NORTH COAST BASINS REPORT

PREPARED FOR THE

CALIFORNIA ADVISORY COMMITTEE ON
SALMON AND STEELHEAD TROUT

PREPARED BY

NORTH COAST BASINS WORKING GROUP

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INTRODUCTION

In 1970, Assembly Concurrent Resolution No. 64 established the Advisory Committee on Salmon and Steelhead Trout, charging them to "develop a program for the preservation, protection, restoration, and enhancement of the salmon and steelhead trout resources of this state...". The Committee produced three reports "An Environmental Tragedy", "A Conservation Opportunity", and "The Time is Now!", which detailed the status of our salmonid populations and the necessary actions needed to protect this valuable and important resource. Despite these reports, the cooperation of the California Legislature and the actions of the Department of Fish and Game, the resource has continued to decline.

In 1983, Senate Joint Resolution No. 19 (Chapter 141) re-established the Advisory Committee on Salmon and Steelhead Trout (ACSST) and provided them with the same directive as the first committee - "to develop a program for the preservation, protection, restoration, and enhancement of the salmon and steelhead trout resources of this state". This new committee has the additional charge of developing a comprehensive salmon and steelhead management plan for the State of California by January 1, 1988.

The ACSST has taken two approaches towards achieving these goals. The first was to have its 11 members (four sport fishing and four commercial fishing representatives, one Native American, one biologist, and one member from the general public) investigate nine issues of general concern that affect state-wide salmonid resources. These issues are: water, economics, habitat, hatcheries, genetics, interagency coordination, law enforcement, research and data collection, and conservation education.

The second approach was to identify 11 geographic regions within the state and establish local working groups in each region. These groups were charged with identifying salmon and steelhead problems and issues at the regional level and developing a Basin Management Plan for each region. They contained a variety of concerned citizens with personal or professional interests in fisheries.

The North Coast Basins Working Group was thusly organized in June, 1985, and has met regularly since that time. The North Coast Basins include the major watersheds from the Oregon border to Humboldt Bay, excluding the Klamath-Trinity basin. The Working Group formed five subcommittees to approach this task on a watershed-by-watershed basis. The subcommittees and their chairpersons were:

Smith River - Jim Waldvogel
Redwood Creek - Jim Harrington/Pat Higgins
Little River - Mitch Farro
Mad River - Nancy Reichard
Humboldt Bay Tributaries - Jud Ellinwood

Each subcommittee met several times in addition to the Working Group meetings. Most of the subcommittees also sponsored public input meetings which were publicized on the radio and television, in newspapers, and by direct mailings. Detailed questionnaires were developed by some subcommittees and distributed to watershed residents, local experts, and others familiar with the drainages. Comments from the public meetings,

analysis of questionnaires, meetings conducted with local experts, and research of published reports and documents were used by the subcommittees and to identify specific problems and solutions within each watershed. Many people contributed to this process by serving on the subcommittees, attending public meetings, filling out questionnaires, or by otherwise providing information. Facilitation of Working Group meetings and report production was provided by local Sea Grant advisors who served as the Working Group "Coordinators".

Early in the process the Working Group decided that for many drainages of the North Coast it would be impossible to develop the comprehensive Basin Plans originally specified by the ACSST. Detailed stream survey data was not available in most cases and none of the volunteers in the Working Group had time to develop this information. It was decided that the best use of our time was to meet with the public and agency experts and develop a list of the major concerns and possible solutions for each basin. The major concerns for the entire north coast area are summarized starting on page 9. Specific concerns and possible solutions are listed for each drainage in Appendices A-F. Those appendices also contain information for each basin which the subcommittees had time or resources to compile.

We hope that this report will support the broad goals of the ACSST in developing legislation to preserve, protect, restore, and enhance the salmon and steelhead resources of the state. We also hope that this report will serve as a blueprint for solving specific problems existing on the North Coast.

DESCRIPTION OF NORTH COAST BASINS

Overview

The North Coast Basins Working Group addressed five drainages in northern California: Smith River, Redwood Creek, Little River, Mad River, and tributaries of Humboldt Bay (Figure 1). With the exception of portions of some Humboldt Bay tributaries, all are in rural, relatively undeveloped areas. The predominant land use along most of the lower drainages is agriculture (predominantly cattle grazing) and timber production is the major land use in the upper reaches. All systems are primarily fed by rainfall and have high flows in the winter and very low flows during summer months. A major hatchery exists on the Mad River and smaller ones are also on the Smith River, Redwood Creek, and along Humboldt Bay. In addition to the hatcheries, enhancement projects are used to supplement salmonid populations in Little River and Humboldt Bay tributaries. Some habitat restoration work has been done in all of the basins.

Smith River Summary

The Smith River is located in the extreme northwestern corner of California in Del Norte County, just south of the Oregon border. The river drains approximately 725 square miles of watershed, most of it within the Six Rivers and Siskiyou National Forests. The Smith River begins in the steep, rocky, densely forested mountains of the Siskiyou Crest and eventually winds its way across a broad flood plain to join the sea approximately 10 miles north of Crescent City.

Fall run chinook salmon and winter run steelhead trout are the major anadromous salmonid species in the Smith River. Coho and chum salmon are not found in great numbers in the Smith River but do spawn in several of the lower river tributaries. Also, remnant runs of spring chinook salmon still exist in the river.

The Smith River is also known as the best sea-run cutthroat trout stream in northern California. Resident rainbow and cutthroat trout are found in the headwaters of many of its tributaries. Runs of anadromous sturgeon, shad, candlefish and lamprey also exist in the system.

Since the disastrous 1955 and 1964 floods, the instream habitat conditions have improved gradually in the Smith River. However, most tributary streams in the Smith are believed to be below optimum fish production. Fish habitat improvement programs conducted by the U.S. Forest Service, state agencies and local enhancement groups have increased in recent years. Habitat problems in the Smith River system still include lack of spawning gravel, sedimentation, and poor summer rearing habitat in several tributaries.

