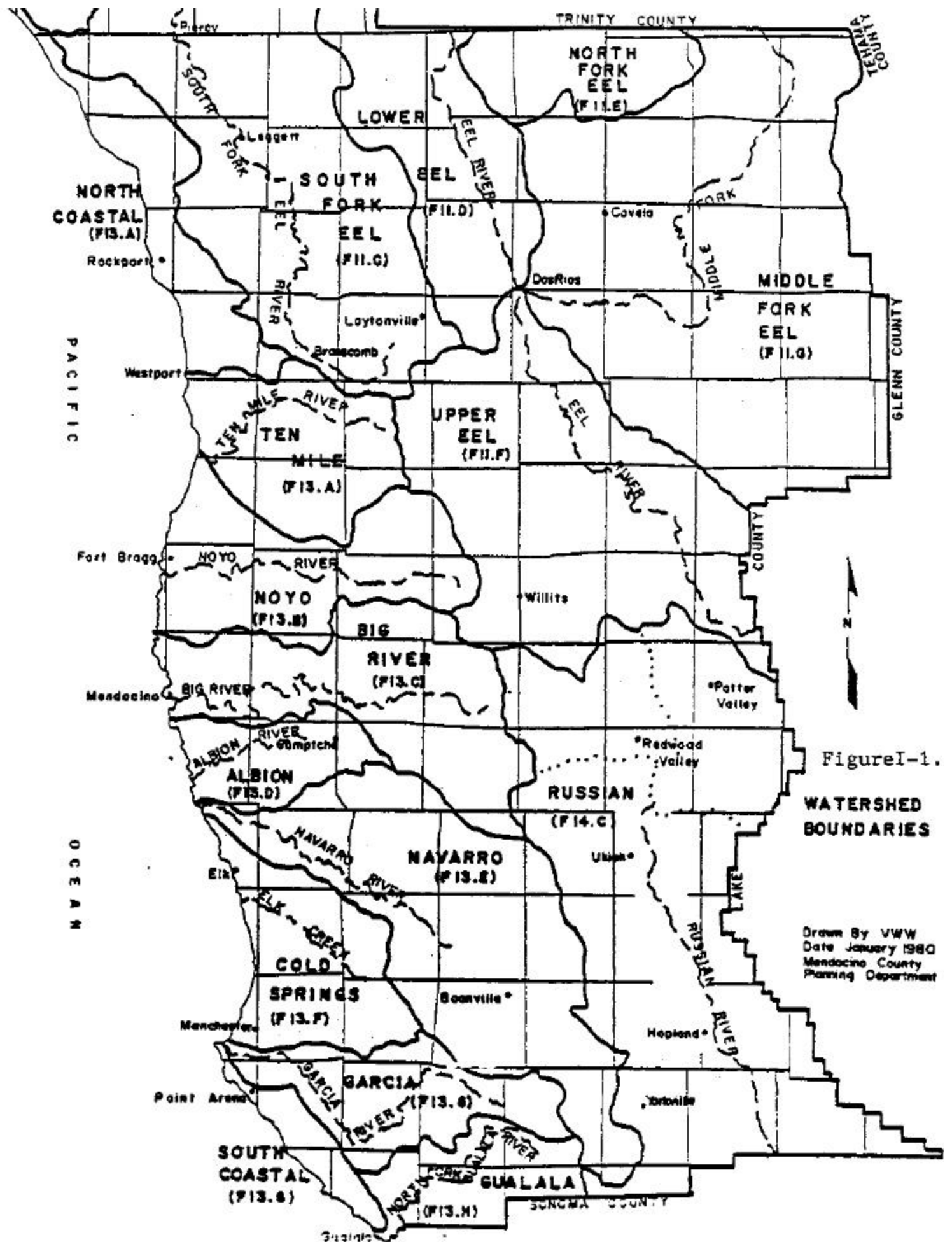


Figure I-1.
WATERSHED BOUNDARIES

Drawn By VWV
Date January 1980
Mendocino County
Planning Department

In a study of the salmon industry, commercial fishing and processing were shown to have contributed \$15.6 million to Mendocino County's economy in 1976 (PFMC, 1978). Salmon fishing had an economic multiplier effect of 2.88 (\$1 generates \$2.88), while salmon processing had an effect of 3.38. An estimated 500 people are employed locally in commercial salmon fishing, with an additional 101 jobs in fish processing.

Sport fishing for salmon and steelhead also provides direct and indirect economic benefits locally. On the Eel River in the 1972-73 season, Fish and Game's survey indicated 53,600 angler-days (202,500 hours) were spent fishing for salmon and steelhead (Puckett, 1973). Ocean sport fishing effort near Fort Bragg amounted to 4,900 angler trips in 1982 (CDFG, 1983). Historically of course, the county's streams attracted far more visitors for the recreational fishing.

Although the value of sport fishing cannot be very accurately determined, one economic study estimated the direct and indirect values to be \$47 per angler-day for river fishing and \$113/angler-day for ocean sport fishing (Smith, 1978). These values are not measured in the marketplace, but reflect the angler's "willingness to pay" for the opportunity to fish. They also do not include the second and third level beneficiaries in service and support industries, such as tourist accommodations, travel, equipment, and boats. Much of these expenses would be spent within the county by the visiting sport fisherman.

Indirect estimates have also been made of the commercial and sport value of each spawning fish: chinook salmon - \$178; coho salmon - \$160; and steelhead - \$69 (Smith, 1978).

Other values

Anadromous fish also have an intangible value in their natural existence unrelated to human use. They serve an ecological value in the river and ocean ecosystems as part of the natural food web. Native wildlife species, such as bear and otter, eat salmon and steelhead as part of their diet. For many non-fishermen, these fascinating fish offer an aesthetic value just by being observed. The fishery resource is also uniquely important to the Covelo Indian Community whose people derive both physical subsistence and cultural sustenance from the salmon and steelhead resource.

Natural History

Salmon and steelhead are anadromous fish, which means "up running" and refers to their movement upstream from the ocean when adults return to freshwater for spawning. The life histories of these fish are described in detail in several sources (Fry, 1973; Moyle, 1976). To present a concise account, excerpts from the report, Anadromous Salmonid Genetic Resources, follow (NCGR, 1982). The critical habitat needs during each stage of their life cycle are also summarized in Table I-2 for reference.

"Although anadromous fish spend part of their life cycle in the ocean, they ascend the cool, oxygen-rich freshwater streams of their origin to reproduce. One characteristic of anadromous fish is that they have a homing instinct which enables a large proportion of the fish to find their natal stream. Spawning usually occurs in headwaters and tributary streams of larger rivers, although any

TABLE I-2
HABITAT NEEDS FOR ANADROMOUS SALMONIDS¹

<u>Life Cycle Stage</u>	<u>Critical Variable</u>
Migration	Temperature Turbidity Barriers Dissolved Oxygen Streamflow
Spawning	Cover (in-stream & riparian) Temperature Substrate composition Redd Area Water depth and velocity Streamflow
Incubation	Surface stream-Intergravel relation Dissolved Oxygen Temperature Biochemical Oxygen Demand Apparent velocity Substrate materials Streamflow
Juvenile Rearing	Fish food production areas Velocity Depth Substrate Riparian vegetation Water Quality: Temperature, dissolved oxygen, suspended and deposited sediment Cover Streamflow Space

1/ Specific requirements vary by species.

Source: Reiser, D.W. and T.C. Bjornn. 1979. Habitat Requirements of Anadromous Salmonids. Influence of Forest and Rangeland Management on Anadromous Fish Habitat in Western North America. USDA Forest Service, Gen. Tech. Report PNW-96, Oct. 1979, 54p.

stream with suitable conditions can be utilized. Salmonids need cold, clean water and a gravel stream bottom free from silt which might smother the eggs.

Upon entering freshwater, [salmon (but not steelhead)] stop feeding, and their bodies begin to deteriorate. When the salmonids reach their natal stream, the female deposits her eggs in nests, or redds, in the gravel on the stream bottom; the male fertilized the eggs with his milt, and they are covered with gravel and left to develop.

While buried in the gravel, the eggs are vulnerable to many factors which might limit their survival, including siltation, floods, pollution, dissolved oxygen content of the surface and subsurface water, dewatering, and water temperature fluctuations. The life cycles of [all] Pacific salmon are complete after spawning, and the fish then die. Steelhead usually live to spawn again. The newly hatched salmonid fry, called alevins, live off their yolk sacs for their first few weeks of life. They then emerge from their redds and begin to search for food, often moving downstream in pursuit of richer feeding grounds (Figure I-2). In the spring, various species and stocks within species will start their ocean migration at different life stages. Before they enter the ocean, they must first undergo a physiological change called smoltification (see Glossary) which preadapts them to living in salt water. Their appearance and behavior change; they become silvery and swim with the current rather than against it. Timing of the upstream migration, spawning, and downstream migration varies between and within species and according to the geographic location of the home stream (Figure I-3).

Salmonids often travel in large unidirectional, circular patterns during their period in the ocean. Although there are many hypotheses, it is not known what migratory cues the fish use to find their way. Different species and stocks within species do have well-defined migratory patterns, and their timing of return to the natal stream is remarkably distinct, even though the individuals from each stock disperse upon entering the ocean...

Chinook Salmon

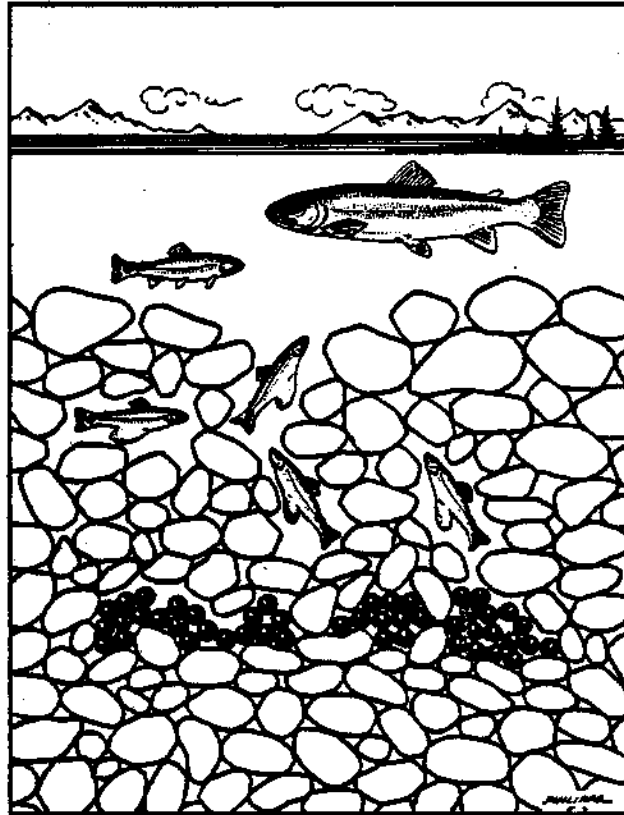
Oncorhynchus tshawytscha is called the king salmon in California, but other common names include chinook, spring, tyee, blackmouth, jack, and quinnat salmon...

This species avoids the smaller coastal streams, preferring to spawn in larger tributaries. Adult fish always die after spawning. Eggs hatch in 50-60 days at California temperatures. Most young chinook salmon migrate to sea after 2-4 months, where they usually spend [2-3] years, though they may spend 1-5 years, before returning to their natal stream to spawn. The average weight of the mature chinook salmon is 20 pounds, although some grow to more than 50 pounds...

The timing of upstream migration, spawning, and downstream migration is extremely variable (see Figure I-3).

The major run in California is the fall run, which enters freshwater in the autumn months and immediately travels upstream to spawn. The juveniles spend only 2 to 4 months in freshwater before migrating to the ocean in the late winter and spring... [Historically, the Eel River reportedly supported a spring run of chinook salmon.]

Figure I-2. Steelhead eggs and fry.



Steelhead eggs are buried in the gravel of a stream bed, several inches beneath the surface. The fry (alevins) remain in the spaces between the gravel until the yolk sac is absorbed. At that time they work their way up to the surface and escape.

Source: California Department of Fish and Game, "Trout of California:", by J.H. Wales. 1957.

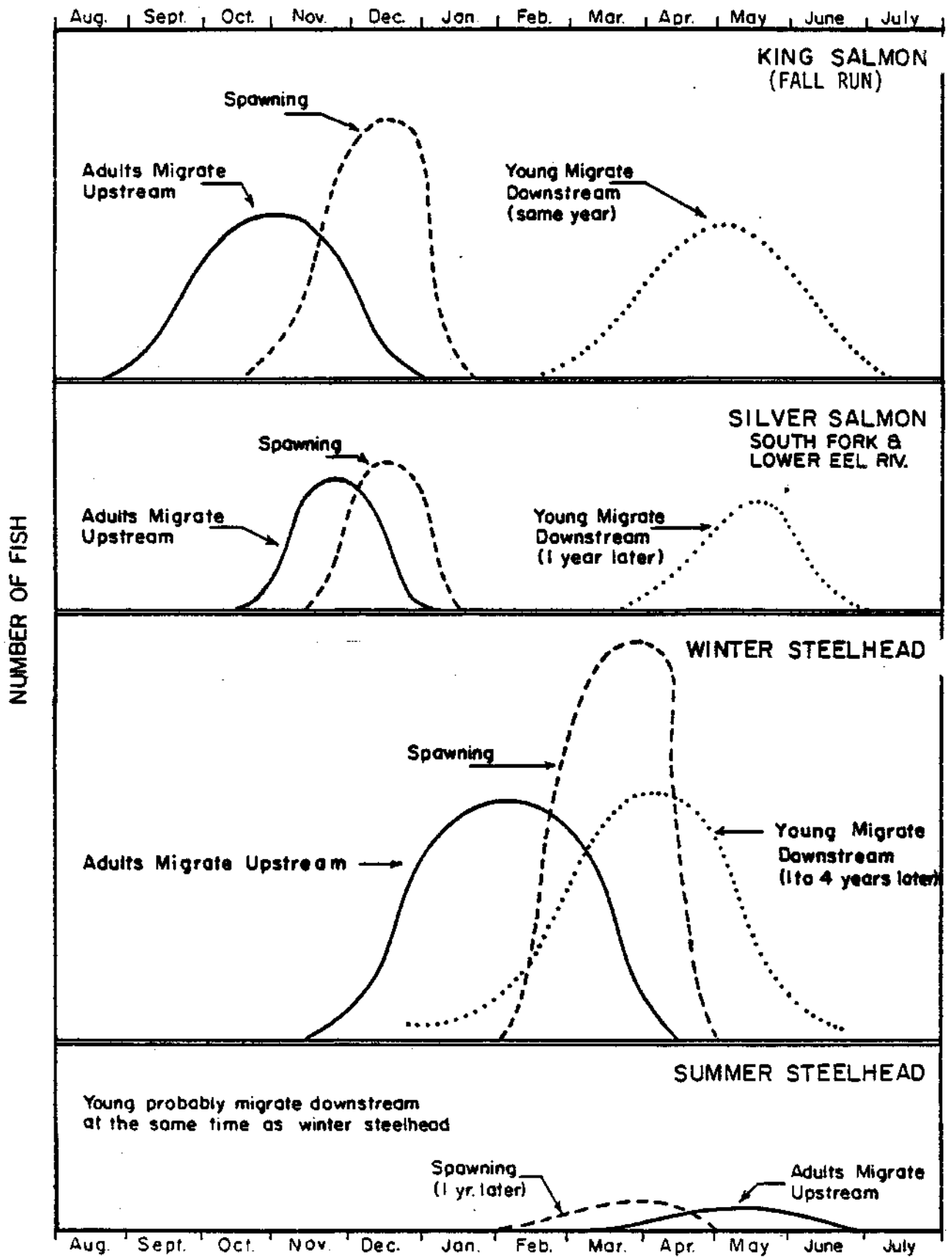


Figure I-3. Time of migration and spawning for Eel River salmon and steelhead.

SOURCE: A Preliminary Analysis of the Potential for Enhancing Salmon and Steelhead Fisheries In the Eel River. Memorandum Report California Dept. of Fish and Game. 1974. 70 pp.

Coho Salmon

Oncorhynchus kisutch is called either silver or coho salmon. They are common in the northern coastal streams of California...

Coho spawning habits are similar to those of the chinook although they do prefer smaller tributary streams and start their migration run in the fall. Young coho stay at least one year in freshwater before migrating to the ocean, so they need streams which remain cool during the summer months. [After a stay in the ocean of two years or so,] mature coho typically weigh 8-10 pounds...

Steelhead Trout

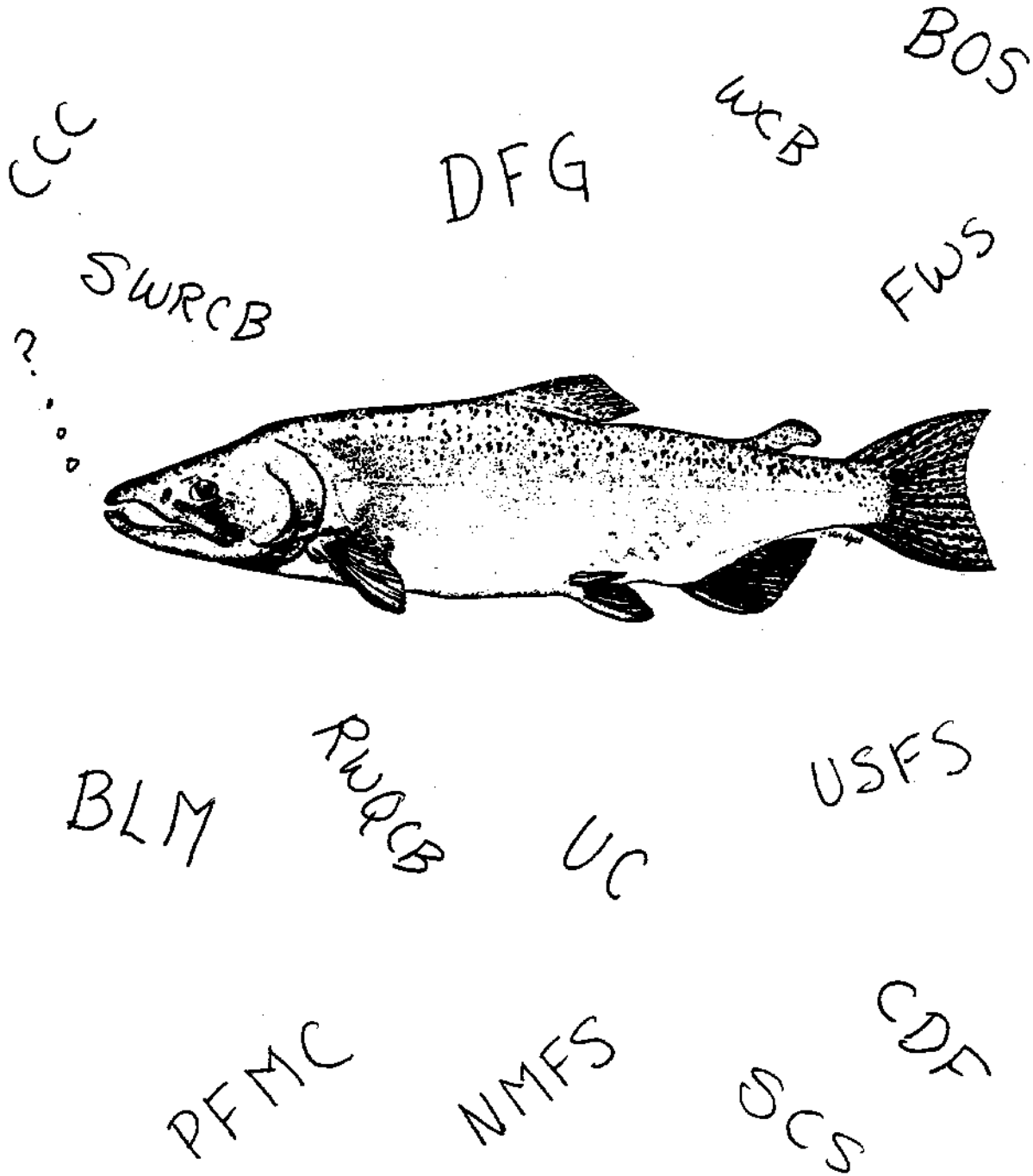
Salmo gairdneri gairdneri are usually called 'steelhead.' They are found in most northern coastal streams in California...

Steelhead are 'optionally anadromous' in that some adults mature without ever going to sea... Steelhead do not always die after spawning. Although they may spawn more than once, most steelhead runs include only 10-20% repeat spawners (Behnke, 1979).

Most of the steelhead in California are of a single type which, under natural conditions, spawns in the spring following its upstream migrations. These fish are referred to as fall run or winter run, depending on when they enter the stream on their spawning run. The spring run (or 'summer') steelhead has a different migration pattern. They enter the stream during the spring or summer, wait a full season, then spawn the following spring. During the summer dry months, they move far upstream and linger in the cooler deeper waters. Because so much habitat has been lost, 'summer' steelhead are not abundant.

The young steelhead spends 1-3 years in freshwater before smolting and migrating to the ocean. After 1-3 years in the ocean, they return to spawn in their natal stream, typically at 3-5 years of age. Most steelhead weigh less than 10 pounds at maturity, although larger fish have been taken. They are widespread in California and are the most important anadromous game fish in California (Fry, 1973).

Chapter II. FISHERIES MANAGEMENT COORDINATION



II. FISHERIES MANAGEMENT COORDINATION

A major purpose of this management plan is to improve coordination among the various agencies and groups involved in salmon and steelhead management in Mendocino County. No one entity has exclusive authority over all aspects of fisheries management and, whenever more than one is involved, there needs to be coordination. Otherwise, their actions may be working at cross-purposes despite a common goal.

To coordinate means "to bring into a common action, movement, or condition" or to "harmonize". Everyone involved with local salmon or steelhead management seems to have an implied goal of increasing the numbers of salmon and steelhead. However, until the means of reaching this goal are clearly defined, it is quite difficult to "harmonize" everyone's actions. The end result can be ineffective management and also a needless waste of money and effort.

The first step in coordination is to identify who does what. A common perception is that there is a multitude of governmental agencies out there duplicating each other's efforts. It is often unclear what each agency does, or who one should go to for a particular fisheries issue. To help answer these questions, a brief description of the roles of each of the local, state, and federal agencies involved with fisheries management (directly or indirectly) in Mendocino County is provided later in this chapter. Where to contact them is identified in Appendix A.

To further clarify each of their roles, Table II-1 provides another way to view them. The level of responsibility or involvement of each agency is identified for the major management activities. Those which have an "X" in their column are legally responsible or actively involved in that activity. For instance, the County, RCD, DFG, and CDF are all involved in habitat improvement work on non-federal land. In another example, six agencies have responsibility for water quality protection. These overlapping activities or authorities point out the need to coordinate agency efforts. Other activities may lack any responsible agency, such as the protection of riparian vegetation on private land outside of the coastal zone and the jurisdiction of the Forest Practices Act.

Non-governmental groups are also involved, with local restoration groups active in habitat improvement and fish population improvement. Their projects are listed in Table IV-1 and each group is described in Appendix B. In addition, sport fishing groups, such as CalTrout and Salmon Unlimited, and commercial fishermen, represented locally by the Salmon Trollers Marketing Association of Fort Bragg, play active supporting roles in most of these management categories.

Another coordination step is to identify each agency's policies regarding fisheries management, or how they plan to manage. These major policies are listed in later chapters under each subject heading (e.g., Habitat Protection, Fish Population Improvement) for the local, state, and federal levels. In this way, comparisons of the various policies can be made more easily since there may be conflicting policies between agencies (or even within an agency), or there may be gaps where no policies exist. Another advantage of organizing these policies by category is to facilitate reference by those seeking the positions of others on a particular fisheries issue.

Formal methods of coordination are sometimes made between agencies or between agencies and groups. These methods include:

<u>TYPE</u>	<u>EXAMPLE</u>
* Joint Power Agreements	County-DFG; ERRC
* Cooperative Agreements	DFG-groups; RCD-landowner
* Sikes Act Cooperative Agreements	DFG-USFS; DFG-BLM
* State Legislative Requirement	California Environmental Quality Act Forest Practices Act
* Federal Legislative Requirement	National Environmental Policy Act Fish & Wildlife Coordination Act
* Memorandum of Understanding	CDF-RCD
* Joint Management Plans	Summer Steelhead Management Plan (DFG-USFS)

Informal coordination is also important and can be achieved primarily through improving communication. Periodic meetings on fisheries issues can be held between the groups and agencies involved in the county. Workshops and conferences, like the Salmon and Steelhead Restoration Conference held at Bodega Bay in January 1983, also provide forums for progress reports, new research findings, and personal discussions.

LOCAL AGENCIES

Local involvement in fisheries management began in 1897 when the City of Ukiah began operation of the Ukiah Hatchery on Gibson Creek. Construction and operating funds came from the San Francisco and North Pacific Railroad Company, which wanted to stock the streams along its line. Although fish culture and stocking is still a local activity, county and city governments now have many other responsibilities associated with fisheries.

MENDOCINO COUNTY: The Board of Supervisors is the governing body of the County. Its five elected members enact legislation governing the county; determine policies for county departments, commissions and special districts; hear appeals from decisions of the Planning Commission; and adopt an annual budget. Policies related to fisheries are primarily located in the county General Plan, which was adopted by the Board in 1981. Its long-term fisheries goal is to restore and maintain in perpetuity the salmon and steelhead populations "to at least their former historic levels".

Fish and Game Advisory Committee. Created by the Board in 1947, the Committee's role is to advise the Supervisors on the use of the County Fish and Game Preservation Fund. This fund is derived from the fines charged violators of the California Fish and Game Code, half of which return to the county where the violation occurred. The funds must be expended for "the propagation and conservation of fish and wildlife", and may include educational and youth activities relating to fish and game. The Committee's seven members also advise the Board on policy matters related to fish and game. The Committee operates the Talmage rearing ponds.

Planning Commission. The Commission's seven members are appointed by the Board to oversee both the short-range and long-range land use planning of the county. Hearings are regularly held to decide upon such land use activities as subdivisions, zoning designation, gravel extraction, commercial and industrial projects, and amendments to the General Plan. Its decisions can be appealed to the Board.

Planning and Building Services Department. Serving as staff to the Planning Commission, the Department is the permit-issuing agency which regulates planning and building activities. Like the Board and Commission, it is obligated to carry out the policies of the General Plan and its enabling ordinances. The Zoning Ordinance determines which uses are allowable in each zone. Special requirements can be added to the permits to ensure conformity to General Plan policies and to provide other needed environmental protections. The Surface Mining Ordinance regulates gravel extraction in spawning streams. In addition, the Grading Ordinance sets standards for mitigating soil erosion related to certain types of projects.

Mendocino County Resource Conservation District (RCD).

The RCD, a legal subdivision of the State of California, encompasses almost the entire county. It is authorized to carry out a resource conservation program which will "help landowners, groups, state, county, city and public district officials conserve soil and water, control water runoff, prevent soil erosion, and stabilize soil on open land, agricultural, urban and recreational

development, wildlife areas and watersheds". With the technical assistance of the USDA Soil Conservation Service (SCS), the District provides conservation plans for landowners which describe the property's soil and water problems and measures which can correct these problems. A recent project of the District is the Tomki Watershed Conservation Program, which is attempting to address erosion and sedimentation on the level of an entire watershed. Although fisheries is not a specific mandate of the agency, its work has the benefit of improving fish habitat.

Inter-County Commissions.

These can be created through a Joint Exercise of Powers Agreement.

Eel-Russian River Commission (ERRC). Created in 1978, the ERRC is composed of supervisorial representatives of four counties lying within the Eel and Russian watersheds: Mendocino, Sonoma, Lake and Humboldt. Its original purpose was to be a forum for natural resource issues of mutual concern, such as the optimum streamflow in the two rivers resulting from the Potter Valley Project Agreement. The status of salmon and steelhead habitat and populations in the two basins and measures which could restore them are concerns of the Commission.

Cities of Fort Bragg, Point Arena, Ukiah, and Willits.

The four incorporated cities of the county have similar responsibilities as the County, except that the City Council is the policy-making body. Policies related to fisheries would be found in their respective general plans. None of the cities is now actively involved in fisheries management, although each has salmon or steelhead streams located within its jurisdiction.

Covelo Indian Community.

Covelo Indian Community. The Covelo Indian Community is a federally recognized Indian tribe comprised of descendants of six aboriginal Indian groups which inhabited the northwestern areas of California, including present-day Mendocino County. The Community resides within, and exercises regulatory authority over tribal members within, the Round Valley Indian Reservation. The governing body of the Community is the seven-member Covelo Indian Community Council. The federal government reserved to the Community certain federally-protected fishing rights in the streams within the boundary of the Reservation. Within the Reservation, the Community has some regulatory authority over several significant salmon and steelhead streams. Development and implementation of fish restoration and enhancement projects in streams within and adjacent to the reservation, and development of a comprehensive on-Reservation fisheries enforcement program, are major planning objectives of the Community.

STATE AGENCIES

In 1870, California's Legislature created the Board of Fish Commissioners, the first wildlife conservation agency in the nation. The new law, entitled "An Act to provide for the restoration and preservation of fish in the waters of this State", provided for the establishment of "fish breederies" the stocking of streams, the construction of fish ladders, and the conservation of fish. In the succeeding 113 years, the state's role in fisheries management has significantly broadened in scope and now involves a number of other agencies too.

The Resources Agency: The Resources Agency is charged with administering policies, laws, and regulations regarding the state's resources. It consists of several departments, boards and commissions with at least some type of involvement with salmon and steelhead habitat or populations.

Department of Fish and Game (DFG). The Department is charged with protecting, managing and enhancing fish and wildlife resources. Functions include protection and propagation of fish, review of environmental impact reports, enforcement of fishing regulations, education and research. Principle sources of funding are revenues from fishing and hunting licenses, a special tax on commercial fishing, and federal aid. The DFG also has state responsibility for protecting rare and endangered species, recommending adequate stream-flows to preserve fish and wildlife for water permits, enforcing certain water pollution prohibitions, regulating streambed alterations, protecting fish spawning areas, and operating state fish hatcheries, among others. Federal projects and private projects needing federal permits are also reviewed by Fish and Game, as a requirement of the Fish and Wildlife Coordination Act.

Fish and Game Commission. The successor to the Board of Fish Commissioners, this present Commission adopts the policies which govern the operation of the DFG. Other responsibilities include: a) setting terms and conditions for issuance of permits and licenses; b) determining seasons, methods, and areas for sport fishing; and c) regulating commercial fishing.

Wildlife Conservation Board (WCB). The Board's activities are limited to acquiring land and developing facilities for fish and wildlife purposes. Projects include access routes to fishing areas; fish hatcheries, egg-taking stations, and ladders; marsh restoration; and stream clearance. Funds come from state horseracing revenues, federal sources, and state bond acts.

State Water Resources Control Board (SWRCB). The Board's responsibility is for the State's water quality and water rights programs. Its water quality authority is derived from the Porter-Cologne Water Quality Control Act as well as the Federal Water Pollution Control Act, since the Environmental Protection Agency has designated the SWRCB to carry out its policy. After the State Board adopts policies and programs, the North Coast Regional Water Quality Control Board (RWQCB) implements them through developing regional plans and issuing and enforcing waste discharge permits. The SWRCB issues the water rights permits to appropriate water from streams and lakes, and it must consider the preservation and enhancement of fish and wildlife in acting upon these permit applications.

Department of Forestry (CDF). Under policies set by the Board of Forestry, the Department oversees the protection and conservation of the State's forestlands. CDF's duties involve the regulation of logging operations on non-federal lands (the Z'Berg-Nejedley Forest Practice Act of 1973), management of Jackson State Forest in Mendocino County (plus six other state forests), operation of state forest nurseries for reforestation and erosion control, technical assistance to landowners on forest, brush and watershed management, and conducting studies on reforestation, range improvement, watershed and other Wildland management. Fishery values and habitat must be considered in its forest management activities.

Department of Water Resources (DWR). The Department is primarily the water supply agency of the State. It develops the California Water Plan; oversees the State Water Project; promotes water conservation, reclamation, and recycling; performs studies; develops flood control measures; and regulates dam safety. In the North Coast, its geologists are conducting watershed erosion investigations of major river basins. The California Water Commission is advisory to the Director of DWR and approves loans and grants for local projects.

California Coastal Commission. As the result of the California Coastal Act, the Commission establishes policies governing land use activities in the coastal zone (averaging 1000 feet inland, plus significant estuaries). They are implemented locally following the adoption of a Local Coastal Plan (LCP). A local coastal program must provide protection of the marine environment and land resources.

Coastal Conservancy. The Conservancy is primarily an agency which funds selected projects approved by the Commission and in compliance with certified local coastal programs. Regarding fisheries, its authority includes providing funds to state and local agencies and non-profit groups to correct the degradation of natural areas; providing funds to state agencies for the establishment of buffer zones around fragile park and natural areas; and making loans to the Department of Parks and Recreation for the acquisition of key park areas.

California Conservation Corps (CCC). The Corps provides public service assistance in the areas of resource management and conservation while its young members (age 18-23) get on-the-job training. These public service projects may be requested by local, state or federal agencies or by environmentally oriented private organizations and are subject to review and approval by the Secretary of Resources. Its fisheries-related projects involve log jam removal and assisting community rearing pond programs.

University of California (UC). In addition to its education role, the University is the primary state-supported agency for research. It also provides certain public service programs.

Cooperative Extension, Sea Grant Marine Advisory Program. As an outreach of the National and California Sea Grant Programs, the Marine Advisory Program serves coastal resource users through education and technical assistance. Its marine advisors operate out of local farm advisor offices and directly communicate with fishermen, fish

processors, and fish propagators, among others. Their methods include producing publications, holding conferences and seminars, informing the media, and attending local fisheries meetings. Sea Grant also funds fisheries research related to salmon and steelhead. In addition, U.C. Cooperative Extension has an Aquaculture Program based in Davis and Bodega Bay which can provide fish enhancement groups with disease and pathology information.

Attorney General (AG). When other existing state authorities do not provide adequate environmental protection, the Attorney General has independent authority to take legal action to stop or prevent degradation.

FEDERAL AGENCIES

The federal role in fisheries management began in 1871 when Congress created the Office of the Commission of Fish and Fisheries to investigate declining numbers of food fishes in U.S. lakes and coastal waters. A year later the first federal hatchery was established to restore food fishes. The federal role has since expanded considerably, but is still primarily limited to federal lands, waters and projects. (U.S. CEQ, 1977).

Department of the Interior:

Fish and Wildlife Service (FWS). The Service is responsible for protecting, conserving, and enhancing the fish and wildlife resources of the United States. As the result of the Fish and Wildlife Coordination Act, federal agencies are required to consult the FWS regarding the impacts of existing or future federal projects and give "full consideration" to the agency's recommendations. When consulted, such as by the Corps of Engineers in the "404" permit process for dredge and fill projects, the Service can recommend that the requested permit be denied. National Wildlife Refuges and federal fish hatcheries are also managed by the Service.

Bureau of Land Management (BLM). The Bureau administers the public domain lands, which amount to about 116,600 acres in Mendocino County. BLM is required to plan for and manage its lands and resources on the basis of multiple use and sustained yield concepts, as described in the Federal Land Policy and Management Act. In addition to producing commodities such as minerals and timber, it is also responsible for protecting and conserving fish, wildlife, and watersheds. Coordination with California Department of Fish and Game on habitat management is done through Sikes Act Cooperative Agreements.

Bureau of Indian Affairs (BIA). Having the trust responsibility for the U.S. to Indian tribes, the BIA is involved with the protection and restoration of Indian lands and the associated natural resources, water rights investigations, and assistance in forest management. Tribal lands include 18,300 acres in Mendocino County, most of which is the Round Valley Indian Reservation.

Department of Agriculture:

Forest Service (USFS). Locally, the Forest Service administers the

Mendocino National Forest, of which 170,000 acres are located within Mendocino County. The agency must comply with the mandates of the Multiple Use-Sustained Yield Act and the National Forest Management Act, among others. The USFS has primary responsibility for management of anadromous fish habitat on its lands, while the California Department of Fish and Game has primary management responsibility for the anadromous fish populations. Coordination between these two agencies for habitat improvement is provided by the Sikes Act Cooperative Agreement and a Memorandum of Understanding.

Soil Conservation Service (SCS). The SCS provides private landowners with technical assistance in soil and water conservation. Working with the Mendocino County Resource Conservation District, the local SCS office develops conservation plans with specific measures to rectify erosion problems or to improve wildlife and fishery habitat.

Department of Commerce: This Department is charged with regulation and administration of interstate commerce in commercial fisheries. Since the passage of the Fishery Conservation and Management Act of 1976, the Secretary of Commerce has responsibility for managing the ocean salmon fisheries between 3 and 200 miles off California's coast.

National Marine Fisheries Service (NMFS). The basic mission of the Service is to protect and promote the wise and full utilization of marine fisheries, (including anadromous), to bring the country's marine fisheries to an improved state of health and productivity, and to benefit consumers and industry in the process. In addition to doing research which can be applied to fisheries management, the agency's scientists review and comment on public and private water and land development projects that may adversely affect anadromous marine and estuarine fish. They also provide technical advice and assistance to permit applicants and regulatory agencies involved in these projects.

Pacific Fishery Management Council (PFMC). This interstate regional council, created by the 1976 Act, makes annual recommendations to the Secretary of Commerce for ocean salmon management off the coast of California, Oregon, and Washington. Its proposal for harvest seasons and quotas, once adopted by the Secretary, have a direct effect on the quantity of chinook and coho salmon harvested by commercial and ocean sport fishermen operating out of Fort Bragg and other local ports. Salmon management plans, adopted in 1978 and 1982, include measures to prevent overfishing and assure an "optimum yield", among others.

Department of the Army:

Army Corps of Engineers (ACE). The Corps has jurisdiction over projects involving the location of a structure in, or the excavation or discharge of dredge or fill material into, "navigable water". Most of the major rivers in Mendocino County qualify, as do the coastal wetlands and some intermittent streams. This permit authority is derived from Section 404 (hence the term "404" permit) of the Federal Water Pollution Control Act. Another local role of the Corps is the management authority over its lands at Lake Mendocino and operation of the Coyote Dam Project, including mitigation for lost anadromous fish habitat.

TABLE II-1 FISHERIES MANAGEMENT RESPONSIBILITIES OF VARIOUS AGENCIES*

MANAGEMENT ACTIVITY	LOCAL		STATE					FEDERAL				
	CO.	R.C.D	DFG	CDF	RWQCB	SWRCB	U.C.	USFS ¹	BLM ¹	FWS ²	NMFS ²	PFMC ³
<u>Habitat Protection</u>												
- Streamflow	/	/	X	/	/	X	/	X	X	X	X	/
- Water Quality	X	/	X	/	X	X	/	/	/	X	X	/
- Land Use	X	/	/	X ⁴	/	/	/	X	X	X	X	0
- Logging	/	/	X	X	X	/	/	X	X	X	X	/
- Riparian Veg.	/ ⁵	/	//X ⁶	0/X ⁶	/	/	/	X	X	X	X	/
<u>Habitat Improvement</u>	X	X	X	X	/	/	/	X	X	X	/	/
<u>Fish. Pop. Prot.</u>	/	0	X	0	/	/	/	/	/	X	X	X
<u>Fish Pop. Improvement</u>	X	0	X	0	0	0	X	/	0	X	X	/
<u>Research</u>	/	X	X	X	/	X	X	X	/	X	X	/
<u>Education</u>	/	X	X	/	/	/	X	/	/	X	X	/
<u>Technical Assistance</u>	/	X	X	X	/	/	X	/	/	X	X	/
<u>Financial Assistance</u>	X	/	X	X	/	X	X	X	X	X	X	/

* Symbols:

"X" - Legally responsible or actively involved with at least some aspect of the activity.

"/" - Concerned about the activity, such as in a commenting or support role, but not legally responsible or otherwise actively involved.

"0" - No official concern, involvement, or responsibility.

TABLE II-1

Footnotes:

1/ Pertains to its own lands only.

2/ Pertains to federal projects only in almost all cases.

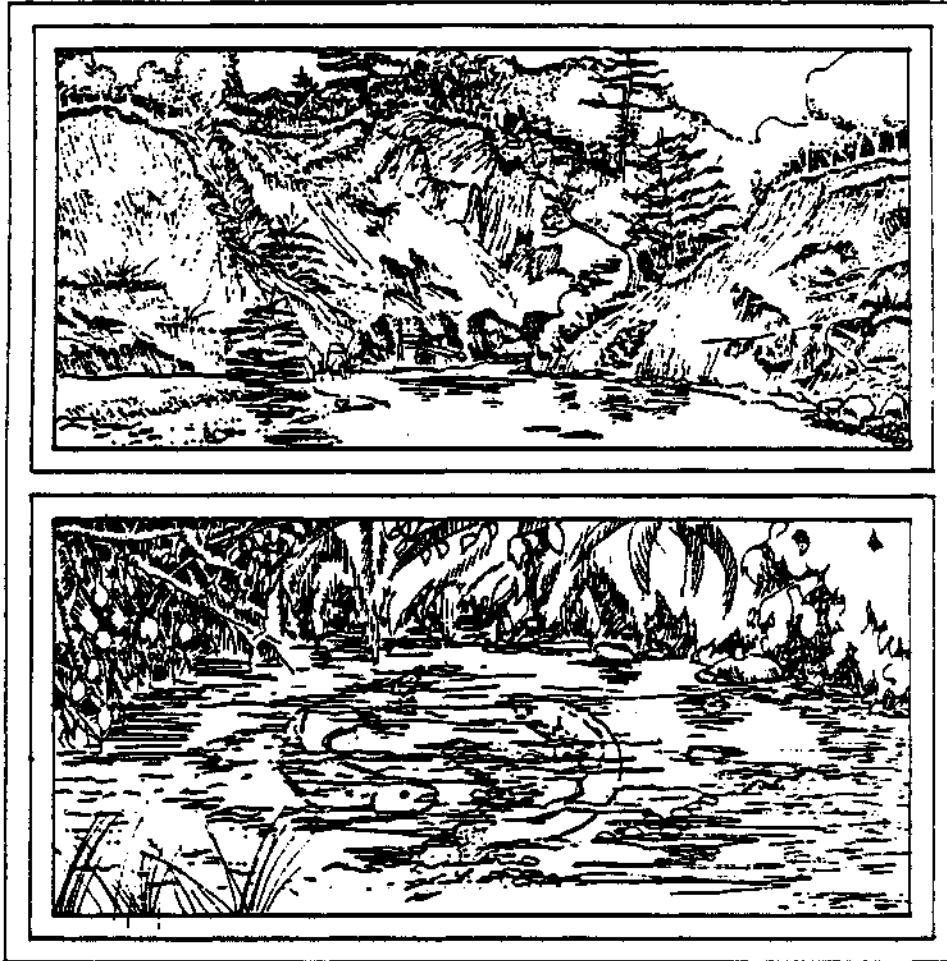
3/ Jurisdiction only includes the off-shore fishery from the 3 mile limit and beyond.

4/ Pertains to State Forest or to regulation of TPZ lands.

5/ No official authority at this time but General Plan directs the Grading Ordinance shall include reasonable measures to "retain and restore riparian vegetation". Also local Coastal Plan Draft includes riparian protection policies.

6/ Legal responsibility limited to vegetation covered by a Timber Harvest Plan.

Chapter III. HABITAT PROTECTION



Sketch by Coastal Headwaters Association

III. HABITAT PROTECTION

The Management Plan Task Force unanimously selected Habitat Protection as the first priority in our management efforts if the County is to succeed in reaching the stated goal.

Findings

Habitat damage must be prevented

The best way to provide salmon and steelhead in Mendocino County's streams is to protect the quantity and quality of the existing habitat. It is certainly the most economical means of fish production since repair of damaged habitat, even if possible, is expensive and time-consuming. The natural, healthy stream habitat was successful in evolving and producing the plentiful population of salmon and steelhead this region was once renowned for. If we are to regain this reputation, the County must not tolerate the loss of any more of its salmonid stream habitat.

Much habitat already impaired

Substantial loss in habitat quality and quantity has occurred to date. With both natural and man-made causes to blame, old-timers in the area can vouch that the creeks and rivers are not what they used to be.