Recent fish populations estimates have not been conducted in the Smith River system. However, accurate California Dept. of Fish and Game estimates for annual production were made in the 1960's. Annual adult production was estimated at 20,000 chinook salmon, 5,000 coho salmon, and 30,000 steelhead trout.**

The Smith River is also known for its scenic beauty, recreational opportunities, outstanding water quality and genetically diverse large chinook salmon and steelhead trout. The California state record steelhead was caught in the Smith River. Portions of the Smith River are in both the state and federal Wild and Scenic River systems and federal wilderness areas are also located within the watershed.

The quality of the watershed of the Smith River system presents some special problems for the salmon and steelhead resources of the river. High levels of some recreational use in the summer (trout fishing, gold mining, etc.) place considerable pressure on juvenile anadromous fish in the system. The ability of the river to clear quickly after heavy rains makes the Smith River the "most fishable river on the North Coast". Sport fishermen can catch adult salmon and steelhead almost every day of the season. These factors increase the pressures on the salmon and steelhead resources of the Smith River.

** A printing error in adult fish production for the Smith River was recorded in the 1986 Annual Report of the Advisory Committee on Steelhead Trout's report "The Tragedy Continues". That estimate was 45,000 chinook, 15,000 coho and 30,000 steelhead.

Redwood Creek Summary

The Redwood Creek basin is entirely within Humboldt County. The basin includes an area of 280 square miles and the creek's main channel length is approximately 63 miles. The basin is characterized by high relief with steep, unstable slopes and narrow valley bottoms. Intensive logging in the watershed began in the 1950's. By 1978, more than 70% of the basin had been logged. This activity, combined with a series of extreme storms, had a severe impact on fish habitat throughout the basin. Redwood National Park and Prairie Creek State Park manage approximately 35% of the watershed. Most of the remaining land is owned by timber corporations.

Populations of chinook and coho salmon, winter and summer steelhead trout and coastal cutthroat are still present in the Redwood Creek system, but at reduced levels compared to historic population estimates. The county operated Prairie Creek Fish Hatchery has been in existence on a tributary of Redwood Creek since 1936.

Redwood National Park is implementing a 15 year, $33 million watershed rehabilitation program designed to reduce erosion and sedimentation within the Park. The Park also conducts a sediment monitoring program and an extensive estuarine management program to provide habitat for salmonid summer rearing. Unfortunately, very little watershed restoration work has occurred in the 65% of the basin that is not under Park management.

Little River Summary

The Little River enters the Pacific Ocean south of Trinidad in Humboldt

County. The 50 square miles of watershed has seen extensive logging activity and is now primarily forested with mature second growth timber. Livestock grazing occurs along the lower few miles of the stream. Chinook and coho salmon, and steelhead and cutthroat trout all utilize Little River. Habitat in Little River is generally in better condition now than it was 30 years ago; however, excellent opportunities still exist for restoration and enhancement of salmonid populations.

Mad River Summary

The Mad River flows northwesterly through 500 square miles of watershed. From its headwaters in Trinity County, it travels almost 100 miles to its mouth at the Pacific Ocean, north of Eureka (Humboldt County). Most of the upper half of the basin is managed by Six Rivers National Forest. Approximately one-third of the watershed is owned by large timber corporations. The remainder is under numerous smaller private ownerships. Forestry is the predominate land use. Livestock grazing and residential development occur over a much smaller area. The Humboldt Bay Municipal Water District's Ruth Reservoir, on the Mad River, stores and controls water which is diverted at a rate of approximately 75 million gallons per day, from a basin at a point 75 miles downstream. The Mad River has populations of coho and chinook salmon and winter and summer steelhead trout.

The lower Mad River receives heavy sportfishing pressure due to its proximity to Humboldt County's population center, and due to large steelhead runs in recent years.

The Department of Fish and Game's Mad River Fish Hatchery has been in operation since 1970. Unlike other state hatcheries, the Mad River Hatchery was built to enhance existing fish populations, rather than as mitigation for habitat destruction. Production goals are 5 million chinook salmon, 1 million coho salmon and 200,000 steelhead. Annual hatchery productin between 1972 and 1985 was extremely variable for each species but averaged 174,000 chinook, 85,000 coho and 603,000 steelhead. General observations of naturally-reproducing fish populations in the watershed indicate that steelhead are relatively abundant and chinook and coho are relatively scarce.

Fisheries restoration and enhancement work in the basin, other than the Hatchery, has been limited. The CCC's have done some barrier removal work in a few tributaries. The Forest Service has done some erosion control work along Pilot Creek, and worked with CDF&G to blast a boulder barrier in the river near Bug Creek in order to improve access for steelhead. The Humboldt Fisherman's Marketing Association reared and released salmon in Lindsay Creek in 1982-83. Redwood Community Action Agency has done various types of habitat improvement work in and along Powers, Mill and Maple Creeks during 1984 to the present.