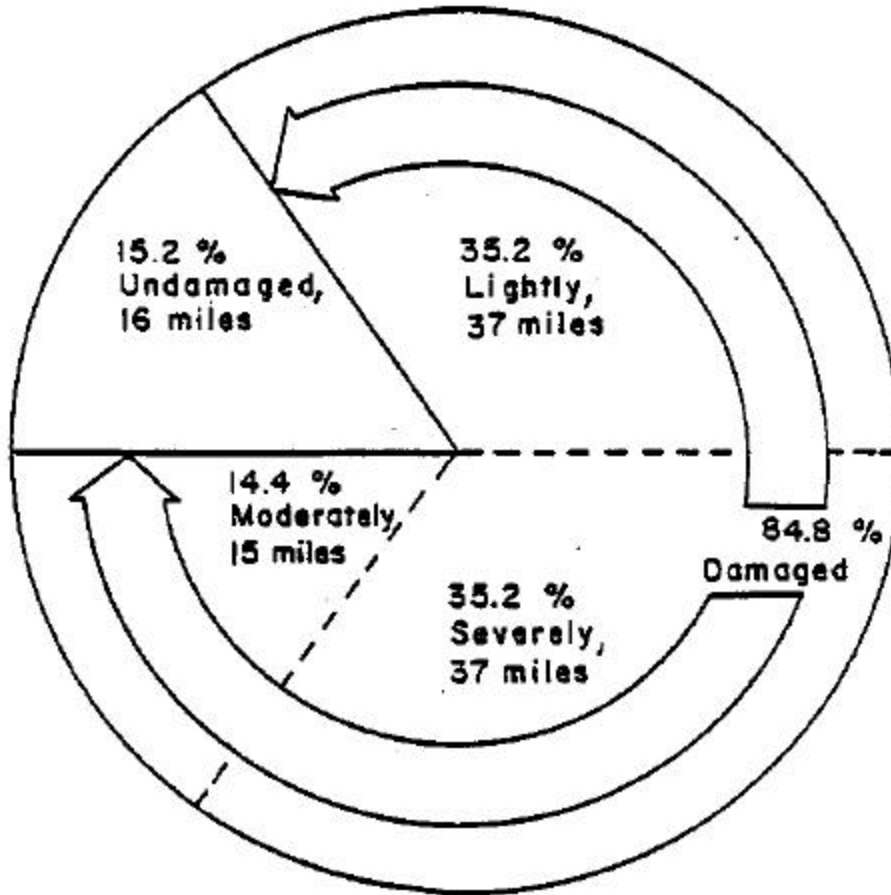
Streams throughout the county have been adversely impacted by poor land management actions (DFG, 1966). In a study of the Garcia River in 1966, results indicated 84.8% of the fishery habitat was damaged, 35.2% severely as shown in Figure III-1. Field biologists estimated that causes included improper road building, logging, and grazing practices. The 1964 flood obviously increased the extent of the damages.

Careless logging operations following World War II were notorious for degrading local streams. As documented in a report by the Department of Fish and Game in 1962 (Calhoun & Seeley), 11 streams in Mendocino County had been damaged that year by destructive logging practices. These actions included using streambeds as roadways, operation of heavy equipment in streams, tractor logging on steep slopes, and removal of streamside vegetation. Soil eroded off the cutover hillsides and deposited in streams, smothering eggs, fish and fish food. Log jams were formed, blocking fish passage to spawning areas. (It should be noted that the Z'Berg-Nejedley Forest Practice Act of 1973 prohibits such damaging logging practices today). The effect on fish populations was observed in a later study of the Little North Fork Noyo River, where salmon and steelhead populations decreased as watershed and stream disturbances progressed (Burns, 1972). Coho salmon biomass decreased 65% after logging in the watershed.

"Dam construction has caused irreversible habitat loss. Coyote Dam, constructed in 1959 to create Lake Mendocino, permanently blocked 62 miles of steelhead spawning and rearing habitat in the upper Russian River. No mitigation for the estimated 2200 to 7300 adult steelhead lost from this run has yet been provided by the Corps of Engineers. Lake Pillsbury, formed by Scott Dam in 1921, inundated and blocked 35.7 miles of habitat in the upper Eel watershed (VTN Oregon, 1982).

FIGURE III-1. Damaged Fishery Habitat in the Garcia River, 1966

GARCIA RIVER - MENDOCINO CO. - 105 TOTAL MILES



Status of Fishery Habitat in Garcia River (1966):

Historic damage caused by roadbuilding, logging, overgrazing and poor land management practices, aggravated by the 1964 flood.

Source: Citizens Advisory Committee on Salmon and Steelhead Trout, An Environmental Tragedy, 1971.

Although located in Lake County, this headwater area contributed an estimated 1250 chinook and 1500 steelhead to the Eel River fishery. This loss has also not been mitigated, in this case by PG&E.

Flood damaged habitat slow to recover

Massive habitat alteration resulted from the major floods of 1955 and 1964, which caused large landslides, streambank erosion, debris dams, loss of streamside vegetation, gravel accumulation, and heavy sedimentation. Almost all of the county's streams suffered from one or both of these floods. Twenty years later the impact is still quite visible in many watersheds.

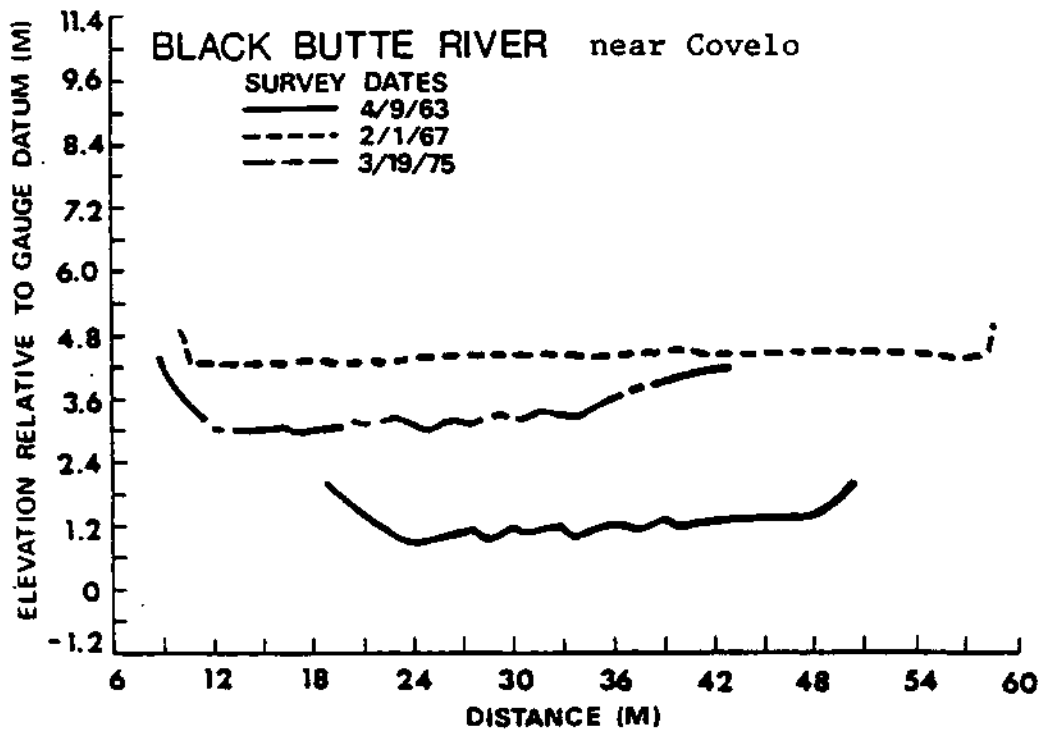
Recovery has been slow, as evidenced by stream channel studies (Lisle, 1982). Figure III-2 shows the changes in streambed elevation and channel width from before the 1964 flood to later years for two local rivers. Material was still depositing in the Noyo River streambed 5 years after the flood. Although the Noyo returned to its pre-flood level by 1975, the channel was still over 20 feet (7m) wider. The difference in Black Butte River's channel width is even more dramatic. Full recovery would require narrowing of channels, establishment of riparian vegetation, and obvious pool-riffle sequences to once again be prime habitat for salmon and steelhead.

Reduced streamflows hinder fish survival

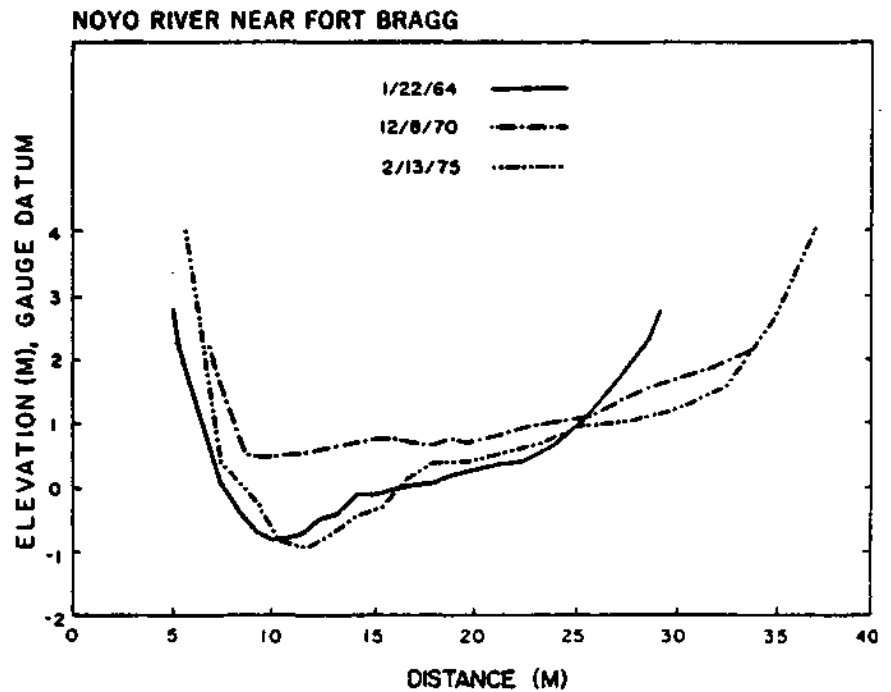
A particular problem currently is the reduction of streamflow to levels below the minimum necessary for fish survival or migration. Lethally high summer temperatures are one result of too little flow. Flow diversion is usually for the water supply needs of residential, industrial or agricultural users. Current law, however, makes no provision for guaranteeing the water needs of fish and other aquatic life.

Fishery impacts were the focus of a recent controversy over the continuing diversion of an average of 184,000 acre feet of Eel River water each year to the Russian River, via P.G.&E.'s Potter Valley Project. The controversy arose during the Federal Energy Regulatory Commission's Relicensing process for the project, for which a new 50 year license was issued in October 1983. P.G.&E. and the intervening parties agreed to a study designed to provide the necessary data for determining adequate flow releases for salmon and steelhead in the upper Eel River drainage. V.T.N. (Oregon), Inc. conducted the required three-year fisheries study under the direction of P.G.&E. and in cooperation with the California Department of Fish and Game and other agencies (VTN, 1982). Following the study, a compromise (i.e. Settlement Agreement) was reached that increases flow releases in the Eel River at critical stages of salmon and steelhead life cycles. Monitoring will determine whether the new flow and other required mitigation measures are adequate to restore the Upper Eel's anadromous fish populations. The following parties were interveners in the relicensing process: Cal. Fish & Game, Humboldt County, Mendocino County/Mendocino County Russian River Flood Control and Water Conservation Improvement District, Sonoma County/Sonoma County Water Agency, Lake County, California Trout, Salmon Trollers Marketing Association of Fort Bragg, and Pacific Coast Federation of Fishermen's Association. CalTrout, along with the Covelo Indian Community, has contested the Settlement Agreement. Also involved in the process were U.S. Fish and Wildlife Service and the California Department of Water Resources."

Figure III-2.
Changes in streambed elevation and width in two local rivers



Soundings of the U.S. Geological Survey in the Noyo River gaging section before, during, and after an aggradation episode. Aggradation peaked in 1970. The channel then progressively degraded to the approximate pre-flood level by 1975, when it maintained its maximum width attained at the peak of aggradation.



Source: Lisle, T.E., 1982.

Concern is also expressed by fishery biologists about the impacts of the many small hydropower projects being proposed at sites not previously dammed. Their operation has the potential of dewatering portions of spawning or rearing streams, blocking migration corridors, diverting fish through the facility, and adversely affecting water quality (Smith, 1982).

Riparian Vegetation critical to stream habitat quality

Streamside trees and shrubs play a valuable role in the habitat needs of salmon and steelhead. By providing shade over the stream, riparian vegetation helps cool the water temperature and can make the difference in survival for these cold water fish, particularly during the juvenile rearing stage. Certain activities, such as channelization or removal of shade trees, can increase the temperature in sections of streams (Reiser & Bjornn, 1979). Insects dependent on riparian plants also are an important source of food for juvenile salmonids.

The value of maintaining adequate streamside vegetation is being recognized today in many ways. Present rules (effective 10/1/83) under the Z'berg-Nejedly Forest Practice Act require specific protective measures during logging operations to ensure retention of the shade canopy along valuable watercourses. Another method, the non-regulatory approach, is also being applied in Oregon, through its Riparian Land Tax Incentive Program. Private landowners there are offered property tax exemptions or personal income tax credits for acceptable streamside management activities. (Warner & Hendrix, 1983).

Numerous development activities can potentially degrade habitat. The following activities, if improperly conducted, can degrade stream habitat:

- | | |
|-------------------------|---------------------------------|
| * Timber harvesting | * Water diversion |
| * Timberland conversion | * Groundwater extraction |
| * Dredging & filling | * Channelization |
| * Grading & excavating | * Grazing |
| * Gravel extraction | * Road construction |
| * Streambed alteration | * Road maintenance |
| * Bank alteration | * Dam construction |
| * Vegetation removal | * Hydropower development |
| * Stream crossing | * Subdivision |
| * Riprapping | * Refuse, landfill or dumpsites |

Many of these activities are now regulated to prevent habitat damage.

Existing protective measures must be implemented

More local, state, and federal policies and regulations are presently in effect for the protection of fish habitat than for any of the other fish management activities. Habitat protection has clearly received the most legislative attention because of its crucial importance to continued fish productivity. Significant improvement was also made in recent years in response to the deteriorated condition of spawning streams. Instream gravel extraction, in most cases, presently requires a reclamation plan under the California Surface Mining and Reclamation Act. California's forest practice rules now are a model for the country, and specifically provide criteria for stream protection. For most

activities affecting stream habitat, at least some regulation is in effect at the local, state or federal level.

The key issue now remaining is to ensure that the protective policies are carried out by those responsible. Effective enforcement must also go hand in hand with education about how to prevent the habitat problems in the first place.

Local government involvement essential

The county and cities can play a most valuable role in salmon and steelhead habitat protection. The county already has many useful policies in its General Plan and will soon have some in the Local Coastal Plan. As the primary administrators of land use, the county and cities can influence where various land use activities will occur and what criteria will be used to protect stream habitat. Some gaps still remain in local policy, such as for small hydropower projects.

HABITAT PROTECTION

Objective: Protect the remaining quantity and existing quality of salmon and steelhead habitat in each watershed.

Recommended New Policies

1. Encourage broad cooperation with the Department of Fish and Game to inventory streams with spawning and rearing habitat, and to evaluate their existing and potential value. Current and potential fish population levels should also be determined.
2. Hydropower projects shall be located, designed, and operated to fully protect salmon and steelhead habitat.
3. Require reasonable and appropriate mitigation measures whenever county approval is required for projects which may degrade or destroy stream habitat. Where existing law requires mitigation, this policy will not require additional mitigation.
4. Request adequate mitigating measures to maintain anadromous fish populations at existing and future stream obstructions and diversions.
5. Encourage development activities that will improve or maintain salmon and steelhead habitat.
6. To provide incentives for voluntary landowner cooperation, investigate developing a County Riparian Land Tax Incentive Program to protect the valuable riparian canopy over streams.
7. Where riparian vegetation protections do not exist, support the expansion of the Department of Fish and Game's regulatory authority (Section 1600 - 1606) to include the protection of existing beneficial streamside vegetation within the criteria specified in the Forest Practice Act (adopted 10-1-83).

EXISTING POLICIES

LOCAL

"General Plan"

Fisheries

- a. Protect, maintain, restore and enhance salmon and steelhead spawning and nursery habitat.
- b. Identify streams with spawning and nursery habitat and determine their current and potential fish population levels.
- d. Allow only compatible development along those important stream sections identified in #b above.

f. Modify the grading and surface mining ordinances to incorporate the necessary measures to protect and enhance fish habitat, including riparian vegetation protection and restoration, and erosion and sediment control measures.

j. Encourage all public land management agencies to preserve, maintain, and enhance the fish habitat within their jurisdiction.

n. Support instream flows adequate to maintain and protect historic fishery values within all county streams.

*p. The local fisheries are a long-term value to the County economically and as such, must take priority over the short-term benefits of oil extraction.

q. Endorse and support implementation of the Summer Steelhead Management Plan prepared by the California Department of Fish and Game and the Mendocino National Forest for the Middle Fork Eel River.

Water Resources

2a. Improved soil conservation and erosion control practices by private landowners and managers shall be actively supported by the County through:

- i. Technical assistance available from the Mendocino County Resource Conservation District, the U.S. Soil Conservation Service, the U.C. Cooperative Extension Service, the Corps of Engineers, and the Russian River Flood Control District.
- ii. Financial assistance available from state and federal agencies (e.g., CA Department of Forestry, U.S. Agricultural Stabilization and Conservation Service). The County shall actively seek necessary funding.

2b. An effective grading ordinance which is complimentary with Chapter 70 of the Uniform Building Code shall be adopted and implemented within the next 12 months. Technical guidance shall be requested from agencies with appropriate expertise.

2c. Any aerial application of phenoxy herbicides, or any matter containing the chemical Dioxin, is prohibited.

2d. Support regular monitoring of pesticides and permitted agricultural chemicals.

5b. Provide incentives for water conservation practices by all water users by supporting:

- i. Technical and financial assistance for irrigation management, from such agencies as the Mendocino County Resource Conservation District/Soil Conservation Service, Agricultural Stabilization and Conservation Service, and U.C. Cooperative Extension.
- ii. Additional research and education on water conservation methods.
- iii. Appropriate water charges to users by water purveyors.

- iv. Water conservation in the sizing of water supply and Wastewater treatment facilities.
 - v. Use of water conservation fixtures and drought-resistant landscaping.
- 5c. Encourage the State to revise water rights law to:
- i. Facilitate coordinated management and use of surface and groundwater resources.
 - ii. Reserve adequate stream flows for protection of fish and wildlife habitat and other instream uses.
- 5g. Cooperate in conducting studies of the effects of flow changes in the Eel River as the result of the recent Potter Valley Project Agreement.
- 5h. No new water diversion shall be allowed that directly or indirectly exports water from within the County to areas outside the County.
- 5j. Water development plans shall include mitigation and enhancement features for fish and wildlife.
- 7a. The County shall adopt within 12 months an ordinance governing the use of the Eel River and guaranteeing protection of its wild and scenic qualities.
- 7b. The County shall actively seek state legislation protecting the Eel River and its major forks.
- 7c. The County shall use any and all means necessary to prevent the flooding of Round Valley.

Forestry

- 3c. Encourage forest management practices on public and private lands which will avoid or minimize resource and land use conflicts.
- 3e. Encourage enforcement of the State Forest Practice Act and attendant regulations. These regulations should be periodically reviewed to insure consistency with County goals and policies.

Mineral Resources

- 2b. Watershed gravel management plans shall be developed to determine sustained yield formulas in cooperation with appropriate agencies, for streams subject to gravel extraction in amounts sufficient to endanger other riparian values, such as wildlife and fish habitat, recreation and aesthetic potential and water supply.

Vegetation and Wildlife

- a. Mendocino County Grading Ordinance shall be adopted and implemented within 12 months which will include reasonable measures to:
- i. Retain and restore riparian vegetation.

ii. Protect and retain natural vegetation in or near construction and road-building sites.

e. Continue to identify and map areas of critical wildlife habitat, particularly riparian vegetation.

"Local Coastal Plan"

- to be completed -

HABITAT

PROTECTION STATE

"Fish and Game Code"

Spawning Area Protection

1505. In addition to any other powers vested in the (DFG), it may manage, control and protect such portions of the following spawning areas which occupy state-owned lands to the extent necessary to protect fishlife in these areas. In the event of any conflict under this section with the action of another department or agency of the state or any other public agency, the action of the Department of Fish and Game taken pursuant to this section shall prevail except for: (a) action of the state or regional water quality control boards in establishing waste discharge requirements, (b) action as required for commerce and navigation, (c) action by public agencies reasonably necessary for bridge crossings, water conservation or utilization, or flood protection projects, including the construction, maintenance, and operation thereof. The exceptions in subdivision (c) shall not extend to the depositing of materials, other than necessary structural materials, in or the removing of materials from the streambeds in the areas designated in this section, other than as necessary for the installation of structures. These areas are (within or near Mendocino County):

The Eel River, from Fort Seward to Lake Pillsbury.

The South Fork Eel River.

The Middle Fork Eel River.

The Mattole River.

The Noyo River.

The Big River.

The Gualala River.

The Garcia River.

Until ownership of any land in these areas has been legally determined, the director shall disapprove any stream alterations of any prime salmon and steelhead spawning areas when in his opinion such alterations would prove deleterious to fishlife.

Streambed Alterations

1601-1606. It is unlawful for any person to substantially divert or obstruct the natural flow or substantially change the bed, channel or bank of any river, stream or lake designated by the department, or use any material from the streambeds, without first notifying the department of such activity, except when the department has been notified pursuant to Section 1601. The department within 30 days of receipt of such notice, or within the time determined by mutual written agreement, shall, when an existing fish or wildlife resource may be substantially adversely affected by such activity, notify the person of the existence of such fish and wildlife resource together with a description thereof, and shall submit to the person its proposals as to measures necessary to protect fish and wildlife.

Pollution

5650. It is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this State any of the following:

(f) Any substance or material deleterious to fish, plant life, or bird life.

Dams, Conduits and Screens

5900-6100. ...it is unlawful to construct or maintain in any stream... any device or contrivance which prevents, impedes, or tends to prevent or impede, the passing of fish up and down stream.

...any new diversion of water from any stream having populations of salmon and steelhead which is determined by the department to be deleterious to salmon and steelhead shall be screened by the owner... (Note: Other sections pertain to federal and state dams, and diversions either over or under 25 cfs.)

"Water Code"

Preservation of Fish and Wildlife Resources

1243. The use of water for recreation and preservation and enhancement of fish and wildlife resources is a beneficial use of water. In determining the amount of water available for appropriation for other beneficial uses, the (State Water Resources Control Board) shall take into account, whenever it is in the public interest, the amount of water required for recreation and the preservation and enhancement of fish and wildlife resources.

The Board shall notify the Department of Fish and Game of any application for a permit to appropriate water. The Department of Fish and Game shall recommend the amounts of water, if any, required for the preservation and enhancement of fish and wildlife resources and shall report its findings to the Board.

This section shall not be construed to affect riparian rights.

Beneficial Uses

1257. In acting upon applications to appropriate water, the board shall consider the relative benefit to be derived from: (1) all beneficial uses of the water concerned including, but not limited to, use for domestic, irrigation, municipal, industrial, preservation and enhancement of fish and wildlife, recreational, mining and power purposes, and any uses specified to be protected in any relevant water sought to be appropriated, as proposed by the applicant. The board may subject such appropriations to such terms and conditions as in its judgement will best develop, conserve, and utilize in the public interest, the water sought to be appropriated.

"Additional State Laws Including Fish Habitat Protection"

Water Quality: Porter-cologne Water Quality Control Act (Water Code, Section 13000 - 13998); Health and Safety Code, Section 5460.

Water Rights: Water Code Section 1200ff

Forest Practices: Z'Berg-Nejedly Forest Practices Act of 1973; rules and regulations for the Coast and Northern Forest District.

Coastal Zone: California Coastal Act of 1972 (Public Resources Code Section 30000 - 30900).

Mineral Extraction: California Surface Mining and Reclamation Act of 1975 (Public Resources Code Section 2710 - 2793).

HABITAT PROTECTION

FEDERAL

"Bureau of Land Management Manual"

Anadromous Fisheries. In recognition of the importance of anadromous fisheries to the State of California and the Nation as a whole and in the spirit of cooperation, it is Bureau policy to protect, maintain and enhance aquatic habitats supporting salmon and steelhead spawning populations and to enhance or restore salmon and steelhead spawning and nursery areas to the maximum extent practical.

Instream Flow Needs. The Bureau shall recognize streamflow as a critical component of stream habitats and strive to include where necessary, in all Bureau activities affecting these habitats, estimates of instream flow requirements for maintenance of fisheries and aquatic habitats. The Bureau shall provide written or oral testimony to the California State Water Resources Control Board (SWRCB) identifying stream flow requirements for aquatic habitat protection on all water rights applications affecting waters within BLM administered lands.

Water Quality Requirements. The Bureau recognizes the importance of water quality to the protection of aquatic habitats and shall identify water pollution sources detrimental to aquatic life whenever possible. The Bureau shall avoid water quality degradation resulting from its programs to the maximum extent practicable and shall provide written or oral testimony to the SWRCB on all water quality matters pertaining to waters within BLM administered lands.

"U.S. Forest Service - Regional Office"

Habitat Management

The USFS anadromous fish habitat management policy is based on prevention of adverse impacts to anadromous fish resources through support to land management activities, such as through the participation of technical specialists from planning through project completion.

"Mendocino National Forest - Summer Steelhead
Management Plan for Middle Fork Eel River"

Essential Habitat

In order to reasonably protect the fish, the Essential Habitat is now considered

to be the aquatic portion of the Middle Fork Eel River and its tributaries and the streamside management zones (SMZ) as delineated on the ground by the presence of riparian vegetation.

"Pacific Fishery Management Council - Salmon Management Plan"

Aquatic Environment

1. All available or potential natural habitat for anadromous salmonids should be preserved by encouraging management of conflicting uses to assure no obstruction

to access, and a maintenance of high standards to protect water quality and quantity for migration, spawning, and rearing of salmon and steelhead.

2. Adequate water should be allocated for anadromous salmonid uses.

"National Wild and Scenic Rivers"

P.L. 90-542 states:

"...selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

Local rivers included in the National Wild and Scenic Rivers System include the main Eel River, the South Fork Eel, the North Fork Eel, and the Middle Fork Eel River.

"Fish and Wildlife Coordination Act"

Water Development

For major federal water development projects, such as dams, reclamation efforts, and channelization projects, the reports and recommendations of the Fish and Wildlife Service and of the state wildlife agency are required to be given "full consideration" by the federal project agency and to be "made an integral part of any report prepared or submitted by" it to the Congress or any entity having authority to authorize the project. The Act also provides for enhancing of the fish and wildlife values, authorizes compensating wildlife features where some damage is inevitable, and requires that wildlife conservation be given "equal consideration" with other features of water projects.

Chapter IV. HABITAT IMPROVEMENT

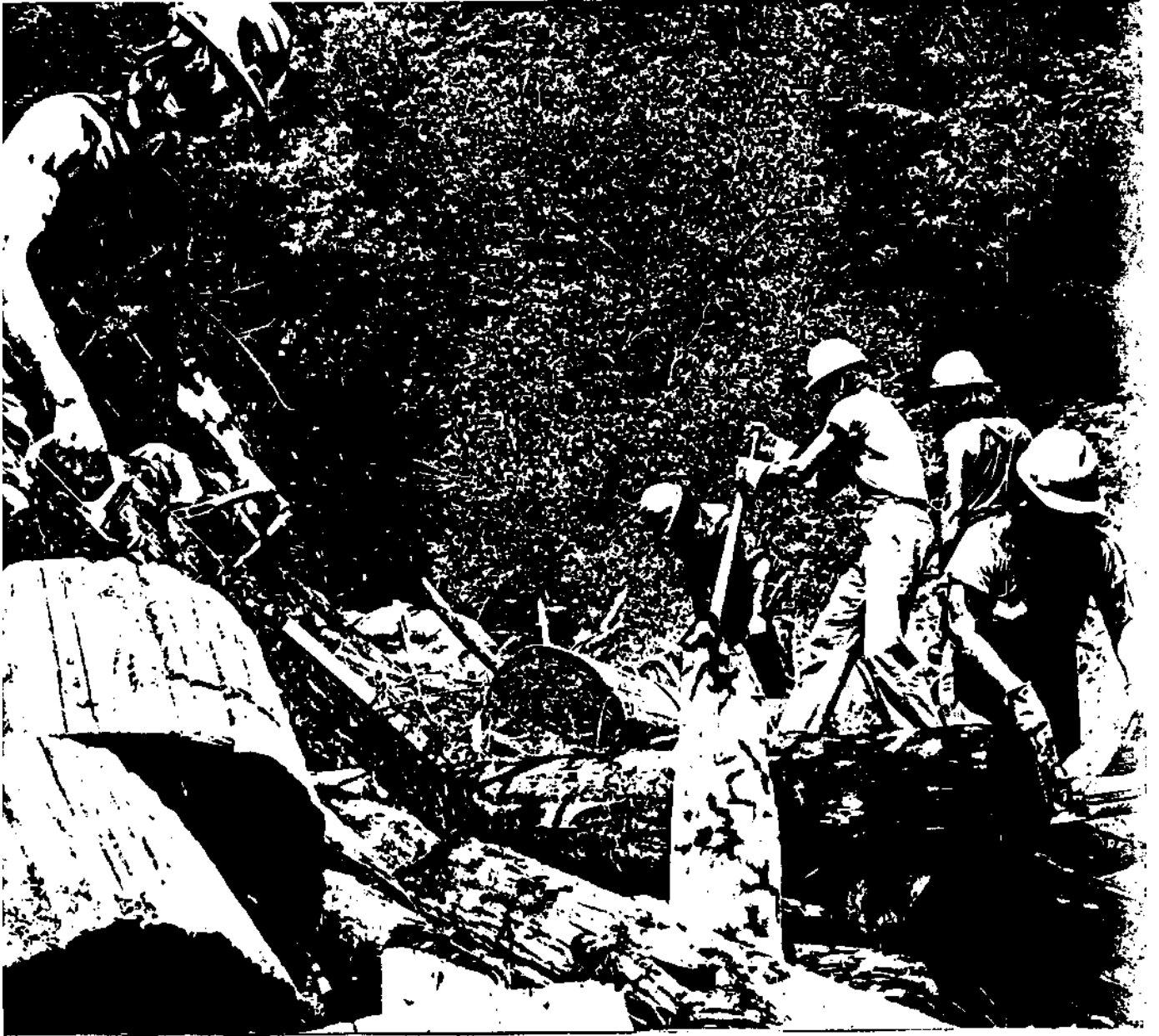


Photo of stream clearance work by CEMR

IV. HABITAT IMPROVEMENT

The habitat damage created by past natural and man-related events has left a large backlog of repair work to be done throughout the county. Although occurring, natural recovery is very slow. Rehabilitation efforts seek to speed up the process, where possible, and thereby boost the numbers of salmon and steelhead more rapidly.

Habitat improvement projects include barrier (log and rock) removal, riparian planting, fish ladder construction, stream-bank stabilization, culvert repair, weir construction, water diversion screening, and erosion control.

Findings

Various groups and agencies restore habitat

At least nine governmental or private organizations are actively involved in habitat restoration in the county. All are listed in Table IV-1, along with the types of projects. For reference, a more detailed description of each group's activities can be found in Appendix B.

The California Department of Fish and Game is the official coordinator of all public and private stream rehabilitation projects, with staff specially assigned to oversee the various types. The Department must approve the project before anyone can begin. Usually, staff is involved from the project's inception and assists in its design as well as its completion.

Significant progress made to date

Although major effort at habitat improvement did not begin locally until 1978, considerable progress is already apparent.

Salmon and steelhead are returning to reopened streams, such as upstream portions of Hollow Tree Creek and Salmon Creek, where they have not been seen in decades. California Department of Fish and Game reports that CCC and CEMR crews alone have opened or improved access to nearly 200 miles of spawning and nursery habitat on 65 streams in Mendocino County between 1976 and 1982 (Snyder & Grass, 1982). In combination with barrier removal projects of New Growth Forest Services, Jackson State Forest, and Coastal Headwaters Assn., local efforts are probably opening up nearly 100 miles of habitat each year. Timber companies are also providing considerable assistance with stream clearance projects.

In other projects, the County, CCC, and USFS have planted several miles of stream with alder and willow to restore riparian shade canopy. Streambank protection is provided elsewhere by cabling logs along the bank, or contouring and seeding the bank. Fish passage and streambank stability also have been improved in certain areas through gravel removal and channel clearing, such as in Morrison Creek.

Where barriers cannot be removed for various reasons, fish ladders are installed to provide passage. Ackerman Creek's Denil-type fish ladder improves passage to 9 miles of spawning and rearing habitat, while Woodman Creek's Alaskan Steeppass fishway opens access to 15 miles at a location which has been a known barrier since 1940.

TABLE IV-1

ANADROMOUS FISHERIES RESTORATION
GROUPS
ACTIVE IN MENDOCINO COUNTY^{1/}

<u>Name</u>	<u>Types of Projects</u>
California Conservation Corps	Barrier removal, riparian planting, in-stream devices
California Dept. of Fish & Game	Barrier removal, egg-taking, stream surveys and inventories
Center for Education and Manpower Resources (CEMR)	Barrier removal, stream inventories
Coastal Headwaters Association	Barrier removal, stream inventories
Garberville Rotary Club	Pond rearing
Gualala River Steelhead Project	Pond rearing
Jackson State Forest	Barrier removal
Mendocino County Fish & Game Advisory Committee	Pond rearing, fish rescue, barrier removal, fish ladders, riparian planting
New Growth Forestry Services	Barrier removal, riparian planting, in-stream devices
Salmon Restoration Association of California, Inc.	Pond rearing, egg-taking, hatchboxes
Save Our Salmon	Pond rearing
U.S. Bureau of Land Management	Barrier removal, stream inventories
U.S. Forest Service, Mendocino National Forest	Barrier removal, riparian planting, stream inventories

^{1/} See Appendix B for a more detailed description of each group's activities.

Restoration work requires knowledge and skills

Care must be taken in how and where stream work is done. The wrong method or location could possibly create more problems than originally existed. For instance, not all debris barriers are impassible to upstream migrants nor undesirable. They can benefit these fish by blocking passage of competing or predatory fish (e.g., squawfish) or by providing cover and sources of food. Removing a log jam by improper methods may release impounded gravels and sediment at a rate which could cause downstream erosion and scouring.

Skills, experience, and innovative methods are valuable assets to have in restoration crews. Blasting rock barriers also takes special skills, since blasters must be licensed by the state.

Adequate funding is key to success

Until substantial financial support became available in recent years, habitat improvement work was much smaller in scale and more sporadic. The Wildlife Conservation Board primarily funded stream clearance work in the county in the decades of the 50's and 60's. In 1979, the California Resources Agency began the "Investing in Prosperity" plan to promote long-term resource restoration and enhancement. As a result, several funding programs were created for rehabilitation work:

- 1) Renewable Resources Investment Fund (RRIF), primarily funded by geothermal revenues, includes: (a) the Salmon and Steelhead Cooperative Restoration Grant Projects, or the "Bosco-Keene projects", formed by AB951 in 1981 and refunded in 1982 and 1983 at \$900,000 per year. (b) California Forest Improvement Program (CFIP), financed from the revenue of timber sales on state-owned forests; 15% earmarked for fish and wildlife habitat restoration.
- 2) Energy and Resources Fund (ERF), supported by a portion of the state's tidelands oil revenue at \$2 million/year.

The ERF program has supported CEMR's and CCC's stream clearing projects as well as Sikes Act work by BLM and the Forest Service. CFIP has funded riparian planting projects by New Growth and a number of local landowners.

By far the broadest in scope, the "Bosco-Keene monies" have funded all of the groups listed in Table IV-2 during the past two years. Mendocino County has received \$687,442, or 38% of the available funds to date. Habitat restoration projects represent 80% of the county's total, with fish culture projects receiving the balance. DFG oversees this program and selects those projects which give the most "bang for the buck". (Rawstron, personal communication).

Watershed rehabilitation is the long-term solution

The treatment of each watershed is critical to achieving long-term stream restoration. If the symptom is only treated and not the cause, the habitat problems will recur. Upland problems affecting the stream include overgrazing, sheet and gully erosion, unvegetated slopes, and poorly constructed roads.

TABLE IV-2

RENEWABLE RESOURCES INVESTMENT FUND
 "BOSCO-KEENE MONIES"
 INVESTED IN MENDOCINO COUNTY
 FOR STREAM RESTORATION ^{1/}

<u>Recipient</u>	<u>1981-82</u>	<u>1982-83</u>	<u>Total</u>
C.E.M.R.	----	\$250,000	\$250,000
Coastal Headwaters Association	\$ 59,880	\$ 10,400	\$ 70,280
Gualala River Steelhead Project	\$ 17,000 ^{2,3,/}	\$ 10,000 ^{3/}	\$ 27,000 ^{2,3/}
Mendocino County	\$ 75,000	----	\$ 75,000
New Growth Forestry Services	\$ 42,000	\$102,881	\$144,881
Rotary Club of Garberville	\$ 16,000 ^{2,3/}	\$ 8,000 ^{2,3,/}	\$ 24,000 ^{2,3/}
Salmon Restoration Association	\$ 28,281 ^{3/}	\$ 25,000 ^{3/}	\$ 53,281 ^{3/}
Save Our Salmon	\$ 20,000 ^{3/}	\$ 23,000 ^{3/}	\$ 43,000 ^{3/}
 	<hr/>	<hr/>	<hr/>
TOTAL	\$258,161	\$429,281	\$687,442

1/ Administered by the California Department of Fish and Game.

2/ Portions of these funds were spent on locations outside of Mendocino County.

3/ Fish improvement projects, such as rearing ponds.

The Resource Conservation District (RCD), along with SCS technical staff, is taking a broader look at habitat disturbance by evaluating the quality of an entire watershed -- the Tomki Creek watershed of the Eel River Basin. For each identified problem, they are prescribing solutions which the landowner can have carried out. Sources of financial assistance for the landowner are also identified. By correcting the causes of sedimentation in Tomki Creek, they hope to return the creek to its full potential as an excellent chinook salmon spawning stream. Other watersheds in the county could benefit from a similar comprehensive approach.

Coordination by watershed important

Of the 17 major watersheds in the county, habitat restoration activities are occurring, or have recently occurred, in almost all of them. Table IV-3 lists the groups that have been active in each watershed between 1978 and 1983. Working together, the groups and agencies can provide a coordinated approach to solving the problems of each watershed.

Good inventories help set priorities

The Department of Fish and Game establishes the priorities for habitat improvement work using the following criteria:

- * Type of problem and degree of severity
- * Number of miles of stream affected
- * Species of anadromous fish (chinook, coho, steelhead)
- * Quality of habitat (existing and potential)
- * Landowner support
- * Physical access
- * Availability of crews

(Snyder, personal communication). Stream inventories which are accurate and up-to-date are necessary to provide the above information and to make the most effective use of limited funds and labor.

For example, a DFG - funded barrier inventory by CEMR in the summer of 1982 identified the following: 2275 barriers on 314 coastal streams were blocking access to 120 miles of habitat; volume of the debris barriers was estimated at 54,000 cubic yards. The Department now knows where to expend its efforts to the greatest effect.

TABLE IV-3

SALMON & STEELHEAD RESTORATION ACTIVITIES
BY
MAJOR MENDOCINO COUNTY WATERSHED

<u>Watershed</u> ^{1/}	<u>Group</u> ^{2/}	<u>Recent Activities</u> (1979-1983)
Albion	CEMR New Growth	Barrier removal Barrier removal
Big	CEMR MCF&G New Growth S.R.A. Jackson S. F.	Barrier removal, inventory Fish stocking Barrier removal Hatchbox, rearing pond Barrier removal
Cold Springs (Elk, Brush Creeks)	CEMR	Barrier removal
Eel - Upper	CEMR DFG MCF&G New Growth USFS	Barrier removal Egg-taking Barrier removal, riparian Barrier removal Erosion control
Eel - Lower	MCF&G	Barrier removal, fishway
Eel - Middle Fork	USFS	Barrier removal, erosion control, riparian
Eel - North Fork	----	----
Eel - South Fork	CCC (BLM) CEMR C.H.A. Rotary Club S.R.A.	Barrier removal, riparian Barrier removal Barrier removal Rearing pond Egg-taking, rearing pond
Garcia	CEMR S.O.S. New Growth G.R.S.P.	Barrier removal Rearing ponds Barrier removal Fish stocking
Gualala	G.R.S.P.	Rearing pond, fish stocking
Mattole	CCC C.H.A.	Barrier removal Barrier removal, hatchbox
Navarro	MCF&G	Fish stocking

<u>Watershed</u> ^{1/}	<u>Group</u> ^{2/}	<u>Recent Activities</u> (1979-1983)
Noyo	CEMR DFG S.R.A.	Barrier removal Egg-taking Egg-taking, rearing ponds, stocking
	MCF&G Jackson S. F.	Fish stocking Barrier removal
North Coastal	----	----
Russian	MCF&G New Growth	Rearing ponds, fish rescue Barrier removal, riparian
South Coastal	----	----
Ten Mile	CEMR S.R.A.	Barrier removal, inventory Rearing ponds

1/ See Figure I-1 for Watershed Boundaries

2/ See Appendix B for a description of each group and its activities. If more than one is involved on a particular project, only grant recipient is listed.

NOTE: DFG has stocked in nearly all of these watersheds at some time (see also Table VI-6).

ABBREVIATIONS:

CCC	-	California Conservation Corps.
CEMR	-	Center for Education & Manpower Resources
CHA	-	Coastal Headwaters Association
DFG	-	California Department of Fish & Game
GRSP	-	Gualala River Steelhead Project
MCF&G	-	Mendocino County Fish & Game Advisory Committee
SOS	-	Save Our Salmon
SRA	-	Salmon Restoration Association of California
USFS	-	U. S. Forest Service

HABITAT IMPROVEMENT

Objective: Improve the quantity and quality of salmon and steelhead habitat in each watershed.

Specific Objectives:

- A. Remove barriers to at least 100 miles of habitat each year until all potential habitat is available.
- B. Restore and improve at least 150 miles of anadromous fish habitat each year.
- C. Rehabilitate at least 100,000 acres of watershed each year.

Recommended New Policies

- 1. Develop and implement a countywide program to rehabilitate and/or improve watersheds for the benefit of salmon and steelhead by encouraging landowner cooperation and participation and involving agencies and local groups.
- 2. Support the development and continuation of local, state, and federal fish habitat restoration programs at funding levels adequate to accomplish the objectives above.
- 3. Identify stream sections with important restoration needs.
- 4. Restore the riparian canopy in existing or potential spawning and rearing streams.
- 5. Seek a variety of funding sources for stream restoration so as not to become overly dependent on one source.
- 6. Emphasize the importance and need for monitoring and evaluating the effectiveness of habitat restoration activities, particularly the collection of the following data (both before and after the project):
 - a) Juvenile counts
 - b) Temperature
 - c) Salmon carcass counts
 - d) Pool-riffle relationships
 - e) Riparian canopy
 - f) Gravel quality and quantity
- 7. Encourage the development of new and innovative methods of stream restoration.
- 8. Support the training and education of stream restoration workers and private landowners in the latest techniques through workshops, conferences, publications, and other means.
- 9. Fish habitat and population restoration projects in the county shall be done

only with the landowner's permission. No restoration work shall be required as a condition of a development permit, except where the work is necessary to mitigate impacts caused by the specific development permit.

10. Attempt to attract funding for habitat improvement by providing an analysis that will show where Mendocino County streams can provide substantial benefits for habitat improvement projects.

Existing Policies

LOCAL

"Fisheries - General Plan"

- c. Identify stream sections with important restoration needs and determine accessibility for restoration crews.
- g. The County shall seek private and public funding for fish and fish habitat restoration programs such as the CEMR Salmon/Steelhead Enhancement Program, the County Fish and Game Advisory Committee and community salmon and steelhead rearing and other support efforts.
- h. Support the restoration of spawning and nursery habitat in the Eel River.
- i. Encourage streamside property owners and appropriate public agencies to participate in salmon and steelhead enhancement projects for coastal rivers and streams of Mendocino County.
- j. Encourage all public land management agencies to preserve, maintain, and enhance the fish habitat within their jurisdiction.
- r. Support the continued use of prescribed burning to improve the quality of the county's watersheds for fish and wildlife habitat. Encourage the use of local labor to help reduce the unemployment problem.