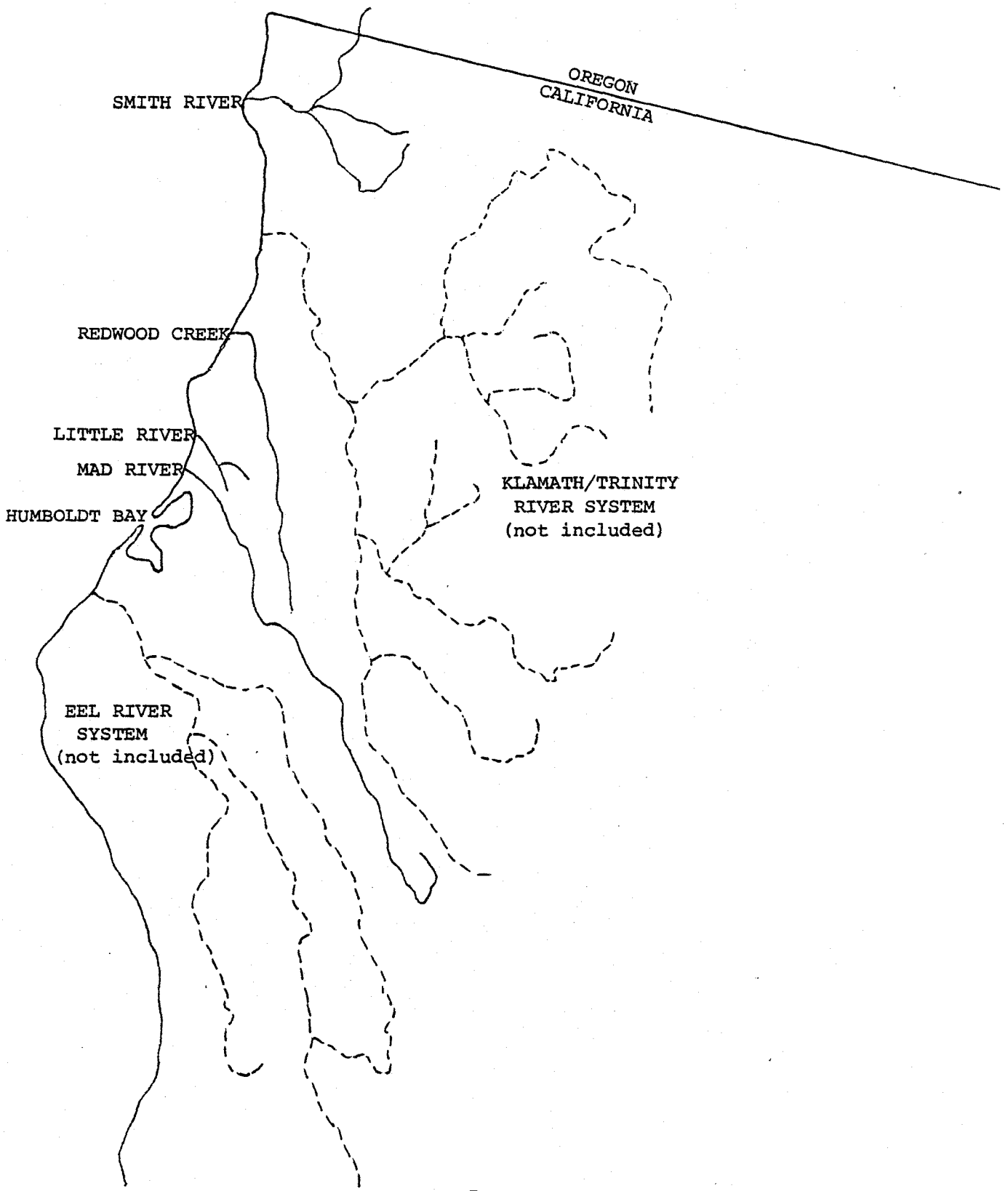
Humboldt Bay Tributaries Summary

Humboldt Bay is the largest estuary between San Francisco and Coos Bay, Oregon. Four major tributaries - Jacoby Creek, Freshwater Creek, Elk River and Salmon Creek - and several smaller streams occupy watersheds totalling

approximately 120 square miles in area.

Coho salmon and steelhead trout are the predominant anadromous species present in the tributaries, with some populations of chinook salmon and cutthroat trout. Much of the habitat historically utilized by salmon and steelhead has been degraded as a result of the logging, agricultural development, and residential expansion that has occurred within tributary watersheds. The floods of 1955 and 1964 also caused major damage to the tributary habitats. Over the years, the salmon and steelhead populations have steadily declined. Recent habitat restoration and population enhancement efforts have begun to reverse this trend; although several persistent problems - the most serious of which are a result of inadequately regulated land use practices - continue to limit the restoration of tributary salmon populations.

FIGURE 1. *Locations of drainages covered by the North Coast Basins Working Group*



MAJOR PROBLEMS/CONCERNS AND RECOMMENDED SOLUTIONS

The following is a description of the five major areas of concern identified by the Working Group. This list is a synthesis of similar lists prepared by each of the five watershed subcommittees (Appendices B - F) All five areas of concern are considered of great importance, so no prioritization is implied by the order of presentation. If a specific problem is not discussed below it does not mean it isn't important. Some problems had insufficient information available to access them or even identify them properly.

I. Enforcement of Existing Sportfishing Laws and Regulations

This issue was considered extremely important by the Smith River, Redwood Creek, and Mad River subcommittees and was also a major concern of the other two subcommittees. Many types of illegal activity were reported, including snagging, gaffing, gillnetting, fishing with hand grenades, and exceeding fish limits. Most people reporting to the subcommittees did not feel that wardens were able to cover north coast drainages adequately.

Until recently, wardens interviewed by the committee considered snagging to be a major law enforcement problem. This is because it was nearly impossible to prove that someone was snagging with a tightline rig (ie, weights below the hook). However, new regulations outlawing tightlining on north coast rivers should minimize or eliminate snagging, in the wardens' opinion. Most of the other illegal activities occur irregularly and, even if staffing was increased several times, the primary way these activities can be stopped is through tips from residents or other fishermen. They considered it extremely important to increase the public's use of CALTIP and for fishermen to exert peer pressure on each other to obey the regulations. Local wardens suggested that by adding two new "floating" warden positions, which could be moved to various drainages as needed and also handle marine enforcement, this district would be adequately covered.

The wardens also stated that a bigger problem than total manpower is the lack of flexibility in hours, caused by recent personnel management decisions at the state level. Previously, wardens would work as many hours as necessary during peak seasons, and either build up "comp time" or be paid overtime for the extra hours. Under present restrictions, if a warden receives a tip regarding illegal activity and he has already used up his hours for the week, he can not respond to it. Needless to say, this has compounded the Department's public relations problems.

The committee recommends the following actions to help remedy the above problems with law enforcement:

1. Increase staffing of CDF&G Wardens by at least two positions in Humboldt and Del Norte counties. This funding should be in addition to existing CDF&G operating costs for this geographical area; they should not be re-distributed from other CDF&G activities. The ACSST should use all in power to influence the legislature to allocate these funds.

2. The Department of Fish and Game should arrange for a variance for

wardens regarding accumulation of "comp time" and overtime. It is our understanding that such a variance already exists for hatchery personnel; it should be used for wardens!

3. Public education should be increased to encourage people to obey fishing regulations, to exert pressure on their peers to obey fishing regulations, and to use CALTIP to report violators. (See Section V - Public Education.)

II. Habitat and Land Use

All subcommittees except the Smith River group indicated that habitat degradation, both instream and in the upper watersheds, was a major problem affecting salmonid populations. Depending on the particular drainage, problems included lack of spawning habitat, lack of rearing habitat, riparian zone degradation, and some cases of severe erosion and siltation. Some Humboldt Bay tributaries have fish passage problems caused by tide gates and culverts.

In many areas poor land use practices during timber harvesting and livestock grazing appeared to be the cause of these problems. On the Mad River, gravel extraction may also be a problem. The subcommittees uncovered a number of "horror stories" of poor land use practices resulting from either ignorance or disregard of proper procedures, and there was concern that existing timber harvest regulations are not always properly enforced.

In some drainages, very site-specific descriptions of problem areas are available (ie, Redwood Creek), but for most drainages there are no comprehensive inventories of fisheries habitat or estimates of population size and distribution. The committee considers this a major problem which must be addressed in order for habitat programs to be corrected most effectively.

The committee recommends the following actions to help remedy the habitat and land use problems described above:

1. Promote better land use practices. Viable incentives for landowners to protect riparian zones and control erosion upslope from riparian areas should be instituted. Specifically, we are suggesting financial incentives in the form of tax breaks or rebates at the federal and state levels to supplement the relatively meager tax breaks available at the county level. We also support expansion of programs such as CFIP to provide matching funds to landowners to correct existing problems. We urge the ACSST to use its power to encourage the legislation to provide these incentives. Existing regulations should be vigorously enforced and fines and other punishments should be severe enough to discourage people from violating them and to pay for restoration of habitat lost due to illegal activities.

2. Improve education of landowners, managers, and equipment operators so that they understand why land use regulations exist and how they

specifically protect fish populations. Many committee members have had experience working with landowners on fisheries restoration projects and have found that after explaining habitat needs of fish many landowners are willing to change their practices. For example, whether or not a tractor operator understands the value of an intermittant stream can have a direct impact on how he treats it. (See Section V - Public Education.)

3. The Department of Fish and Game and other agencies should inventory all salmonid streams on a regular basis and in a uniform manner, and should maintain the resulting data in an accessible format. Our conversations with CDF&G biologists indicate (and our personal observations confirm) that this is impossible at the present staffing levels. The ACSST should use its power to influence the legislature to allocate sufficient funds to accomplish the recommendations listed in Section IV - Data Collection and Research. We estimate that for Humboldt and Del Norte counties this would require at least two additional field biologists and two more seasonal aides.

4. This committee agrees with the adage, "An ounce of conservation is worth a pound of restoration", and believes that protection of existing habitat should always be a priority. Restoration activities should never be used as a trade-off to justify continuing loss of fisheries habitat; however, restoration is a very valuable tool for correcting past mistakes. This committee fully supports local, state, and federal programs to finance restoration activities to improve habitat and re-establish fish populations lost through past practices. We urge the ACSST to use its power to influence the legislature to expand those programs with long term, stable funding.

III. Management

The committee had one general and several specific recommendations regarding fisheries management practices.

1. With the exception of the Smith River, parts of which are designated as a "Wild and Scenic River", and the portions of Redwood Creek in Redwood National Park, no written management plans or goals exist for salmonid populations in the drainages considered by this committee. Such management plans would greatly aid the public in understanding and evaluating proposed fishery activities. (ie, the construction of a permanent diversion weir at the Mad River Hatchery and prioritization of restoration and enhancement projects in the north coast area). We strongly support the Department's plan to develop an EIS for the Mad River weir, and assume that it will address the management goals for the Mad River basin and show how the hatchery's goals coincide with these. We also strongly suggest that management plans for each basin be developed which address the following questions:

   a) What salmonid species are present and what are their population estimates? Have populations been increasing, decreasing, or staying constant?

b) For each species: are populations spawner-limited? If so, is supplemental seeding appropriate? If so, what should be the genetic source of eggs for re-seeding? Do fishing regulations need to be modified or enforcement activities increased to protect spawners?

c) For each species: is habitat the limiting factor? If so, is it spawning habitat, rearing habitat, or barriers to migration? Is habitat modification (restoration) feasible? If so, what species and life stage should be the primary target of these activities? What is the secondary species and life stage that should be targeted? Are there any ongoing land-use problems that are contributing to continued loss of habitat? If so, what are goals for reducing or eliminating these land use problems?

d) As part of this management plan a map showing the distribution of species within the watershed and locations of major habitat problems should be included.

2. The committee expressed concern that present regulations regarding closure of the sport fishery during low water periods were inadequate since they are rigidly tied to gauging station flow rates, and other factors may often apply. We recommend that CDF&G district biologists be given the authority to close a fishery in areas where fish are obviously schooled up and vulnerable, even when flow rates have not dropped to the prescribed level. We urge the ACSST to work with the Fish and Game Commission to accomplish this goal.