STATE

"Fish and Game Commission Policies"

Steelhead Rainbow Trout

It is the policy of the Fish and Game Commission that:

IV. California's steelhead resources are largely dependent upon the quality and quantity of habitat. Because of damage and threats to this restricted habitat, emphasis shall be placed on management programs to inventory and protect and, wherever possible, restore or improve the habitat of natural steelhead stocks.

"Fish and Game Code"

Fish and Game Management

1501. The Department may expend such funds as may be necessary for the

improvement of lakes and streams for fish, including the selection, restoration, rehabilitation, and improvement of areas of water or land adaptable as hatching, feeding, resting, or breeding places for fish, and the construction of such works as may be necessary to make them available for such purposes, including the removal of barriers to the movement and migration of fish with the permission of the owner.

The Department may carry on such fisheries habitat improvement work on private land with permission of the property owner, without the State acquiring an interest in the property.

FEDERAL

"Bureau of Land Management Manual"

Anadromous Fisheries. In recognition of the importance of anadromous fisheries to the State of California and the Nation as a whole and in the spirit of cooperation, it is Bureau policy to protect, maintain and enhance aquatic habitats supporting salmon and steelhead spawning populations and to enhance or restore salmon and steelhead spawning and nursery areas to the maximum extent practical.

"USFS-DFG Sikes Act Management Plan"

Goals Produce more fish and wildlife on National Forest habitats through direct habitat improvement and coordination with other forest resource programs.

Chapter V. FISH POPULATION PROTECTION

The Fish Yarn Out of Date

"The new game law provides that no fisherman can take more than fifty trout during one calendar day. This is considered a direct blow at some of the local fishermen who have been accustomed to dwell on the large number of their catches. Fifty is a mere bagatelle and no self-respecting fisherman would brag over such a miserable catch. The art of telling fish stories, therefore, appears to be at a discount and will have to be confined to the length and size of the finny monster."

April 7, 1905- Editorial, Ukiah Republican Press

V. FISH POPULATION PROTECTION

Although habitat degradation is the primary cause of the population losses of anadromous fish, the number of fish harvested by man is also a critical factor.

Findings

Salmon and Steelhead populations seriously depleted

In the past 40 years, the numbers of steelhead counted in the Eel River at Van Arsdale Dam have declined 86%, while chinook salmon decreased 70% and coho salmon 64% in the South Fork Eel River (at Benbow Dam) (CDF&G, 1982). Figure V-1 shows the decline by decade based on the total numbers of three counting stations in the North Coast, including those on the Eel, while Figure V-2 reveals the trend at Van Arsdale.

The problem is serious throughout the county's streams, although measurements are lacking elsewhere. Observations by biologists, fisherman, and residents all confirm, however, that populations are far below their historical levels.

Fishing regulations a management tool

Fishing regulations attempt to protect the salmon and steelhead population by limiting: (1) the number or size (2) the location, (3) the season, and (4) the "method of take. Managers can also restrict the number of people allowed to fish, such as the "limited entry" policy of the state for commercial salmon trollers.

Local authority is preempted by the state in establishing fishing regulations. Sport fishing regulations are issued annually by the Fish and Game Commission, while commercial salmon fishing is regulated by both the state (within the 3 mile limit) and the Pacific Fisheries Management Council (from the 3 to 200 mile limit). In addition, certain fishing rights are reserved by federal statute for the Indians of the Round Valley Reservation. State authority to regulate Indian fishing and hunting on the Reservation is limited by Fish and Game Code Section 12300.

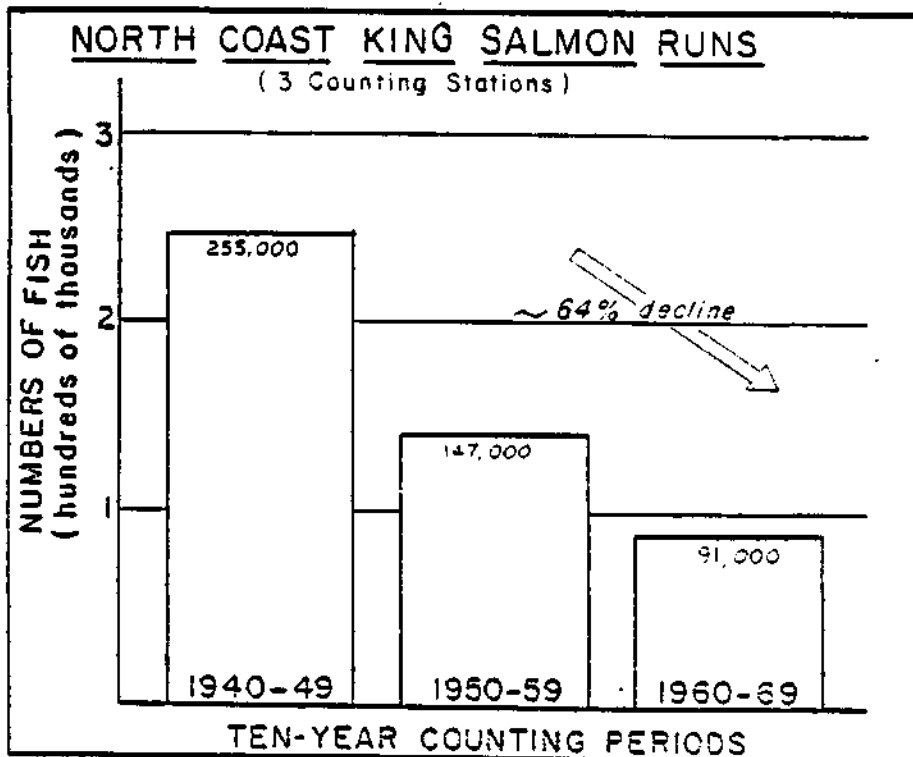
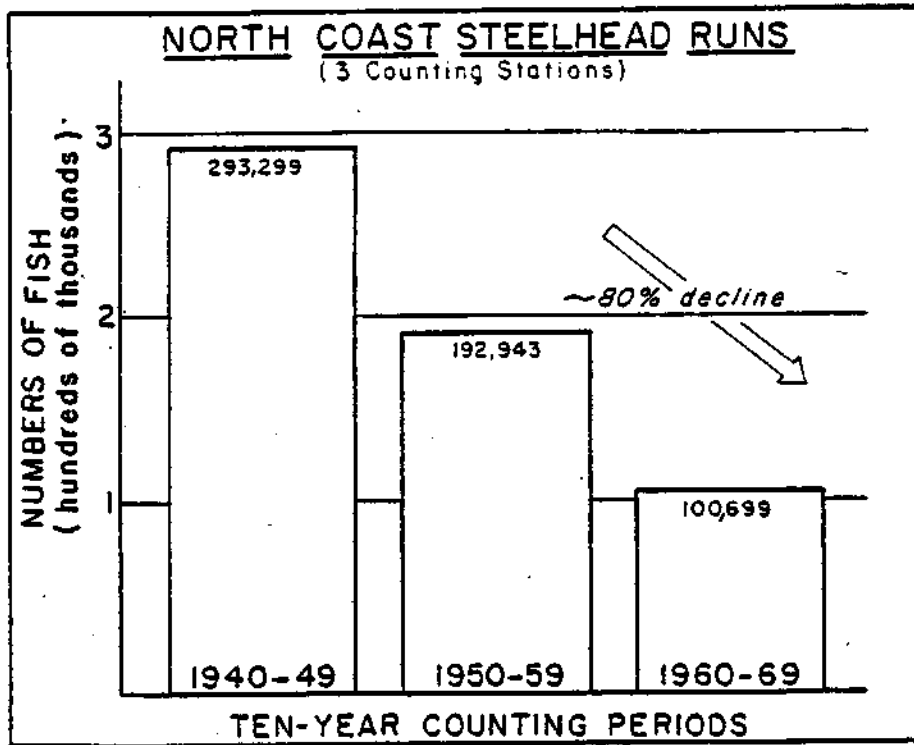
Legal restrictions on fishing tend to be controversial. Disagreements arise over the need for the limits, the data used to make decisions, and other concerns. A balance is sought between the biological needs of the fish and the angling needs of the people.

Poaching remains a problem

Illegal fishing is unfortunately a common problem throughout the county and can lead to a drastic depletion in population. Poaching activities include fishing out of season, exceeding the legal limit, fishing without a license, or using illegal methods, such as gigging or fencing off streams.

DFG wardens are responsible for enforcing the fishing regulations, but they have difficulty catching people in the act due to limited manpower covering hundreds

Figure V-1. Trends in North Coast steelhead and salmon runs.



Source: Citizens Advisory Committee on Salmon and Steelhead Trout, 1971.

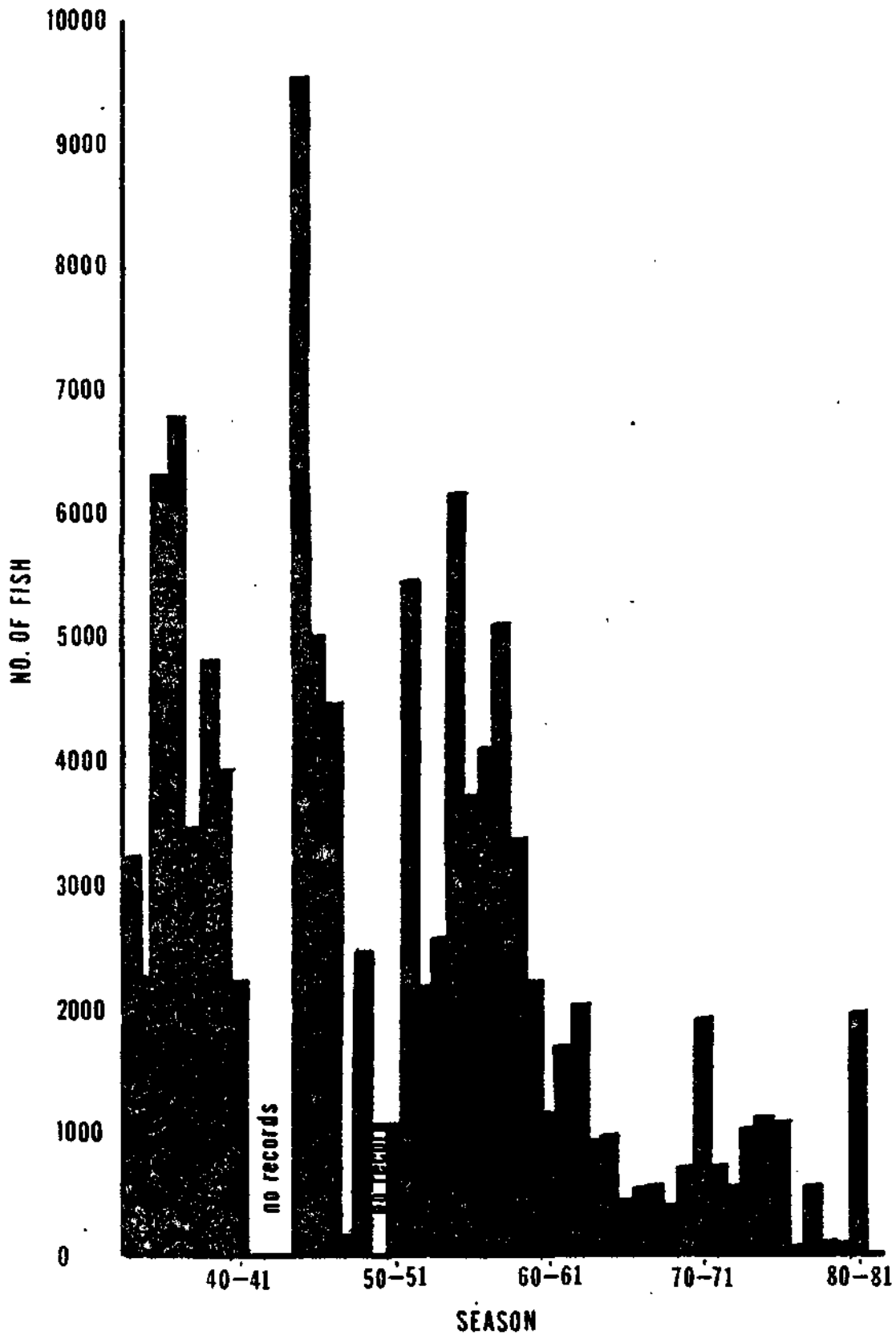


Figure V-2 Number of upstream migrating adult Steelhead trout trapped annually at the Van Arsdale Fisheries Station, migration season 1933-34 through 1981 - 82.

Source: Baker and Ambrosius, 1982.

of miles of stream. They also are dependent upon local judges to give sufficient penalties or sentences which will discourage future poaching attempts.

The CalTIP (Californians Turn In Poachers) program was recently begun to provide rewards to secret witnesses of poaching incidents through the use of a "Hotline" phone system. It has shown to be successful statewide.

Summer steelhead population classified "sensitive"

The largest California population of adult summer steelhead is presently found in the Middle Fork Eel River (Jones and Ekman, 1980). Since its numbers have been severely reduced through natural and man-related events, the species was designated "sensitive" by the U.S. Forest Service as manager of most of its habitat. Historical populations exceeding 3,500 adults compare with numbers fluctuating between 198 and 1,600 during the past 20 years. The present goal is to maintain and protect a population of 1,600.

Management measures taken to protect this unique population involve the closing of fishing in its summer holding area, the development of a Summer Steelhead Management Plan by DFG and USFS, the use of a full time patrol to prevent poaching during the summer, and an annual count of adult and juveniles.

FISH POPULATION PROTECTION

Objective: Protect and maintain, as a minimum, the existing level of salmon and steelhead populations in each watershed.

Recommended New Policies

1. Review the State Sport Fishing Regulations and proposed changes annually and make necessary and timely recommendations which will protect the salmon and steelhead populations while providing reasonable angling use.
2. Minimize the number of illegally caught fish by:
 - a) Supporting an adequate level of Department of Fish and Game enforcement staff, along with necessary equipment;
 - b) Educating the public about the need for protecting and increasing the fish population;
 - c) Supporting the CalTIP program of the Department of Fish and Game and encouraging public involvement in the program.
3. Support and promote compliance with fishery regulations and laws.

Existing Policies

LOCAL:

"General Plan - Fisheries"

k. Encourage adequate funding and manpower for the California Department of Fish and Game to improve its enforcement of the Fish and Game Code and to increase its monitoring and research efforts on fishery and wildlife resources within the county.

m. Promote the collection of baseline data to determine present populations of steelhead and salmon in the county's streams.

q. Endorse and support implementation of the Summer Steelhead Management Plan prepared by the California Department of Fish and Game and the Mendocino National Forest for the Middle Fork Eel River.

FISH POPULATION PROTECTION

STATE:

"Fish and Game Commission Policies"

Steelhead Rainbow Trout

It is the policy of the Fish and Game Commission that:

II. The greatest fishery value of this resource is its potential to provide recreational angling for sea-run fish. Management shall be directed toward providing such angling and maintaining a vigorous, healthy resource. Angling for juvenile steelhead will be restricted to the extent necessary to insure optimum spawning stock and angling opportunity for sea-run fish.

VII. The Department shall develop and implement programs to measure and, where appropriate, increase steelhead population size and angler use and success, consistent with the objectives of providing quality angling and maintaining a healthy resource.

"Fish and Game Code"

205. Any regulation of the commission pursuant to this article which relates to fish, amphibia, and reptiles, may apply to all or any areas, district, or portion thereof, at the discretion of the commission, and may do any or all of the following as to any or all species or subspecies:

- (a) Establish, extend, shorten, or abolish open seasons and closed seasons.
- (b) Establish, change, or abolish bag limits, possession limits, and size limits.
- (c) Establish and change areas or territorial limits for their taking.
- (d) Prescribe the manner and the means of taking.

7120. It is unlawful for any person to possess more than one daily bag limit of any fish taken under a sport fishing license.

Chapter VI. FISH POPULATION IMPROVEMENT

Sketch from Oregon Wildlife
February 1983



VI. FISH POPULATION IMPROVEMENT

Fish population improvement includes all artificial propagation activities intended to directly augment the fish population level, such as hatcheries, rearing ponds, egg-collecting, fish rescue, aquaculture, hatchboxes, and stocking.

Brief History

Fish culture efforts began locally in the 1890's when the San Francisco and North Pacific Railroad wanted to stock the streams along its line. An egg-collecting station was initiated in Little Lake Valley in 1896, with a hatchery constructed a year later on Gibson Creek, west of Ukiah. Millions of salmon and steelhead eggs were transported from the Eel for rearing and release into the Russian every year because of the two facilities. The Ukiah Hatchery was also a popular stop for San Francisco excursionists up for the weekend on the railroad (Carpenter, 1914).

The state later became very active in the region in its efforts to maintain angling in California (Leitritz, 1970). Hatcheries were developed on several tributaries of the Eel and Russian rivers (Table VI-1), with eggs collected locally when possible. As the result of numerous problems, especially major flood destruction, all of the local hatcheries eventually were abandoned. Two egg-collecting stations, one on the Eel for steelhead and another on the Noyo for coho, are the only remaining state-operated propagation facilities in the county.

Findings

Community fish rearing efforts are expanding

As seen in Table VI-2, the number of community-operated rearing ponds continues to grow. They are located throughout the county, from Piercy to Gualala, and are operated by local non-profit restoration groups. (For a more detailed description of each group's involvement, see Appendix B). The Department of Fish and Game oversees all of these programs, providing a fish culturist for technical advice and assistance.

Most rearing ponds are Doughboy-type pools with specialized water systems, such as those at Talmage and Point Arena. Other types include in-stream gravel ponds (which release fish when flows wash them out), and tomato tubs. Juvenile fish are planted in the ponds as fingerlings and then raised there until the smolt stage, when the fish are directly released into the adjacent stream or transplanted into others.

During the 1982-83 season, the capacity of these rearing ponds totaled 685,000 smolts (see Table VI-3). All ponds tend to lose some fish due to disease, predation, or other cause but in good years they will have a survival rate of 90% or more. Return rates of the adults are not yet known. The smolts need to be adequately imprinted in the stream where planted in order for the adults to come back to the same location. Marking studies would help determine the success of these pond rearing programs.

Another method used to increase survival is through hatchboxes. These structures

TABLE VI-1
PUBLIC FISH HATCHERIES AND EGG COLLECTING STATIONS
OPERATED IN MENDOCINO COUNTY
FROM 1897 THROUGH 1982 ^{1/}

<u>Name of Installation</u>	<u>Location</u>	<u>Years of Operation</u>
Ukiah Hatchery	Gibson Creek, trib. to Russian River	1897-1910 ^{2/} 1911- 1927
Snow Mountain Egg Collecting Station (Now "Van Arsdale")	Eel River, near Potter Valley	1907-present
Eel River Egg Collecting Stations	South Fork Eel River Kinney Ck., Dutch Charlie Ck.	1920-1921
Cold Creek Hatchery	Cold Creek, trib to Russian River	1928-1937
Cedar Creek Experimental Station	Cedar Creek, trib to South Fork Eel River	1949-1950
Cedar Creek Hatchery	Cedar Creek, trib to South Fork Eel River	1955-196
Pudding Creek Egg Collecting Station	Pudding Creek near Fort Bragg	1957-1962
Noyo River Egg Collecting Station	South Fork Noyo River	1962-present

1/ Operated by the California Department of Fish and Game.

2/ Owned and operated by the City of Ukiah

Source: Leitritz, Earl. 1970. A History of California's Fish
Hatcheries, 1870-1960. Fish Bulletin No. 150, California
Department of Fish.& Game, Sacramento, 92 p.

TABLE VI-2
PRIVATE & COMMUNITY - OPERATED
REARING PONDS AND EGG-COLLECTING STATIONS
MENDOCINO COUNTY
1896 -1983

<u>Name of Facility</u>	<u>Location</u>	<u>Operator</u>	<u>Date</u>
Little Lake Valley Egg Collecting Station	Outlet Creek, trib. to Eel River	Northwestern Pacific R.R.	1896-1907
Talmage Rearing Ponds	Mill Creek, trib. to Russian	Mendocino Co. F&G Adv. Comm.	1969-present
Ten Mile Rearing and Egg-taking Station	Ten Mile River	Salmon Restoration Assoc.	1971-present
Point Arena Rearing Ponds	Hutton Creek trib. to Garcia River	Save Our Salmon	1973-present
Hollow Tree Creek Egg-Collecting & Rearing Station	Hollow Tree Creek, trib. to South Fork Eel River	Salmon Restoration Assoc.	1979-present
Gualala Rearing Ponds	Doty Creek, trib. to Gualala River	Gualala River Steelhead Project	1979-present
Leggett Rearing Ponds	South Fork Eel River	Rotary Club of Garberville	1980-present
Big River Hatchbox & Raceway	South Fork Big River	South Fork Big River Watershed Assoc. & Salmon Restoration Assoc	1981-present
Pudding Creek Rearing Tubs	Pudding Creek	Salmon Restora- tion Assoc.	1982-present

TABLE VI-3
ESTIMATED CAPACITY
OF
COMMUNITY - OPERATED REARING PONDS

<u>Name of Pond</u>	<u>Species</u> ^{1/}	<u>Estimated Capacity</u> ^{2/}
Big River (South Fork)	SS	10,000
Gualala	SH, SS	50,000
Hollow Tree Creek	KS	150,000
Leggett	SH	25,000
Point Arena	SS, SH	75,000
Pudding Creek	KS	25,000
Talmage	SH	150,000 yearlings
Ten Mile	KS, SS	200,000
Total		685,000 Smolts

1/ Symbols: SH - Steelhead
SS - Silver Salmon (Coho)
KS - King Salmon (Chinook)

2/ 1983 capacity levels estimated at 4-6 per pound for yearling smolts (SH, SS) and 25 per pound for King Salmon smolts. Figures estimated by each pond operator.

are located in the stream and provide shelter for fertilized eggs. When hatched, the fry can be released into the stream or transferred to rearing ponds. One small-scale hatchbox project on the Big River is in its fifth year and has reportedly succeeded in returning several hundred adult coho to the river this year, after years of almost no recorded escapement (CDFG, 1983).