3. Punch cards are currently required for the ocean sport fishery and for the Klamath-Trinity sport fishery. Punch cards are useful for limiting the catch of salmonids during the season, verifying that daily limits are adhered to, and for providing trends on catch rates and catch areas that are of use to biologists. We urge the ACSST to work with the Fish and Game Commission to expand the use of punch cards for salmon and steelhead to the other north coast river systems! Users of north coast rivers strongly endorse this management tool.

4. There is presently a daily bag limit of 3 steelhead per fisherman in California. The Smith River subcommittee strongly suggested, and the other groups concurred, that a 2 steelhead daily limit would be more than adequate for any fisherman. We urge the ACSST to work with the Fish and Game Commission to change the steelhead daily bag limit.

5. There was great concern among all subcommittees about the summer "trout" fishery in north coast rivers. We know that most "trout" caught are actually salmon and steelhead smolts and that a summer closure would be justified in some north coast drainages. We urge the ACSST to work with the Fish and Game Commission to reduce the take of salmon and steelhead smolts from north coast streams.

IV. Data Collection and Research

As already mentioned, there is a lack of accessible, standardized data reports for most north coast streams. Different agencies collect information in different ways and for different purposes, and most stream surveys end up stuffed away in file cabinets in various offices within Fish

and Game and Forest Service offices. Similarly, many surveys and projects performed by students and professors from HSU and other academic institutions, or by salmonid enhancement volunteers and contractors end up filed away in equally obscure locations. This information needs to be collected in some standardized manner to provide easy access.

We feel that there is a need for a central computerized data bank which will accept survey information from a variety of sources. The state of Illinois has what they call a "Fisheries Analysis System (FAS)" which approaches what we feel is needed. This is a microcomputer based, comprehensive data base management and analysis system for fisheries management and research. The system is designed to help district fisheries biologists organize their data - from planning samples, to enter raw data, to store data on floppy discs, to analyze it, and to produce tables and graphs for annual reports. Data is uploaded onto a mainframe computer for statistical compilation and statewide fisheries analysis. A description of the system is included in Appendix G. We feel that development of a similar system (one more geared towards stream surveys) should be a priority of the Department of Fish and Game, in conjunction with other agencies and universities. The ACSST should work with the state legislature to obtain funding for this purpose.

A second problem with data collections is the small number of field biologists positions. As described in Section II, the present staff size is inadequate for the number of streams on the north coast which should be regularly inventoried. Again, the ACSST should work with the legislature to provide adequate funding for field staff.

Four major areas which require further research were suggested by the committees. We suggest that the ACSST pursue various sources of funding to insure that this research is conducted

1. Estuaries: Whate role do estuaries play in the lifecycle of north coast salmon and steelhead? Enhancement groups need to know if they should be doing more in the way of protecting and enhancing the estuaries, relative to the work being performed upstream? What are the most effective means of doing this?

2. Economics: What is the economic value of north coast salmon and steelhead in terms of commercial and sport fisheries and their values to "non-consumptive" recreationists? What percentage of the local economy is dependent upon this resource? What is the cost|benefit ratio of restoration and enhancement activities?

3. Predators: What is the effect of predators on salmonid populations in north coast streams? In particular, what component of a run is consumed by mammals and birds? Is this increasing, decreasing, or remaining constant?

4. Genetics: Particularly for Smith River chinook salmon, what is the basic biology of the species? Where do they migrate, are they a unique genetic stock, and what affects the timing of their run? The same questions could also be asked for most of the other north coast salmonid populations.

V. Public Education

LACK OF PUBLIC EDUCATION WAS CONSIDERED THE ROOT CAUSE OF MOST PROBLEMS FACING NORTH COAST SALMON AND STEELHEAD POPULATIONS. This committee feels that the most effective way to deal with this is through a longterm comprehensive program for young people through the county schools. Several programs are being developed along these lines in Humboldt County, including:

1. Classroom aquariums to hatch out steelhead and associated class activities stressing habitat requirements of salmonids are being used in 30 schools. Many agencies and volunteers are helping teachers with this project.

2. The Eureka City School District is developing a "model stream" project which will teach students about stream ecology and which will serve as an extended rearing facility for steelhead fry from the classroom aquariums.

3. The local chapter of the American Fisheries Society has set up a "speakers bureau" of students from Humboldt State University, who will go into elementary and secondary schools to talk about salmon and steelhead ecology.

4. Many local agencies are sending speakers to public schools and providing field trips at hatcheries and other sites for students. A notable example is a ranger from Redwood National Park who has developed the "Salmon Survival Game" which he takes to classrooms for students to learn about various perils faced by salmonids trying to return to spawn.

5. Many salmonid enhancement and restoration groups have involved nearby schools in their projects.

In Del Norte County some of these same activities include:

6. A local 4-H group "adopted" a section of Peacock Creek and Clark's Creek on the Smith River to put in some gravel retention weirs and clear debris jams as a club project while learning about salmon and steelhead biology.

In spite of these activities, local schools are still a long way from having a comprehensive program that will keep reinforcing values learned in some of the special projects mentioned above. It is important to maintain a longterm program that will encourage youth to be good stewards of north coast streams. We are encouraged that a graduate student in education at HSU is working on a comprehensive curriculum on stream ecology and salmonid biology for local school, and strongly support this and similar activities.

Public education for adults is a more difficult problem because it is harder to break old habits than develop new ones. One approach which ties

in to the research needs described in Section IV is to point out the economic value of salmon and steelhead to the local community and the economic consequences of habitat degradation. Neighborhood "Adopt-A-Stream" programs would be ideal, especially in more urban areas along the Humboldt Bay tributaries. There are very few organized sport fishing groups on the north coast, but many can provide a means of developing positive attitudes through educational programs. Wardens suggested that it would be useful to have interpretive displays near intensive fishing areas (such as the lower Mad River) which explain regulations and why they are important. All of these are good ideas which should be pursued locally as well as at the state level.