Both public and private funding assists effort

Fish restoration projects are popularly supported by many funding sources. A major boon was the "Bosco-Keene monies" for salmon and steelhead restoration, financed from state geothermal revenues. (See Chapter IV and VIII for more information on funding programs.) Local rearing pond programs have received \$147,281 over the past two years from this source as shown in Table IV-2. Since 1969, the county's Fish and Game Preservation Fund has provided the support for the Talmage Ponds.

Barbecues are popular fund-raising events which also provide education and political benefits. The 4th of July Salmon Barbecue by the Salmon Restoration Association attracts thousands of visitors each year. In addition, the timber industry has contributed to the effort. Four local companies (Georgia-Pacific, Harwood, Louisiana-Pacific and Masonite) have donated individually or jointly over \$50,000 for the fish pond program in the Garcia River, Big River, Ten Mile River and Hollow Tree Creek drainages. This effort continues with considerable financial and technical assistance being provided in Ten Mile River and Hollow Tree Creek.

A new funding source is the Salmon Stamp Program, financed from a special tax placed on commercial salmon licenses. Its focus will be on restoration projects designed to produce additional salmon.

State hatcheries serve County

Four state hatcheries are involved with producing chinook, coho and steelhead for local rearing ponds or direct stocking. Those juvenile fish provided to the cooperative pond rearing programs are all considered surplus to state programs.

Table VI-4 lists these facilities along with their location, species and design capacity. Both Warm Springs and Trinity River hatcheries were developed primarily to "mitigate" for the habitat lost by dam construction. In addition, Warm Springs Hatchery, a state-of-the-art facility, is designed to raise chinook salmon smolts as an enhancement feature. Since the Russian River system does not now support a self-sustaining chinook population, the hatchery operators must seek disease-free chinook eggs from outside sources. Recently, the hatchery has reared 10,000 chinook from late fall running stock from the Eel River and coho eggs from the Klamath River (CDFG, 1983).

Mad River Hatchery is the primary producer for the local rearing ponds. As partly shown in Table VI-5, chinook eggs are collected from the Mad, Klamath, Eel, Ten Mile, and Noyo rivers. Steelhead fingerlings are taken from the Eel, Noyo, and San Lorenzo rivers (NCGR, 1982). In the past, the fish raised at this hatchery have been planted in many different North Coast streams.

TABLE VI-4

STATE FISH HATCHERIES INVOLVING MENDOCINO COUNTY'S SALMON STEELHEAD POPULATIONS
1/

<u>Name of Facility</u> ^{2/}	<u>Location</u>	<u>Species of Fish</u> ^{3/}	<u>Design Capacity</u> ^{3/5/}
Mad River Hatchery	Mad River	Arcata, KS	5,000,000 fingerlings
	Humboldt Co.	SS	300,000 yearlings
		SH	150,000 yearlings
Warm Springs Hatchery	Dry Ck., trib. to	KS	1,000,000 fingerlings
	Russian R.	SS	110,000 yearlings
	Healdsburg,	SH	300,000 yearlings
	Sonoma Co.		
Trinity River Hatchery	Trinity River	KS	8,300,000 ^{4/}
	Lewiston, Trinity	SS	500,000 yearlings
		Co.	SH
Silverado Hatchery	Napa River	SH	^{6/}
	Yountville,	RT	1,615,000 yearlings
	Napa Co.	KS (Wisc.)	1,000,000 fingerlings

1/ from: California Department of Fish & Game, "California's Fish Hatchery and Planting Program", Sacramento, 11 p. 1977; and "Salmon Management in California", Anadromous Fisheries Branch, Sacramento, 49 p., 1983.

2/ Only the Mad River Hatchery is designed to augment anadromous salmonid populations in North Coastal streams. The Warm Springs and Trinity Hatcheries are primarily for mitigation for the spawning habitat lost by dam construction on their respective river systems.

3/ KS - King Salmon, also called Chinook Salmon
 SS - Silver Salmon, also called Coho Salmon
 SH - Steelhead
 RT - Rainbow Trout

4/ 7,000,000 fingerlings and 1,300,000 yearlings

5/ Capacity may vary from year to year

6/ Depends upon availability of eggs; usually from Van Arsdale (Eel River)

TABLE VI-5
STOCK SOURCE AND DISTRIBUTION -
COMMUNITY REARING POND PROGRAMS
IN MENDOCINO COUNTY

<u>Name of Facility</u>	<u>Species</u> ^{1/}	<u>Source/Hatchery</u> ^{4/}	<u>Local Release Locations</u> ^{2/}
Talmage ponds	SH	Eel River/ Mad River (MR)	Russian, Navarro, Noyo, Big Rivers
Ten Mile ponds	KS-f	Wisconsin/	Ten Mile
	KS-f	Hollow Tree/	Ten Mile
	KS-f	Ten Mile/MR	Ten Mile
	KS-f	Ten Mile/Silver.	(died)
	SS	Noyo/MR	Ten Mile
	KS-s	Trinity/Trinity	Ten Mile, Trinity
Hollow Tree Creek ponds	KS-f	Hollow Tree/ Silverado	Hollow Tree Creek Russian
Pudding Creek tubs	KS-f KS-s	Wisconsin/	Pudding Creek (died)
Big River raceway	SS	Hollow Tree/ hatchbox ^{3/}	Big River
Point Arena ponds	SS	Mad River/MR	Garcia
	SH	Mad River/MR	Garcia
Leggett ponds	SH	Mad River/MR	Eel-South Fork
Gualala ponds	SH	Mad River/MR	Garcia
	SS	Noyo/Warm Springs	Gualala

1/ SH - Steelhead Trout
 KS-f - King Salmon, fall run - (chinook)
 SS - Silver Salmon - (coho)
 KS-s - King Salmon, spring run - (chinook)

2/ Based on records during history of operation up to May 1983

3/ Hatchbox project is an experimental one.

4/ Abbreviations: MR - Mad River; Silver. - Silverado Hatchery

Genetic diversity of wild stocks must be protected

Although artificial propagation efforts may compensate for declining natural runs of salmon and steelhead, other consequences of these practices may not be so desirable. Scientists are concerned that stocking with hatchery fish could lead to the decline of wild stocks instead of their restoration (Hankin, 1982; NCGR, 1982). To help prevent this, it is important to first understand the significance of genetic diversity of naturally produced wild populations.

Despite being the same species, individual populations, or stocks, often reveal a variety of different traits. Some of these are behavioral, such as the built-in variations in timing of upstream migration by anadromous populations (e.g., winter-run vs. spring-run steelhead). Other traits may be physiological, morphological or biochemical and less obvious upon superficial examination. Genetic variations are also apparent between populations from different watersheds, reflecting thousands of years of selection and adaptation.

The advantages of this genetic diversity in wild stocks are many, but basically it provides flexibility in the population to adapt to a whole host of unknown future conditions: new diseases, change in habitat; droughts, floods and other weather perturbations; and new predators, among others. This adaptability to existing and future conditions provides resiliency in the population, prolonging its chances of survival. As the National Gene Resources Council remarked, "Gene resources are an insurance policy against the economic and biological disasters that can occur when a species' environment becomes less favorable to its survival or productivity".

Enhancement may damage wild stocks

Hatchery practices tend to erase much of this natural diversity (NGRC, 1982). Eggs are often collected from spawning adults during only a short period of their migration, skewing the future population to have a narrower built-in clock. Another practice uses unequal numbers of males and females (e.g., 1 male per 4 females), which can cause inbreeding and magnify the chances of undesirable characteristics. Inadequate sampling in establishing a broodstock also loses genetic variability.

The potential is now widely recognized for hatchery practices to result in the production of fish poorly adapted to the natural environment. Hatchery stocks can even contribute to the decline of wild stocks because: 1) hatchery and wild stock have different abilities to withstand harvesting, and when mixed together, it results in higher mortality of wild stocks; and 2) interbreeding between the two may reduce the fitness of wild stocks (Hankin, 1982).

Now that the hatchery problem is being recognized, both biologists and fishermen desire greater protection of wild stocks. Looking at Table VI-5, one can see the genetic source and distribution of the species used in local rearing pond programs. Although DFG biologists and most pond operators would prefer not to use stock from another drainage, they often have no choice. Eggs from the desired species in a particular stream are just not available.

Few local streams retain indigenous stocks

Since fish plantings have gone on for at least 85 years in the county, few stocks remain genetically intact. Some plantings, however, may have been too small or lacked imprinting to have had any substantial effect on the original population, but it is difficult to determine now. Also, stocked fish tend to stray to other drainages.

An initial attempt to identify the streams retaining substantially indigenous stocks can be found in Table VI-6. Only three streams may still have an intact chinook population, 10 streams an intact coho population, and 15 streams a pristine steelhead one. Further research may add to or subtract from this list.

Protecting some of these populations as controls or "genetic reserves" may soon become crucial to research and to maintaining the viability of future populations.

Better practices can reduce genetic problems

One method to minimize genetic interference between river systems is to use only those eggs collected from that drainage. This practice may soon become increasingly possible because of the addition of another DFG fish Culturist to the cooperative pond rearing effort (and paid for by the Salmon Stamp Program). Plans call for a limited number of local rearing pond operators to be trained in the proper methods of egg collection. This new program should help produce more fish from the existing stocks.

Another important action is to have "constant proportions of all fish released from enhancement facilities be identified with a distinctive mark, say a single fin clip", as recommended by Dr. David Hankin, Professor of Fisheries Biology at Humboldt State University. This marking allows later statistical estimates of the numbers of hatchery fish in a spawning run in the natural stream.

Salmon ocean ranching has serious implications

Local commercial salmon fishermen are very concerned that the development of a fish farming facility on the North Coast could mean the end of the natural wild salmon as well as the small independent fisherman. The artificially raised salmon, through genetic selection, may tend to return to the release facility at a size too small to be legally caught by commercial trollers. In 1972, an out-of-county firm proposed to install and operate a domesticated anadromous fish rearing facility at the mouth of Elk Creek on the coast, but it was turned down by the Planning Commission. Current state law does not allow new ocean ranching operations without special legislative approval.

TABLE VI-6
MENDOCINO COUNTY RIVERS AND CREEKS POTENTIALLY
RETAINING NATIVE SALMONID POPULATIONS
MINIMALLY AFFECTED BY HATCHERY TRANSFERS
AND OUTPLANTINGS^{1/}

(Listed from North to South)

<u>Chinook</u>	<u>Coho</u>	<u>Steelhead</u>
Mattole	Whale Gulch Creek	Eel River, North Fork
Eel River, North Fork	Jackass Creek	Whale Gulch Creek
Eel River, Middle Fork	Usal Creek	Jackass Creek
	Cottoneva Creek	Usal Creek
	Hardy Creek	Cottoneva Creek
	Howard Creek	Eel River, Middle Fork
	Juan Creek	Hardy Creek
		Howard Creek
	Wages Creek	Juan Creek
	Albion River	Wages Creek
	Gualala River, North Fork	Pudding Creek
		Greenwood Creek
		Elk Creek
		Alder Creek
		Brush Creek

1/ Based upon the following sources: Weldon Jones, Mendocino Unit Fisheries Biologist, DFG, personal communication; Table F-2 in: Anadromous Salmonid Genetic Resources - An Assessment and Plan for California, by National Council on Gene Resources, 1982, p. 157. This latter source based its determination upon Mad River salmon and steelhead hatchery records (1970-1982).

FISH POPULATIONS IMPROVEMENT

Objectives:

- A. Emphasize the natural system as the primary means of restoring, improving and maintaining salmon and steelhead population numbers.
- B. Encourage the artificial propagation of salmon and steelhead only as a temporary measure to augment a population in a stream until it reaches an optimal or self-sustaining level.
- C. Retain the genetic integrity and diversity of wild stocks in the county's streams.

Recommended New Policies

1. Stocking of artificially reared anadromous salmonids in the county's streams must be done only with existing stocks and should be carried out in a manner designed to have a minimum impact on existing, self-perpetuating anadromous populations. If the stream does not support such populations, introduced salmonids should be of compatible stocks.
2. A portion of the anadromous fish outplanted from all local rearing ponds should be marked before releasing into the county's streams and should be monitored for their performance.
3. Certain control streams shall be managed to retain their existing wild stocks and shall not be tampered with by the planting of artificially reared stocks. These streams and wild stocks are:
 - a) Middle Fork Eel River - Summer Steelhead
 - b) Gualala River - Steelhead
 - c) Alder Creek - Steelhead, Coho Salmon
4. Coordinate outplantings of all artificially reared fish and manage local rearing pond programs in a manner which mimics the natural system and life cycle.
5. Identify the genetic integrity of each stream in the county, based on hatchery transfer and planting records and in-stream surveys. Streams and watersheds should be categorized as to the number, source, and time of stock introductions.
6. Support the training of local people in proper methods of operating a rearing pond program, including the collection of local sources of salmon and steelhead eggs.
7. Support private and public funding of fish restoration programs at levels sufficient to accomplish adequate restocking of local streams.

EXISTING POLICIES

Fish Population Improvement: Rearing Programs

LOCAL

"General Plan"

g. The County shall seek private and public funding for fish and fish habitat restoration programs such as the CEMR Salmon/Steelhead Enhancement program, the County Fish and Game Advisory Commission, and community salmon and steelhead rearing and other efforts.

STATE

"Fish and Game Commission Policies"

Publicly-operated Rearing Programs for Salmon and Steelhead

It is the policy of the Fish and Game Commission to:

I. Support the utilization of the state's salmon and steelhead resources for public rearing programs, within the following constraints:

A. Only those fish surplus to the needs of the Department programs shall be utilized for such programs.

B. The suitability and acceptance or rejection of proposed programs shall be determined by the Department.

C. Priority of allotment of available surplus fish among acceptable programs shall be based on past performance on existing programs and the Department's evaluation of the potential of proposed new programs.

D. Routine care and food costs shall be the financial responsibility of the sponsoring group. The Department will provide technical advice and counsel and special assistance as appropriate.

II. It is recognized that natural production provides the great bulk of the state's salmon and steelhead resources. The Department's goals of maintaining and improving this production shall not become subservient to the goals of publicly operated rearing programs.

"Fish and Game Code"

Cooperative Salmon and Steelhead Rearing Facilities

1200. The Department is authorized to enter into agreements with counties, nonprofit groups, private persons, individually or in combination, for the management and operation of rearing facilities for salmon and steelhead. All such agreements shall be in accordance with the policies of the commission and the criteria of the department which govern the operation under such agreements.

The purpose of operating such facilities shall be to provide additional fishing resources and to augment natural runs...

EXISTING POLICIES

Fish Population Improvement: Fish Stocking

LOCAL

"General Plan - Fisheries"

0. Request of the State Legislative that 5% or more of state fishing license fees be set aside for the rearing, planting and restocking of native fish in county streams.

STATE

"Fish and Game Commission Policies"

Steelhead and Salmon

It is the policy of the Fish and Game Commission:

I. To maintain an adequate breeding stock, suitable spawning areas, and provide for the natural rearing of the young to migratory size. Hatchery production shall be limited to areas where it is necessary to supplement natural production in coastal streams.

II. That resident trout will not be planted or developed in coastal steelhead and salmon streams, except after prior Commission approval (a) where the stream is no longer adaptable to anadromous runs, or (b) during the mid-summer period in those individual streams considered on a water-by-water basis where there is a high demand for angling recreation and such planting or development has been determined by the Department not to be detrimental to the anadromous species.

Steelhead Rainbow Trout

It is the policy of the Fish and Game Commission that:

VIII. Artificial propagation of steelhead, except for mitigation, shall be for the purpose of improving angling for sea-run fish, and should include strains or varieties of steelhead which have the greatest potential to contribute to recreational angling. Artificial production of rearing and stocking programs shall be managed so as to produce minimal interference with natural salmonid stocks, and such programs shall be periodically reviewed to assess their effects on these stocks.

"DFG-County Cooperative Agreement for Talmage Ponds"

County agrees to liberate the fish in such locations and in such percentages of the total fish reared as is designated herein. Said fish will be liberated at such locations, as heretofore designated, as will provide public fishing without charge and without exclusion or discrimination of any individual of the public and at such locations where such fish are most likely to survive and multiply.

Fish Population Improvement: Fish Stocking

FEDERAL

"U.S. Fish and Wildlife Service"

Anadromous Fish Management Policy

It is the policy of this region (includes California) to encourage the scientific management of the anadromous fishery resource. Management will be aimed at the restoration of each race of the salmonid fishery to waters where such fisheries once existed. Wild fish strains will be favored over hatchery strains. Emphasis will be placed on maintaining and restoring, where possible, natural-occurring runs of fish. The objective of the Service will be to cooperate with the respective State game and fisheries departments, National Marine Fisheries Service, private groups and individuals in developing anadromous fish runs of maximum size.

Salmon/Steelhead Species Trade-Offs

This policy recognizes that various management agencies and user groups are proposing possible trade-offs of one species for another (salmon for steelhead; fall salmon for spring salmon). Before commenting either favorably or unfavorably on any such trade-offs, appropriate Service field level personnel would need to make a thorough evaluation of the trade-off issues and submit a report to the Regional Office in Portland, Oregon. The final decision to accept or reject the trade-off would be made by the Service's Regional Director.

"U.S. Forest Service Summer Steelhead Management Plan -
Middle For Eel River"

Oppose introduction of exotics (e.g., Washougal strain of summer steelhead) to Eel River. Eliminate all stray non-native summer steelhead in holding habitat.

EXISTING POLICIES

Fish Population Improvement: Fish Rescue

LOCAL

"Board of Supervisors (Minutes of April 10, 1979)"

Raise rescued fish in ponds and then return to the same watershed from which they were taken.

Increase the native strain rather than bringing in strains from other areas as happens with DFG fish.

STATE

"Fish and Game Commission"

Steelhead and Salmon

It is the policy of the Fish and Game Commission:

III. That salmon and steelhead may be rescued whenever the water supply in a stream is inadequate to maintain fish life.

Steelhead Rainbow Trout

It is the policy of the Fish and Game Commission that:

IX. Juvenile steelhead rescue shall be limited to instances where habitat conditions are temporarily inadequate to maintain fish life and when suitable rearing areas are available with the capacity to rear rescued fish to smolts without impairment of other steelhead populations. Rescue should be undertaken only in special circumstances involving large numbers or steelhead of special significance.

"DFG - Regional Policy"

Mendocino County's fish rescue program may extend into the Russian and Eel River drainages, excepting Tomki Creek where Potter Valley studies are continuing.

Conditions under which operations shall be conducted are as follows:

(1) All fish rescue activities shall be limited to those streams or portions of streams designated in advance in writing by the Department's Unit Fishery Biologist. Generally, the waters will be those which are incapable of supporting juvenile salmonids throughout the summer.

(2) All fish rescue activities must be confined to the period from May 1 through September 30.

(3) Operations shall be limited to the rescue of steelhead trout only, unless otherwise designated by the Unit Fishery Biologist. All other species shall be

returned to the stream...

(9) Fish rescued from the Russian River and Eel River drainages shall be held and raised separately from each other and all other fish.

Chapter VII. INFORMATION

Field Form

THE RESOURCES AGENCY OF CALIFORNIA

Department of Fish and Game

STREAM SURVEY

NAME OF STREAM _____ CO. _____

DATE _____ EXTENT OBSER. _____

TRIB. TO _____

RELATION TO OTHER WATERS _____

WATERSHED AND IMMED. DRAINAGE BASIN (Type: Terrain; Soil; Cultivation;
Vegetation; Shade)

WIDTH _____

DEPTH _____

FLOW _____

VELOCITY _____

BOTTOM (Bedrock, Boulder, Rubble, Gravel, Sand, Mud, Silt, Organic Debris)

SPAWNING AREAS _____

POOLS _____

SHELTER _____

VII. INFORMATION

Since better information can usually help make better decisions, the objective of this management category is to: "Improve our understanding of the salmon and steelhead resource through better educational, research, and data collection efforts."

Findings

Inadequate information on local fishery

Most streams in the county are not monitored effectively to produce reliable estimates of spawning populations of anadromous fish. For example, no recording station or other means of data collection is available on the Russian River so reported numbers of fish are truly "guesstimates".

Estimates for coastal streams were made in the 1960s for the California Department of Fish and Game's Fish and Wildlife Plan, although no field data was collected for the effort. The update of this plan, scheduled for publication in 1983, also does not improve upon the data base. The large personnel requirement of these surveys is the primary reason for inadequate coverage.

Without baseline data on spawning populations, however, it will be difficult or impossible to measure the success of fish restoration efforts or the effects of habitat alterations.

California Fish and Game collects and stores most of the fisheries data

As shown in Table VII-1, what fisheries data is collected in the county is principally gathered by the Department of Fish and Game. Some types, such as stream surveys and barrier inventories, are conducted when needed, or when personnel are available. (Some local stream surveys go back to the 1930's.) Annual measurements of adult numbers at certain locations, like the Van Arsdale fish ladder on the Eel or the summer steelhead holding area on the Middle Eel, are done for monitoring purposes. When special funds become available, data collection efforts are sometimes made under contract with a non-profit group. The Coastal Headwaters Association used the "Bosco-Keene restoration funds" to conduct its survey of the Mattole River watershed, for example.

Other types of fisheries information prepared by DFG include anadromous fish distribution maps and inventories. In 1981, the distribution of Chinook and coho salmon and steelhead trout were plotted (based on stream surveys) on 7.5 minute USGS topographic maps by staff of the agency's Inland Fisheries Branch (NCGR, 1982). An inventory which alphabetically lists each stream in Mendocino County and identifies the anadromous species known to be present was also prepared recently.