APPENDIX A.

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APPENDIX B:

SMITH RIVER BASIN REPORT

The Smith River is known for its scenic beauty, recreational opportunities, outstanding water quality, and its genetically large adult salmon and steelhead. It is situated in the northwest corner of California in Del Norte County. The Smith River basin drains approximately 725 square miles of watershed and enter the Pacific Ocean approximately 5 miles south of the Oregon border.

Like most northern California streams, the instream habitat of the Smith River system was greatly affected by the 1955 and 1964 floods. It is believed that most tributary streams in the Smith River are below optimum fish production and habitat improvement programs would do a great deal to improve present salmonid populations.

The Smith River Basin Citizen's Advisory Group (SRBCAG) was formed as a subcommittee to provide information and made management recommendations about the Smith River salmon and Steelhead Resources to the North Coast Basins Advisory Committee. SRBCAG had 30 active members who represented many facets of the community and the fishing industry. Numerous group meetings were held over a two-year period to provide input to the Smith River Basin Plan. The recommendations listed below represent a consensus of SRBCAG members.

Basin Problems and Recommendations

The SRBCAG produced a "Smith River Salmon and Steelhead Questionnaire" that was distributed to Smith River sport fishermen, river guides, landowners, agency representatives and other river resource users. The questionnaire alluded to concerns or problems that resource users perceived as being important. The areas discussed in the questionnaire included habitat, laws and enforcement, predators, artificial propagation, public education, management, water use and quality, and research needs.

Three topics stood out as having significant problems that concerned many committee members and interviewees. These topics were laws and enforcement, public education, and management. The other topics also had some problems and concerns but didn't carry the priorities of the three mentioned. Each topic will be discussed in the following text and management recommendations by the committee are included.

Habitat - The Smith River is probably one of the few North Coast streams that has good instream habitat in most of its tributaries. The 1955 and 1964 floods caused severe scouring to bedrock of upper tributaries and some areas lack adequate spawning gravels. The effects of past logging practices are healing and most lower system tributaries appear to be stabilizing and improving their habitat.

Recommendations - Continue the ongoing stream enhancement programs being conducted by the U.S. Forest Service, Calif. Dept. of Fish and Game, Calif. State Parks, local enhancement groups, Rural Human Services and the University of Calif. Coop. Ext. Service. Encourage the state legislature to continue funding statewide stream enhancement programs and provide adequate funds for local projects in Del Norte County.

Laws and Enforcement - This topic was the area that all committee members and most questionnaire responders indicated as being the serious problem on the Smith River. Poaching, over-limits and in-season fishing regulations are believed to be a real problem related to improving the salmon and steelhead resources of the Smith River. There are some special fishing problems related to the Smith, its closeness to Oregon, and good water quality that needed to be addressed.

The Smith River is the "most fishable" stream on the North Coast. This refers to its high water quality and its ability to clear quickly after heavy rains. There are very few lost fishing days due to water conditions on the Smith. This natural situation places considerable instream fishing pressure on the salmon and steelhead populations.

Oregon has restricted seasonal bag limits on salmon and steelhead (a punch card system is used) and season "in-river closures" on the taking of adult salmonids. When Oregon rivers are closed to fishing, or when seasonal bag limits are reached by their fishermen, they transfer their fishing pressure to the Smith River system.

Recommendations -

1. One Calif. Fish and Game warden services the entire Smith River system. This is inadequate! The high fishing pressure on the Smith River warrants a second Fish & Game warden to regulate the Smith fish resources during peak salmon and steelhead runs and during the opening of deer season. Recent changes in the fishing gear regulations have made it simpler to catch snaggers (tight liners), but poaching is still a serious problem.
2. Immediately institute a punch card system for the taking of adult salmon and steelhead on the Smith River. Include a seasonal bag limit of 20-40 salmon or steelhead on this system. The Oregon laws would then be comparable.
3. Reduce the daily bag limit of adult steelhead from three to two fish. Everyone on the committee feels two steelhead per day is plenty.
4. The committee strongly recommends a closure of the Smith River to all fishing from April 1 to the Saturday preceding Memorial Day weekend. This would allow more steelhead 'runbacks' to escape the fishery and would eliminate the influx of Oregon fishermen during their same closure period.
5. Made it illegal to possess a "spear gun" within 200 feet of any tributary of the Smith River (same law as is present with gaffs). You can legally use a spear gun on the Smith to take suckers, however, the Smith River has such clear water and isolated deep holes that most "spearing" is done on summer steelhead and spring chinook. (Both of these runs are severely depressed in the Smith). It is almost impossible for a warden to enforce this continuous poaching problem. Illegal possession of a spear gun on a river bar would be much easier to enforce.
6. Consider the closure of chinook salmon (not steelhead) fishing after January 1 upstream from the confluence of the South and Middle Forks of the Smith River. There is a great deal of mainstem spawning by chinook in these sections of the Smith and during low water periods the salmon are very confined in the gorge area.

Predators - Several committee members and questionnaire responses indicated that predators (seals, otters and fish ducks) were a serious problem on the Smith River. Large numbers of adult steelhead have been noted with seal bite scars the past several fishing seasons.

Artificial Propagation - The Rowdy Creek Fish Hatchery is the only private, non-profit salmon and steelhead enhancement facility in the State of California. It has been operating on the Smith River since 1967 and rears chinook salmon, coho salmon, and steelhead trout from native Smith River stock to enhance the system.

The hatchery has done an excellent job of enhancing the fish resources of the Smith River during low return years. However, the facility has not been able to reach its full operating capacity. Several committee members would like to know the effects of the hatchery stock on "wild runs" when it reaches full capacity.

Recommendation - The Calif. Dept. of Fish and Game should continue monitoring the possible effects that hatchery reared salmonids may have on wild stocks within the Smith River system. Protection of the genetically diverse wild chinook salmon and steelhead stocks is a high priority.