All or portions of the above data can be found in at least one of the following locations (though no one source has all of the above data):

- 1) DFG Regional Office Library - Yountville

TABLE VII-1
CURRENT ANADROMOUS FISHERIES
DATA COLLECTION EFFORTS
IN MENDOCINO COUNTY

<u>Collector</u>	<u>Type of Data</u>	<u>Location</u>	<u>Frequency</u>
Calif. Dept. of Fish & Game	Stream surveys	All streams	Periodically
	Barrier inventories	All streams	Periodically
	Upstream migrating adult counts	Eel River (Van Arsdale)	Annually
	Chinook salmon pop. estimates & distribution; sport effort	Eel River	1981/82/83
	Summer steelhead adult counts	Middle Fork Eel River	Annually
	Chinook salmon carcass counts	Tomki Creek (Eel River)	Annually
	Commercial salmon catch	North Coast (Fort Bragg)	Annually
	Recreational ocean salmon catch & effort	North Coast (Fort Bragg)	Annually
C.E.M.R.*	Barrier inventories	Coastal streams	1982
Coastal Headwaters Association*	Stream surveys	Mattole R. & tribs.	1982/83
U.S. Bureau of Land Management	Stream surveys	South Fork Eel River tribs. Russian River tribs.	Periodically
U.S.F.S., Mendocino National Forest	Stream surveys	Middle Fork Eel River tribs.	Periodically

* Under contract to the California Department of Fish & Game for this effort.

- 2) DFG Anadromous Fisheries Branch Office - Sacramento
- 3) DFG Inland Fisheries Branch Office - Sacramento
- 4) Mendocino Unit Fisheries Biologist Office - Ukiah

Better data reporting methods needed

Although DFG collects most of the fisheries data, other agencies and groups are also involved (Table VII-1). Each one has a different method of gathering the data as well as recording it. This discrepancy sometimes causes confusion in interpreting the results. A uniform procedure would rectify this problem.

In addition, a procedure is needed to provide up-to-date annual reporting of the results from the various restoration projects conducted throughout the county. In Appendix C is a sample reporting form for each group to complete and return to DFG and the County.

Fisheries research needs support

Several research projects related to salmon and steelhead are currently in progress in California. A list of known researchers is provided in Appendix D. Most of this research is being conducted in the universities, though governmental agencies are also involved.

Some very useful information is resulting, such as: 1) identification of the best time to release smolts from rearing ponds and hatcheries, 2) the relationship of stream dynamics to habitat recovery rates; and 3) specific habitat needs of anadromous fish species.

Other important fisheries research still needing to be done includes: improved understanding of the dynamics of anadromous fish populations; the genetic differences between various stocks; and the effects of artificially reared fish on the wild stock populations.

Research conducted on experimental watersheds

Mendocino County is fortunate to have two research watersheds which are designated to collect baseline data. Pristine Elder Creek, a tributary of the South Fork Eel River, is a National Landmark stream monitored continuously by the U.S. Geological Survey. Its watershed has had almost no human disturbance and is presently under protective management.

In a paired watershed study, the Caspar Creek basin in Jackson State Forest has been evaluated since 1960. Both the California Department of Forestry and the U.S. Forest Service are measuring the effects of logging and road building on certain stream characteristics. Although the watershed was clearcut and burned in the late 1800's, it recovered sufficiently to support good stands of second growth conifers. The North Fork of the Caspar was selected as the control watershed while the South Fork basin was chosen to be selectively harvested.

INFORMATION

Objective: Improve our understanding of the salmon and steelhead resource through better educational, research, and data collection efforts.

Recommended New Policies

1. Update the County Biological Resources Map every 2 years to more accurately identify current locations of anadromous salmonid stream habitat. These maps should reflect the results of habitat improvement projects, which will continue to open up new streams.
2. Establish uniform and coordinated data collection methods for fisheries information by the various agencies and groups, and provide for reasonable access to and exchange of local fisheries data.
3. Request an annual summary of habitat and fish restoration activities from each agency and group actively involved in the county.
4. Support research analyzing the genetic differences between wild and hatchery stocks, geographically separated stocks, and seasonally separated stocks.
5. Support research which will enable us to better understand the dynamics of anadromous fish populations.

EXISTING POLICIES

LOCAL

"General Plan - Fisheries"

- b. Identify streams with spawning and nursery habitat and determine their current and potential fish population levels.
- k. Encourage adequate funding and manpower for the California Department of Fish and Game to improve its enforcement of the Fish and Game Code and to increase its monitoring and research efforts on fishery and wildlife resources within the county.
- l. Support a study of the impacts of dragboat fishing and the implications of allowing development of salmon ocean ranching on the North Coast, including the impact of native fish populations, traditional harvest methods, sport fishing, and independent fishermen and support industries.
- m. Promote the collection of baseline data to determine present populations of steelhead and salmon in the county's streams.

STATE

"Fish and Game Commission Policies"

Public Information and Education

It is the policy of the Fish and Game Commission that:

I. The Department shall disseminate to the maximum extent feasible information to the public through the news media, books, pamphlets, motion pictures and other appropriate means regarding all matters dealing with the conservation, protection, management and administration of the state's fish and wildlife resources. It shall also inform the public about the authority and activities of the Commission and the Wildlife Conservation Board.

II. The Department shall develop education programs in conjunction with the Department of Education directed toward the state's youth, which emphasize the importance of the preservation, enhancement and proper management of California's fish, wildlife and habitat resources and which recognize the role and value of hunting and fishing as resource management tools. Young people will be encouraged to participate in conservation, hunting and fishing programs based on a sound renewable natural resource ethic.

Research

It is the policy of the Fish and Game Commission that:

I. Research shall be undertaken and carried on whenever questions or problems arise and need to be resolved which affect the protection, preservation, propagation, conservation, management or administration of fish and wildlife resources in this state, including the investigation of disease.

II. Whenever possible and advantageous, the services of the University of California or other academic or research institutions, or federal, state or local agencies shall be utilized.

III. Major new research programs or investigation shall not be undertaken without prior approval of the Commission. In presenting a proposed research program the Department shall advise the Commission of: (a) the nature and purpose of the program; (b) the need therefore; (c) whether the subject of the proposed research has ever been investigated or studied before and, if so, where the results have been reported; (d) the estimated cost of the program; (e) its estimated duration; and (f) what beneficial purposes the results of the research will serve. The provisions of this paragraph shall not extend to investigations of disease or to research programs ordered or recommended by the Legislature.

IV. The Department shall report to the Commission regularly the status of major research programs in progress.

Steelhead Rainbow Trout

It is the policy of the Fish and Game Commission that:

IV. California's steelhead resources are largely, dependent upon the quality and quantity of habitat. Because of damage and threats to this restricted habitat, emphasis shall be placed on management programs to inventory and protect and, whenever possible, restore or improve the habitat of natural steelhead stocks.

VI. The Department shall develop and implement plans and programs to improve the protection of steelhead habitat including, but not limited to, assessment of habitat status and adverse impacts, land use planning, acquisition of interests in streams threatened with adverse developments, and research on effects on habitat changes caused by activities such as over-grazing, gravel extraction, logging, road construction, urbanization and water development.

"Fish and Game Code"

Research and Data Collection

1000. The Department shall expend such funds as may be necessary for biological research and field investigation and for the collection and diffusion of such statistics and information as shall pertain to the conservation, propagation, protection, and perpetuation of birds and the nests and eggs, thereof, and of mammals, reptiles, and fish.

FEDERAL

"Bureau of Land Management Manual"

Aquatic Monitoring and Evaluation

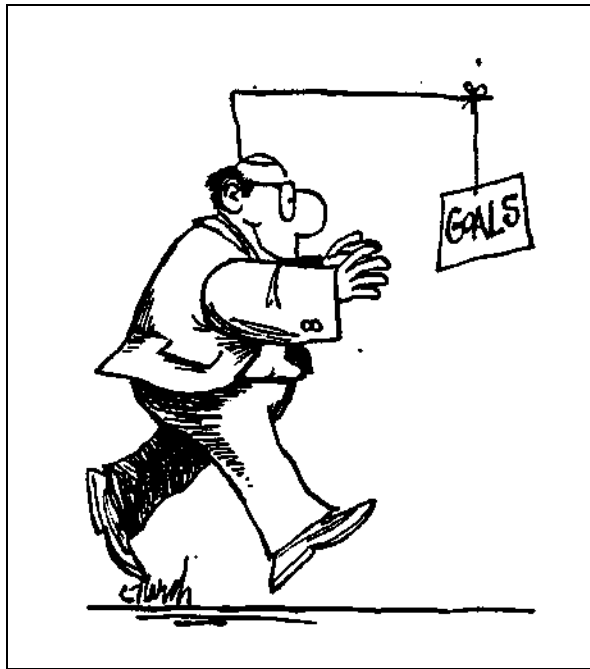
In order to maintain an effective aquatic habitat management program, the Bureau will regularly monitor aquatic habitats on public lands and evaluate impacts of management decisions and habitat management practices upon them.

Studies and Research Involving Aquatic Habitat/Multiple Use Relationships

In the routine management of aquatic habitat, where managers have identified a need, and to the extent funding is available, studies and research will be conducted. These studies will be designed to develop management criteria to help the Bureau meet its overall management objectives and those for aquatic habitat management. The development of fishery studies on all proposed mini-hydropower projects affecting waters on public lands would be a good example.

It is Bureau policy to promote or conduct such studies and/or research through cooperative efforts with the State, other Federal, and academic institutions.

Chapter VIII. IMPLEMENTATION



VIII. IMPLEMENTATION

This Mendocino County Salmon and Steelhead Management Plan will be implemented, where appropriate, by the Mendocino County Board of Supervisors, the California Department of Fish and Game, other resource management agencies, local fisheries restoration groups, and private landowners. Its intent is to provide:

- a) Policy direction to the Board of Supervisors, County Departments, and other County representatives, particularly in those areas where the County has the authority to take action (e.g., habitat protection, fish population improvement).
- b) Management guidelines to the California Department of Fish and Game, as the principal manager of the County's fishery, which may influence future actions in the County;
- c) Suggested guidelines to other resource management agencies, both at the state and federal levels;
- d) Guidelines and suggested opportunities to those interested in stream habitat and fish restoration work in the county;
- e) Information to private landowners about the benefits and activities related to salmon and steelhead protection and restoration;
- f) A coordinated action plan to guide all of the above in a concerted effort to achieve and maintain optimum natural production of salmon and steelhead in each watershed.

The Management Plan is intended also to be used as a handbook to reference needed information. If updated every several years and expanded as more information becomes available, the Plan should serve its purposes well.

Since adequate funding of fisheries management activities is essential for their successful implementation, it is important to identify possible sources of funds. Table VIII-1 lists many of the funding opportunities which currently support anadromous fisheries-related projects within California. Some of these sources were discussed in previous chapters (e.g., Energy and Resources Fund in Chapter IV), while others are not directly used in the county at this time. As described earlier, private funding sources have contributed significantly to restoration efforts locally.

Table VIII-1.

STATE, FEDERAL, AND PRIVATE SOURCES OF FUNDING, ACTIVITIES THEY SUPPORT,
AND PRINCIPAL RECIPIENTS

Sources	Activities Funded	Principal Recipients
<u>State of California</u>		
Fish and Game Preservation Fund	Management and research activities	California Department of Fish and Game
Energy and Resources Fund	Habitat restoration	State agencies
Commercial salmon stamp fees	Salmon propagation and restoration	California Department of Fish and Game
Assembly Bill 951 (1981)	Habitat restoration	State agencies and nonprofit organizations
<u>Federal</u>		
Department of Commerce		
National Marine Fisheries Service	Research, support services (marketing)	Mainly in-house activities
Aid to Commercial Fisheries Programs (PL 88-309)	Research, development, improvement, and services	State agencies
Anadromous Fish Conservation Program (PL 81-681) ¹	Research, fish facility construction and operation, stream clearance	State fishery agencies, colleges and universities, and private companies
Office of Sea Grant	Research and development, education, training, extension and advisory services	Universities, public and private nonprofit research organizations
Marine Resources Monitoring, Assessment, and Prediction	Resource surveys; surveys and catch data analysis; fishery oceanography, and climatology.	In-house
Department of the Interior		
Fish and Wildlife Service	Research, hatcheries, and support services (disease and management programs)	Cooperative fisheries at universities and in-house programs
Federal Aid in Fish Restoration (Dingell-Johnson Act)	Research, development, management projects, and land acquisition for sport fishery restoration	State fishery agencies
<u>Private</u>		
Fishermen's associations	Habitat restoration and enhancement	N.a. ²
Communities and nonprofit organizations	Fish propagation facilities	Mainly in-house activities
Private industry	Fish propagation facilities	Mainly in-house activities

¹This Act is also administered by U.S. Fish and Wildlife Service.²Information not available.

Sources: Living Marine Resources, Inc., 1980; National Marine Fisheries Service, 1981; Pacific Coast Federation of Fishermen's Associations, Inc., 1982; U.S. Fish and Wildlife Service, 1979.

Source: National Council for Gene Resources, 1982.

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APPENDICES

- APPENDIX A. Directory of Agencies Involved with Fisheries Management
- APPENDIX B. Descriptions of Restoration Groups Active in Mendocino County
- APPENDIX C. Sample Form for Annual Survey of Salmon and Steelhead Projects in Mendocino County
- APPENDIX D. List of Anadromous Fish Researchers with Research Relevant to Mendocino Streams
- APPENDIX E. Bibliography

DIRECTORY OF AGENCIES INVOLVED WITH
FISHERIES MANAGEMENT

Local

Mendocino County (Board of Supervisors - 468-4221)
 Courthouse (Planning & Bldg. Services - 468-4281)
 Ukiah, CA 95482 (Fish and Game Advisory Committee)

Mendocino County Resource Conservation District
 405 Orchard
 Ukiah, CA 95482 468-9223

Covelo Community Tribal Council
 P.O. Box 448
 Covelo, CA 95428 983-6126

Eel-Russian River Commission County
 Courthouse
 825 - 5th St. Eureka, CA 95501 445-7691

State

Resources Agency
 1416 9th St.
 Sacramento, CA 95814 (916) 445-5656

California Coastal Commission
 631 Howard St.
 San Francisco, CA 94105 (415) 543-8555

California Conservation Corps
 1530 Capitol Ave.
 Sacramento, CA 95814 (916) 445-0307

Dept. of Fish and Game (707) 944-4460	Region III Office
1416 9th St.	P.O.Box 47
Sacramento, CA 95814 (916) 445-3531	Yountville, CA 94599

Dept. of Forestry (707) 462-0506	CDF District Office
1416 9th St.	776 S. State St. Sacramento,
CA 95814 (916) 445-9920	Ukiah, CA 95482

Dept. of Water Resources
 1416 9th St.
 Sacramento, CA 95814 (916) 445-6582

State Water Resources Control Board
 P.O. Box 100
 Sacramento, CA 95801 (916) 322-8353

SWRCB - Div. of Water Rights
P.O. Box 2000 (901 P St.)
Sacramento, CA 95810 (916) 322-4503

Coastal Conservancy
1330 Broadway
Oakland, CA 94612 (415) 464-1070

University of California Cooperative Extension
Sea Grant Marine Advisory Service
c/o Bruce Wyatt
2604 Ventura Ave., Rm. 100-P
Santa Rosa, CA 95401 (707) 527-2621 or 468-4495

Attorney General's Office
555 Capitol Mall, Suite 350
Sacramento, CA 95814 (916) 445-9555

Federal

U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814 (916) 440-2292

U.S. Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825 (916) 484-4731

Bureau of Land Management
555 Leslie
P.O. Box 940
Ukiah, CA 95482 (707) 462-3873

Bureau of Indian Affairs
2800 Cottage Way
Sacramento, CA 95825 (916) 484-4237

U. S. Forest Service
Mendocino National Forest
P.O. Box 431
Willows, CA 95999 (916) 934-3316

Soil Conservation Service
405 Orchard
Ukiah, CA 95482 (707) 468-9223

National Marine Fisheries Service
3150 Paradise Dr.
Tiburon, CA 94920 (415) 435-3149

Pacific Fishery Management Council
526 SW Mill St.
Portland, OR 97201 (503) 221-6352

CALIFORNIA CONSERVATION CORPS
(CCC)

201 Project
P.O. Box 176
Weott, CA 95571

(707) 946-2262

CONTACTS: Marc Groff, Melvin Krebs

TYPES OF PROJECTS: Barrier removal, riparian planting, In-stream habitat structures

YEAR GROUP FORMED: 1977

LOCATION OF PROJECTS: South Fork Eel River drainage; Mattole River

PROJECT DESCRIPTION: Log jams in creeks on both public and private lands are removed by a 60 member crew stationed in Weott and Leggett. All of their work is prioritized by the California Department of Fish & Game. Recent efforts have focused on creeks in the South Fork Eel drainage, including Hollow Tree Creek and its major tributaries from Piercy to Leggett. In-stream fish habitat structures are installed incidental to barrier removal, primarily root wads and large logs pulled from log jams and cabled along streambanks.

The CCC has also assisted DFG with stream surveys and carcass counts, carried out riparian revegetation with willows and alders, seeded and mulched streambanks, and built hatchboxes. When needed, the CCC has helped community stream restoration projects, such as putting in water lines for rearing ponds.

EXISTING OR POTENTIAL PROBLEMS: Work force may be cut back substantially in 1983-84.

FUNDING SOURCES: Stream clearance projects are funded from the State's Energy and Resources Fund (ERF).

GOALS OF GROUP: To assist the Department of Fish & Game in restoring and enhancing all of the North Coast salmonid habitat. Primary goal is to open all barriers to salmonid migration. Secondary goal is to plant a quarter million riparian trees for rearing habitat.

CALIFORNIA DEPARTMENT OF FISH AND GAME

Region III
P.O.Box 47
Yountville, CA 94599

Mendocino Unit Fisheries Biologist
540 Zinfandel
Ukiah, CA 95482

CONTACTS: Bob Snyder, Alan Grass - barrier removal - (707) 944-4460;
Royce Gunter, Steve Saunders -fish culture; Yountville (707) 944-4460;
Weldon Jones, fisheries biologist, Ukiah, (707) 462-0604
Mike Bird, "Bosco-Keene Projects", (916) 241-3199

TYPES OF PROJECTS: Barrier removal, In-stream devices, Stream surveys. Monitoring, Egg-taking; Hatcheries.

YEAR PROJECTS BEGAN: Barrier removal - 1950s; stream surveys - 1930s; Egg-taking- 1907.

LOCATION OF PROJECTS: All streams in Mendocino County.

PROJECT DESCRIPTION: The Dept. of Fish and Game (D.F.G.) is involved either directly or indirectly in all of the fish restoration projects in the County. Its personnel are responsible for identifying stream barrier sites and for supervising their removal by the various restoration groups. Rock barriers are often blasted by DFG's own licensed rock blasters. Between 1976 and 1982, work crews have opened or improved access to nearly 200 miles of spawning and nursery habitat on 65 streams in Mendocino County alone.

Stream surveys are conducted periodically by biologists to inventory stream habitat quality and fish populations. All egg-taking activities are supervised by the agency's fish culturists, who also oversee the community-operated rearing pond programs. D.F.G. also operates its own egg-taking stations at Noyo (for coho salmon) and at Van Arsdale (for steelhead and chinook salmon) on the Eel. These eggs are taken to Mad River or to Warm Springs Hatcheries for their early development; some are later returned to rearing pond projects throughout the County.

EXISTING OR POTENTIAL PROBLEMS: Shortage of personnel to keep stream surveys up-to-date and to assist all the active groups with their restoration projects. Hatcheries cannot always produce to their full capacity due to disease, lack of egg supply, inadequate maintenance funds, etc.

FUNDING SOURCES: The Department's internal budget provides the salaries of its biologists and fish culturists and the operating expenses of the egg-taking stations and hatcheries. Supplemental funding is now available from the "Bosco-Keene Fund" to carry out new restoration projects and from the Salmon Stamp Program to improve the hatcheries and other facilities. The Calif. Wildlife Conservation Board also donated monies to restore the Noyo Egg-taking Station in 1983.

CENTER FOR EDUCATION AND MANPOWER RESOURCES
(CEMR)

Resource Projects Section
Post Office Drawer
Ukiah, CA 95482

(707) 468-0194

CONTACT: Ron Kusina, Director

TYPES OF PROJECTS: Stream restoration: barrier removal, streambank stabilization, habitat development; monitoring; stream inventories - barrier assessment.

YEAR GROUP BEGAN: 1978

LOCATION OF PROJECTS: South Fork Eel River basin - Hollow Tree and Indiar Creek sub-basin; Eel River - Outlet Creek sub-basin; Big River; Albion River; Garcia River; Brush Creek; Ten Mile River; Noyo River; Pudding Creek; Caspar Creek; Cottoneva Creek; Hare Creek; Jughandle Creek; Russian Gulch.

PROJECT DESCRIPTION: CEMR's Mendocino Fisheries Program is a county-based stream restoration project, maintaining field operation crews in Laytonville and Fort Bragg and headquarters in Ukiah. Last year the Program shifted its priorities from the South Fork Eel River to the local coastal river systems. Working in cooperation with CDF&G, Program priorities were established and executed.

During the 1981-82 season, operations were conducted on 15 separate streams. A total of 96 barriers were removed, comprising of 4300 cubic yards of material, and 24.5 miles of habitat were restored. Assistance was also provided to the Salmon Restoration Association by removing debris upstream from the Hollow Tree egg-taking station and to CalTrans in clearing a debris trap for a culvert. Productivity was increased in the summer of 1982 with the addition of mechanized removal vehicles.

Stream bank stabilization and erosion controls are carried out where needed following barrier removal. Habitat devices are placed instream in some areas to develop better pool/riffle relationships. Some monitoring of earlier work sites is done, such as observing the presence of spawning fish.

In the summer of 1982, CEMR contracted with DF&G to determine the location of barriers and their priority for removal on selected coastal streams.

EXISTING OR POTENTIAL PROBLEMS: Access to work sites difficult.

FUNDING SOURCES: In 1982-83, state funds under the "Bosco-Keene" program amounted to \$250,000 for CEMR. In previous years, funds came primarily from the state Energy and Resources Fund (ERF).

GOALS OF GROUP: The primary goal of the Mendocino Fisheries Program is to increase the native stocks of salmon and steelhead trout resources within county watersheds, with particular emphasis on coastal systems.

COASTAL HEADWATERS ASSOCIATION

P.O. Box 12
Whitethorn, CA 95489

CONTACTS: Richard Gienger Claire Trower, Sec.-Treas.
Box 283 3848 Wilder Ridge Rd.
Whitethorn, CA 95489 Garberville, CA 95440
(707) 986-7721 or 986-7419 (707) 986-7688

PROJECT TYPES: Stream restoration: barrier removal, streambank stabilization; Stream surveys; Monitoring

YEAR GROUP BEGAN: 1981

LOCATIONS OF PROJECTS: South Fork Eel River - Indian Creek drainage; Mattole River

PROJECT DESCRIPTION: Stream clearance work involved the removal of debris jams on two tributaries of Indian Creek: Anderson Creek and Sebus Creek, both in Mendocino County. Logs were also cabled to streambanks to provide stabilization.