Public Education - All committee members feel that the long-term goal for improving the salmon and steelhead resources in the Smith River must include youth and public education efforts. The future of the resource depends on the attitude of the users for its survival.

Recommendations - Encourage funding at the state level for introduction of salmon resource material into the public school curriculum. Provide local teachers with the opportunity to participate in fish biology projects and enhancement efforts. Develop enhancement programs (and fund these programs to acceptable levels) that allow public participation in stream enhancement.

Management - A lot of frustration appeared when the topic of management was reviewed in the questionnaire and discussed by committee members. Many members believe that management of the Smith River system is not done using good biological techniques, but rather political considerations. The apparent attitude by some state agencies that the Smith River fish resources are "doing just fine by themselves, because the river is so clean and pure" really irritates the local resources users. Locals have seen the salmon and steelhead resources of the Smith decline dramatically in 30 years and they want to see the problems solved. Solutions to these problems are being recommended under each topic.

Recommendations - Increase the biological staff of Calif. Dept. of Fish and Game to better monitor the fishery resources of the Smith River basin. Improve the interagency coordination of programs and information on the Smith River (Calif. Dept. of Fish and Game, State Parks, Water Resources, U.S. Forest Service, University of California, etc.). Make Dept. of Fish and Game policies consistent with the resource needs and desires of local enhancement groups and fish resource users.

Water - The Smith River has the best water quality of any river in the State of California. Man's use of the water source has begun to show some effects in small tributaries of the Smith River. Future development of residences on some tributaries will greatly affect water levels in streams and water quality from septic systems.

A recent development (1987) has occurred along the Smith River that may have a long-term effect on the water quality of the system. A maximum security state prison is being constructed that will put its treated sewage effluent directly into the Smith River flood plain. The system will infiltrate 1,000,000 gallons per day of tertiary treated sewage to the Smith River. The effects on water quality and fish resources are not known.

Recommendation - The Calif. Dept. of Fish and Game and the Water Quality Resources Board must continually monitor the effects of the state prison water treatment process on the Smith River resources.

Research - There is a general feeling that historic and long-term fisheries information is lacking for the Smith River system. There have been no estimates of salmon or steelhead population sizes since the 1950's. There have been spawning estimates of chinook salmon on Rowdy Creek, Patrick's Creek and Mill Creek since 1979.

Recommendations - Continue the long-term spawning estimates of Smith River tributaries presently being conducted by the U.S. Forest Service, University of Calif. Cooperative Extension, and the Calif. Dept. of Fish and Game.

Request that the Calif. Dept. of Fish and Game fund a project to estimate the total populations of chinook salmon, steelhead trout and coho salmon in the Smith River. Provide funds for an inventory of Smith River spawning habitat and its rearing capacity.

Miscellaneous Topics - There are a few concerns or problems on the Smith River that cross topics previously discussed. These are:

1. Gravel extraction - many committee members felt that gravel extraction was having a negative effect on fish resources of the Smith River but technical information substantiating this fact was lacking. The removal of large quantities of gravel in the system has caused the deep "holding holes" for adult salmon below these extraction sites to silt-in. The lower river historically was used for trolling for fish and now is frequently unpassable with boats at low water levels.

Recommendations - Require that gravel extraction be limited to present specific sites and that a method of deep channel excavation be used, not the present long, flat low gradient extraction over great distances. (This promotes the dropping of bed loads and increases downriver siltation).

2. Agricultural spraying - A major industry (lily bulb farming) is located in the Smith River valley that uses considerable amounts of pesticides. Committee members would like to know the long-term effect of this pesticide use on juvenile salmonid resources and possible groundwater contamination.

Recommendation - Have the Dept. of Water Resources monitor Smith River groundwater sources and inflow areas of the Smith River from lily bulb growing sites.

3. Timber Harvesting Practices - The effects of present timber harvesting on adult and juvenile salmonids in the Smith River system is not well known. Since the Smith River has high water quality and the ability to clear quickly after storms, the possible negative effects are not readily

seen.

Recommendation - Determine the impacts of present timber harvesting on Smith River water quality, water temperature and the habitat.

The Smith River holds a unique salmon and steelhead resource. It is considered to be the prime fishing river of the State of California. The salmon and steelhead runs on the Smith River have a mystique that draws fishermen from all over the United States.

Protecting and enhancing these fine salmonid resources is an important goal for members of SRBCAG and the community. Resource managers and enforcement agencies need to realize the true values of the Smith River salmon and steelhead.

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Salmon and Steelhead Committee

Committee Members and affiliations

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Submitted by Jim Waldvogel

APPENDIX C

REDWOOD CREEK BASIN REPORT

Basin Description

Redwood Creek is 63 miles long with a basin area of 272 square miles. The headwaters arise at 5000 feet at Board Mountain and flow in a northerly direction to Orick. Annual rainfall varies from 70 inches at Orick to 100 inches in the steeper headwater areas of the watershed. Rainfall intensity can be high with 4.5 to 6.0 inches falling over a 24 hour period with a two year recurrance interval.

Redwood Creek has three distinct reaches: an upper reach with a steep gradient of 550 feet per mile and a narrow channel, a middle section with less steep gradient and wider channel in the Redwood Valley area and a gorge below, and the lower reach with a gentle gradient of 11 feet per mile and a wide flood plain. The basin is relatively steep with average hillslope gradients of 26%. Prairie Creek is the largest tributary of Redwood Creek. It joins Redwood Creek at Orick and has a fairly low stream gradient.

Redwood Creek follows the Grogan Fault which separates Franciscan formation materials on the east side of the basin from the mica-schist formations on the west. The Franciscan formation gives rise to particularly unstable soil types with low permeability.