The Mattole Survey Program began in 1981 and has surveyed 200 miles of "blue line" stream in the drainage, most of which is in Humboldt County. Data collected has included: juvenile salmon population estimates, temperature monitoring, high water spawner surveys, locations of needed habitat improvement work, and locations for hatchbox placement. Stream surveyors were local residents. Some of the identified habitat improvement work has already been performed by the CCC. Pre-project surveys have provided baseline information which is then monitored following the project's completion.

EXISTING OR POTENTIAL PROBLEMS: Gaining landowner permission for access has at times been a problem. Educating landowners about the needs of native salmon and steelhead is difficult.

FUNDING SOURCES: State funds under AB 951 ("Bosco Funds") totaled \$59,880 in 1981-82 for the Mattole Survey Program, and also for barrier removal in Indian Creek. In 1982-83, the same funding source provided \$30,400 for the 2 drainages.

GOALS OF GROUP: To educate local landowners and the community about salmonids and their habitat, which is the key to long-term fisheries restoration. To continue survey work and monitoring of rehabilitation efforts. To employ local residents in a rehabilitation program.

GARBERVILLE ROTARY CLUB

c/o Monroe Tobin
734 Cedar
Garberville, CA 95440

or

John McGrath
948 Redwood Dr.
Garberville, CA 95440
(707) 923-2422

TYPES OF PROJECTS: Pond rearing

YEAR BEGAN: 1980.

LOCATIONS: So. Fk. Eel R. @ Cedar Creek, @ So. Mill Ck., and @ Mendocino-Humboldt County Line.

PROJECT DESCRIPTION: Their rearing pond program includes three within Mendocino County. Some are Doughboy-type pools and others wash-out ponds. About 25,000 steelhead from the Mad River Hatchery are being raised in 1982-83 in the Piercy area ponds.

EXISTING OR POTENTIAL PROBLEMS: Gill disease has been a serious problem, as well as high summer temperature in the ponds. Poaching has also reduced the numbers of fish produced.

FUNDING SOURCES: State funds from the RRIF program ("Bosco-Keene monies") amounted to \$16,000 in 1981-82 and \$8,000 in 1982-83 for the all of the Club's rearing ponds. Other funding sources included the Humboldt Area Foundation, and Bay Area Sportsmen. Donations have matched or exceeded the state contributions.

GOALS OF GROUP: Continue to raise steelhead to smolt size and eventually also raise king salmon.

GUALALA RIVER STEELHEAD PROJECT

P.O. Box 266
Gualala, CA 95445

CONTACT: Leighton Nelsen, P.O. Box 7, Gualala (707) 884-3566

TYPES OF PROJECTS: Pond rearing

LOCATION: Gualala R., Garcia R.

YEAR BEGAN: 1979

PROJECT DESCRIPTION: Two doughboy-type pools are located on Doty Creek, a tributary to the Gualala River and located within Mendocino County. In 1982-83, the project raised and released 8,000 steelhead (from the Mad River Hatchery) into the Garcia River. The Dept. of Fish and Game will not let them release a non-indigenous strain of steelhead into the Gualala River.

Silver salmon, probably from Warm Springs Hatchery, are expected to be received for the coming season. These will be released into the So. Fork Gualala River (Sonoma County), where there currently is no silver salmon population.

EXISTING OR POTENTIAL PROBLEMS: Water intake from the creek gets plugged with gravel. Occasional disease problems.

FUNDING SOURCES: State funds under the RRIF program ("Bosco-Keene monies") were received in both 1981-82 and 1982-83. Sonoma Co. Fish and Wildlife Advisory Committee has contributed \$2,000 each year. Donations also provided.

GOALS: Continue to raise and release as many fish as possible.

JACKSON STATE FOREST

802 N. Main St.
Fort Bragg, CA 95437

(707) 964-5674

CONTACT: Forrest Tilley, Calif. Dept. of Forestry

TYPES OF PROJECTS: Barrier removal

LOCATION OF PROJECTS: Noyo R. (So. Fk.), Big R. (No. Fk.)

PROJECT DESCRIPTION: Log jam removal efforts began within Jackson State Forest in the 1950s, but have accelerated considerably in the last three years. Work crews are provided by the Chamberlain Creek Conservation Camp, which is located within the Forest. Their stream clearance methods are similar to those of other restoration groups, but they lack heavy equipment. Barrier sites are identified for the crews by the Dept. of Fish and Game.

EXISTING OR POTENTIAL PROBLEMS: More stream surveys needed. Physical access to sites sometimes difficult. Conservation Camp crews may be unavailable during a critical fire season.

FUNDING SOURCES: Equipment and minor operating expenses provided by DFG. Vehicles and fuel costs come from CDF's internal budget funds, and the fixed labor costs are paid by the Dept. of Correction's internal budget funds.

MENDOCINO COUNTY FISH & GAME
ADVISORY COMMITTEE

Courthouse

Ukiah CA 95482

CONTACT: Bill Townsend, Chairman (707) 452-5223

P.O. Box 765, Ukiah

TYPES OF PROJECTS: Pond rearing, fish rescue, stream restoration

YEAR GROUP FORMED: 1947

LOCATION OF PROJECTS: Rearing ponds at Talmage (Russian River); fish rescue in creeks throughout county; stream restoration in Ackerman Creek (Russian R.); Woodman, Sherwood, and String Creeks (Eel R.).

PROJECT DESCRIPTION: The Talmage rearing ponds consist of 6 doughboy pools with a capacity to rear about 150,000 juvenile fish. In 1982, 100,000 steelhead from the Mad River Hatchery were raised at the ponds. These fish are released as smolts or pre-smolts in March or April into the Russian River and its tributaries, the Navarro River, Noyo River, and Big River. Fish rescue in drying creeks during June and July has been done off and on since the 1950s. These rescued juvenile steelhead are either transferred to a perennial stream or to the rearing ponds for feeding and later release. The County's stream restoration projects include the construction of fish ladders over barriers in Ackerman and Woodman Creeks and the revegetation of riparian sites with alder and willow along String Creek east of Willits. Rock barriers in Sherwood and Woodman Creeks are to be blasted under contract with New Growth Forest Services.

EXISTING OR POTENTIAL PROBLEMS: Occasional disease problems with the reared or rescued fish. Steelhead recovery in the Russian River continues to be impaired by summer dams blocking passage (such as Healdsburg) and the lack of mitigation by the Corps of Engineers for habitat lost by Coyote Dam. The dam's operation also causes prolonged turbidity in the Russian, which degrades its quality for rearing habitat.

FUNDING SOURCES: The Advisory Committee receives the County's share of Fish & Game fine monies, which is one-half of the total fines charged for code violations occurring within the County each year. The County's share has recently averaged \$12-15,000 each year. Funding for the stream restoration projects was received in 1981-82 from the State under AB951 (the "Bosco funds"), which totaled \$75,000.

NEW GROWTH FORESTRY SERVICES

P.O. Box 61
Ukiah, CA 95482

(707) 485-0414

CONTACTS: Meca Wawona, Ross Walker, Harold Appleton

TYPES OF PROJECTS: Barrier removal, riparian planting,
in-stream devices

YEAR GROUP BEGAN: 1976

LOCATION OF PROJECTS: Big Salmon Ck., Feliz Ck. (Russian R.),
No. Fk. Garcia, Daugherty Ck. (Big R.), Seward Ck. (Russian R.),
Bloody Run Ck. and Sherwood Ck. (Outlet Ck, Eel R.), Woodman Ck. (Eel R.)

PROJECT DESCRIPTION: Current projects include the removal of major log jams on Daugherty Ck. and on No. Fk. Garcia R., and the blasting of rock barriers on Feliz Ck., Bloody Run Ck., Woodman Ck., and Sherwood Ck. (the latter two under contract with Mendocino County). Projects for 1982-83 total \$110,000. Past projects involved log and debris removal in upper Big Salmon Creek plus road and culvert work and streambank stabilization. Seward Creek was also opened to steelhead following barrier removal & check dam construction, which helps maintain channel profile and provides spawning terraces and summer pools.

EXISTING OR POTENTIAL PROBLEMS: Lack of current surveys to identify specific problem sites requires them to do their own surveys without compensation. Monitoring of before and after status of representative stream improvement projects is needed, but funds are usually not available.

FUNDING SOURCES: In 1982-83, state funds from RRIF ("Bosco-Keene monies") were primary source. The California Forest Improvement Program (CFIP) provided funds in 1980-81-82-83.

GOALS OF GROUP: Short-term goals are to identify and prioritize stream problems, develop projects for their treatment, and encourage local landowners to undertake stewardship of their stream habitats. Evaluation of projects' success will be done by monitoring. Long-term goal is to promote carrying out habitat restoration efforts within the context of watershed restoration goals and strategies.

4/83

SALMON RESTORATION ASSOCIATION OF CALIFORNIA, INC.
(SRA)

P. O. Box 1448
Fort Bragg, CA 95437

CONTACTS: Don Bradley, Pres. - 964-5859
Frank Welch, Treasurer - 964-6631 Carol
Steele, Secretary - 964-6631 Bill Maahs -
964-5832

TYPES OF PROJECTS: Pond rearing, egg-taking, hatchbox

YEAR GROUP BEGAN: 1971

LOCATION OF PROJECTS: Ten Mile River, Hollow Tree Creek (trib. to South Fork Eel River), Pudding Creek, Big River - South Fork and Johnson Creek.

PROJECT DESCRIPTION: Facilities at Ten Mile Creek include an egg-taking station, "tomato tubs" for holding adult chinook salmon until ready to spawn, and an in-stream gravel pond. The Hollow Tree Creek site is primarily an egg-taking station used to provide a permanent supply of local-origin salmon eggs. All of the fish resulting from this facility will be planted in Hollow Tree Creek for one entire four-year life cycle, after which the surplus eggs will be available to other ponding programs. Fish from Hollow Tree are reared at Silverado Hatchery in Yountville or at the Ten Mile ponds.

Fish at Pudding Creek are raised in four tomato tubs, then taken either to the Ten Mile pond or to Pudding Creek for release. The two projects on Big River use coho eggs taken at Hollow Tree Creek. These are raised in a Zimmer-type hatchbox until the swimup stage, when they are transferred to a concrete raceway built parallel to the stream above flood level.

EXISTING OR POTENTIAL PROBLEMS: Disease problems, such as gill bacteria, reduce production levels. Fish are sometimes released prematurely due to inadequate screening or early washout of the in-stream ponds. A more permanent egg-taking facility is needed on Hollow Tree Creek.

FUNDING SOURCES: Salmon fishermen provide the financial base and personnel to operate the projects. State funds under AB 951 ("Bosco funds") were received in 1981-82 and '82-83. The annual salmon barbeque in Fort Bragg has provided much of the needed operating funds. For the Hollow Tree Creek project, four local lumber companies contributed funds towards its construction. In the past, the Mendocino County Fish & Game Advisory Committee has also loaned funds for fish food. The new state Salmon Stamp program is expected to provide funds for an improved Hollow Creek Station.

GOALS OF GROUP: To restore streams and rivers that do not have fish and enhance other streams to create surplus fish. Primary purpose is to provide salmon to plant in coastal streams to restore natural runs where they have been lost.

SAVE OUR SALMON
(S.O.S.)

c/o Leonard Craig
General Delivery
Pt. Arena, CA 95468

(707) 882-2249

TYPES OF PROJECTS: Pond rearing

YEAR GROUP BEGAN: 1972

LOCATION OF PROJECT(S): Hutton Creek, trib. to Garcia River

PROJECT DESCRIPTION: Rearing ponds consist of 3 doughboy pools. In 1982, silver salmon from the Mad River Hatchery were brought in as fingerlings in May (@200/lb.). About 35,000 (@4/lb.) were released into the Garcia in October, and 40,000 later. In the past, steelhead have also been raised when available from a state hatchery. Current capacity of the project is about 75,000 juvenile fish.

EXISTING OR POTENTIAL PROBLEMS: A limited water source creates water supply problems at times. Project site is on land owned by the timber industry and may not be available in the future.

FUNDING SOURCES: State funds under AB 951 ("Bosco funds") provided \$23,000 for labor, feed, and supplies in 1982. In past years, contributions were raised through an annual Wild Pig Barbeque in Pt. Arena, and loans for fish food were received from the County Fish and Game Advisory Committee.

GOALS OF GROUP:

U.S. FOREST SERVICE
MENDOCINO NATIONAL FOREST

P.O. Box 431
Willows, CA 95988

Covelo Ranger District
78150 Covelo Rd. Covelo, CA 95428

CONTACTS: Emil Ekman, Fishery Biologist, Willows - (916) 934-3316
Rob Finch, Covelo District - (707) 983-6118

TYPES OF PROJECTS: Habitat improvement: barrier removal, riparian planting, in-stream devices, erosion control; Stream surveys.

LOCATION OF PROJECTS: Middle Fork Eel River drainage: Thatcher Creek, Howard Creek, Beaver Creek; Main Eel River above Lake Pillsbury (Lake County).

PROJECT DESCRIPTION: In recent years, the U.S. Forest Service (USFS) has been active in the development of improved or additional spawning and rearing habitat for salmon and steelhead. The agency works closely with the California Dept. of Fish & Game in selecting the highest priority programs.

The Mendocino National Forest has emphasized the summer steelhead habitat of the Upper Middle Fork Eel and the streams above Lake Pillsbury for priority work. Rock barriers are periodically blasted in the Middle Eel when migratory passages for the summer steelhead become blocked in the spring. Riparian plants have been placed along Thatcher and Howard Creeks as well as the Middle Fork. To reduce sedimentation of Thatcher Creek, check dams were placed upstream, a road was reconstructed, and grasslands were reseeded to reduce erosion. Revegetation work was also done on road cuts above Pillsbury.

Since illegal fishing during the summer low flow is believed to be a key factor in reducing survival of the adult summer steelhead, the Forest Service has supported a special patrol from May to October to police this sensitive species' holding area. The patrol also collects habitat and population data.

EXISTING OR POTENTIAL PROBLEMS: Funding for Summer Steelhead patrol discontinued for 1984. Riparian planting not successful.

FUNDING SOURCES: The Sikes Act (PL93-452) provides in part for the funding of fish habitat management and improvement projects. State funds originate from the Energy and Resources Fund (ERF) and are allocated to the USFS. From 1979-1982, expenditures on the Mendocino N.F. totaled \$176,000 for stream improvement.

GOALS: 1) Produce more fish on National Forest habitats through direct habitat improvement, and coordination with other forest resource programs, 2) Intensify fish protection and management activities to maintain and enhance existing populations, 3) Fully realize the recreational potential and related economic benefits derived from fish resources.

U.S. BUREAU OF LAND MANAGEMENT
(BLM)

P.O. Box 940
Ukiah, CA 95428

1585 J St.
Arcata, CA 95521

CONTACTS: Dick Johnson, Fish. Biol., Ukiah 462-3873
Jim Decker, Fish & Wild., Arcata 822-7648

TYPES OF PROJECTS: Barrier removal, riparian planting, stream inventory and survey, erosion control

YEAR BEGAN: 1978

LOCATIONS: So. Fk. Eel - restoration; M. Fk. Eel, N. Fk. Eel, Russian, Navarro - surveys.

PROJECT DESCRIPTION: Most of BLM's stream restoration work in Mendocino County is focused on the South Fork Eel drainage. Through land exchange, BLM will be gaining 8 miles of river frontage adjacent to the Nature Conservancy's holdings on the main So. Fk. Eel in the near future.

Stream inventories, done in cooperation with the Dept. of Fish & Game, identify sites needing improvement. Projects such as barrier removal, riparian planting, and erosion control work are carried out on BLM lands by the CCC crews stationed in the area.

A recent Habitat Management Plan (HMP) for Noonung Creek in the King Range Conservation Area will be used as a model for plans on other BLM managed creeks. Seven miles of Cedar Creek, east of Leggett, are being evaluated in 1983 by consultants for a Habitat Management Plan. Restoration work may begin in 1984.

EXISTING OR POTENTIAL PROBLEMS: Need to know more about stream restoration activities and their success in order to set priorities.

FUNDING SOURCES: BLM's budget funds the survey and HMP work. Improvement work by the CCC is paid through the state's Energy and Resources Fund (ERF).

GOALS: To protect, maintain, and enhance aquatic habitats supporting salmon and steelhead spawning populations and to enhance or restore salmon and steelhead spawning and nursery areas to the maximum extent practical.

ANNUAL SURVEY OF SALMON AND STEELHEAD PROJECTS IN MENDOCINO COUNTY

Please return to: Mendocino County Fish and Game Advisory Committee,
Courthouse
Ukiah, CA 95482

Date:

Name of Group:

Address:

Type of Project: (circle one)

Habitat Improvement

Fish Rearing

Current Budget:

Source of Funds:

Fish Rearing Projects

1. Location and type of facility: (Example: "Mill Ck., trib. to Russian R.
- 6 doughboy pools").

2. Species being reared and egg stock: (Example: steelhead - Eel River).

Do you collect your own egg stock? If so, when and where?

3. Number of fish reared this past season at your site:

Estimated capacity of site:

Give dates of release of fish, size at time of release, and location (s) of release: (Example: 3/3/83 - 5/lb. - 1000 fish to Ackerman Creek, trib. to Russian).

4. Describe marking program used for monitoring and any results to date:

5. Describe any other related projects: (Example: Fish rescue - 5,000 juvenile steelhead - Mill Ck. to Russian R.)

Habitat Improvement Projects.

1. Name of streams receiving effort and approximate location (s): (Example: "Hollow Tree Ck., trib. to So. Fk. Eel - upper and middle reaches).

2. Miles of stream opened or improved during year:

3. Type of restoration:

Debris barrier removal (indicate volume removed)

Rock Barrier removal-

In-stream devices (describe)-

Riparian planting (describe)-

Erosion control (describe)-

Other-

4. Describe monitoring efforts and any results to date:

Stream Surveys and Inventories

1. Location(s) of streams surveys and inventories conducted during past year:

Where can the data be obtained?

LIST OF ANADROMOUS FISH RESEARCHERS
WITH RESEARCH RELEVANT TO MENDOCINO STREAMS

<u>Researcher</u>	<u>Subject</u>
Dr. Tom Lisle, Dr. C.S. Yee Anadromous Fish Habitat Research Redwood Sciences Laboratory Forest Service, USDA 1700 Baywood Dr. Arcata, CA 95521 (707) 822-3691	Stream hydrology, morphology Habitat quality
Dr. Graham Gall 245 Animal Science Bldg. University of California Davis, CA 95616	Fish genetics
Dr. Richard Nishioka Dept. of Zoology 4079 Life Science Bldg. University of California Berkeley, CA 94720	Fish culture - smoltification & time of release
Dr. George Allen Dr. Terry Roelof School of Natural Resources Humboldt State University Arcata, CA 95521	Fish culture Habitat restoration
Dr. Theodore Kerstetter Professor of Biological Sciences Humboldt State University Arcata, CA 95521	Sea Grant Program Manager Fish culture/hatcheries

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GLOSSARY

Anadromous - Fishes which migrate from saltwater to freshwater for spawning.

Angler Day - One person angling for any part of 1 day.

Biomass - The weight of a fish stock or defined portion of a stock.

Brood Year - The year in which the eggs were spawned.

Carrying Capacity - The Concept that the environment can support only a finite quantity of a species, or combination of species, during any part of their life cycle.

Catch or Harvest - Physical possession of fish in a fishery that are either retained or released.

Catch Rate (Sport) - The time spent to catch fish for sport expressed as catch in numbers or pounds per unit of effort.

Catch Rate (Commercial) -

Compensation - Management activities that replace fish stocks in kind or their habitat lost through development or other activities.

Conservation - Planned management of the anadromous fishery to prevent exploitation, destruction, or neglect.

Enhancement - Management activities designed to augment the fish population beyond its historic or existing level.

Escapement - Normally the number of fish remaining for reproduction, but may denote the number remaining after a prior fishery.

Exploitation Rate - The percentage of fish in a population that is removed by fishermen at a given time.

Genetic Diversity - The range of genetic differences among individuals or groups of organisms.

Goal - An enduring statement of purpose.

Hatchery Stock - Any fish resulting from artificial spawning and/or rearing, regardless of the history of the parent stock.

Indigenous Stock - A fish or stock of fish native to a stream, where man has not introduced other stocks of the same species.

Issue - A point of debate or controversy.

Maximum Sustained Yield (MSY) - The greatest number of fish that can be taken without reducing the number of individuals necessary to propagate the species.

Mitigation - The reduction of adverse effects.

Objective - The specific attainable ends toward which effort is directed. When achieved, objectives represent significant and measurable progress toward the attainment of a broader, longer range goal.

Optimum - The best, most favorable.

Outplanting - Transportation and release of fish away from hatchery or rearing site.

Plan - A formalized statement of goals, objectives, and policies; an assemblage of management directions.

Policy - The specification of a definite course or method of action for the attainment of goals and objectives.

Problem - An obstacle to achieving a goal or objective.

Program - An activity or combination of activities carried out to meet an objective.

Recruitment - The number of new fish added to a population at some specific life-history stage.

Rehabilitation - Short-term management techniques that restore fish stocks decimated or destroyed by natural or man-made events.

Restoration - Improving conditions by repairing or rehabilitating.

Run - A number of stocks grouped together on the basis of similarity in migration times.

Salmonid - A family of fishes (Salmonidae) that includes both resident and anadromous forms of salmon, trout, and related species.

Smolt - A Juvenile salmon or trout that is a seaward migrant.

Smoltification - The physiological processes by which juvenile anadromous salmonids adapt to life in the marine environment.

Stock (n.) - Fish spawning in a particular area at a particular time which do not interbreed with any group spawning in a different area, or at the same place in a different season, to any substantial degree. Fish of the same species in adjacent rivers might be managed as a single stock.

Stock (v.) - To provide; to plant or release.

Wild Stock - A fish or stock of fish naturally spawned and reared.

Yield - The weight or number of fish removed by fishing during a defined time period.