The lower 35% of the Redwood Creek watershed is in Redwood National Park although some of the land in the park was purchased after timber harvest. The remainder of the watershed is largely privately owned, with the exception of a small area controlled by the Bureau of Land Management. Logging is the primary land use in the basin and over 70% of the watershed was cut between 1947 and 1980. Unlike most of the other tributaries upstream, Prairie Creek has not been extensively logged and lies within Redwood National Park.

The 1964 flood covered the town of Orick with five feet of water and when the flood waters receded a thick blanket of silt and numerous logs covered the valley floor. As a result of this flood, the Army Corp of Engineers built a levee from just below Prairie Creek to the ocean.

Salmon and Steelhead Runs: Past and Present

Historically large runs of silver salmon (Oncorhyncus kisutch) entered Redwood Creek. Large chinook salmon (Oncorhynchus tshawytscha) also entered the system with specimens of 65 lbs. recorded. Both silvers and chinook return in the fall. Populations were sufficient to support a commercial net fishery at the turn of the century. Although much of Prairie Creek is optimal silver salmon habitat, observations by fishermen and at Prairie Creek Hatchery indicate chinook are more numerous than silver salmon today. The reverse was historically true according to a 1930 report by Caldwell and Burghduff. Steelhead (Salmo gairdneri) out numbered both salmon species combined in 1960 according to a US Fish and Wildlife report. Recent observations by sport fishermen and hatchery personnel confirm that this relationship still holds true with winter steelhead runs relatively healthy

while salmon runs fluctuate widely at much lower levels. Summer steelhead counts in a 12 mile index section of Redwood Creek have ranged between 6 and 44. Sea run cutthroat trout (Salmo clarki) were numerous in the past and are still present.

Prairie Creek is the site of a county fish hatchery which was originally built to take cutthroat trout eggs. Currently the hatchery raises 40,000 steelhead, 60,000 chinook, and 100,000 silver salmon to the yearling stage. The percent contribution to the basin by the hatchery is unknown as populations estimates for the overall basin have not been compiled. Some input to the committee expressed concern that the hatchery may be decreasing native silver salmon stocks in Prairie Creek. However, there is considerable support for the facility in the community, although consistent funding for the hatchery has been in jeopardy due to county budget short falls. Some salmonids stray from the hatchery into the main flow of Redwood Creek; therefore, wild strains indigenous to the main stem should be protected to maintain genetic diversity.

Basin Problems

Redwood Creek serves as a classic example of cumulative impacts of logging activities (Hagens et al 1986). Tributaries have been blocked by logjams and debris flows. Massive quantities of sediment have buried historical spawning areas. Janda et al (1975) found that sediment carried by the 1964 flood was seven times greater that that carried by similar events in the past due to impacts of land use. The tributaries with steeper gradient and the upper reach of Redwood Creek itself have flushed the increased sediment load caused by erosion and re-established equilibrium (Madej 1984) but pools in the lower river which were important for rearing and as resting places for returning adults have filled in. Madej (1984) indicates that these sediments may not be flushed from the system for over 100 years. The pools in the lower and middle reaches were of particular importance to summer steelhead. Turbidity is very high during winter runoff. Summer stream temperatures are also elevated over historic levels due to removal of riparian vegetation, during logging operations and through bank erosion from increased sediment loads in the channel.

The levee constructed by the Army Corps caused arms of the estuary, the north and south slough, to become isolated and anoxic in the summer. The estuary is critical to young chinook salmon and cutthroat trout and the decrease in this habitat was thought to be linked to the decline of these species (Hofstra et at 1983). Prior to 1982 local farmers breached the lagoon in summer to prevent inundation of their fields which washed immature salmonids into the ocean. Since 1982 Redwood National Park has managed the estuary to prevent premature release of the young salmonids. A project to link the south slough to the main portion of the estuary is being carried out by RNP.

The Army Corps requires that vegetation be removed from the stream channel and the levee in the creek bed near and below Orick. Vegetation removal destroys habitat for juveniles, shade for maintaining optimal water temperature, and cover for returning adult fish. Concern has also been expressed over extensive use of herbicides on the levee for vegetation control and its potential impact on fish.

In addition to habitat degradation, stocks of anadromous salmonids have

also been subjected to intensive fishing pressure both in the ocean and in stream. The lack of riparian vegetation in the creek below Orick makes fish highly vulnerable in low water conditions. Poaching has been a long standing problem in the Orick area with organized snagging efforts being conducted by local residents. Increased enforcement efforts by CDF&G in recent years have somewhat decreased the problem. Reduced ocean harvest by commercial fishermen in the ocean may have been responsible for good returns of salmon reported by anglers in the basin over the last two seasons.

The Highway 101 bypass, which is being constructed, is expected to have substantial impact on tributaries of Prairie Creek. Redwood National Park is monitoring habitat changes related to construction and Caltrans is pursuing mitigation measures.

Basin Economics

The town of Orick depends heavily on tourism as the timber industry has declined as a major employer. Rainfall patterns over the last several winters have allowed considerable opportunity to fish for winter steelhead. Contributions to local business by anglers have been considerable. Recreation studies indicate that 23% of the people living in the west coast states go fishing. This market is just beginning to be tapped and as the watershed of Redwood Creek heals itself the creek will become clearer, and therefore, offer better sport fishing opportunities.

Coupled with the scenic values of Redwood National Park, Redwood Creek could offer very good fishing and an excellent aesthetic experience. The community of Orick could derive the greatest gain from the resource by establishing a sport fishery that targeted clients which were less consumptive users of the resource. Many fishing groups, such as flyfishermen, now stress limited kill, fishing primarily for sport. If such a group could be attracted to Redwood Creek, then economic benefits for the community and job creation could be achieved without greatly diminishing the resource. To fully benefit both from increased sport fishing and tourism associated with Redwood National Park, Orick needs a lodge and better tourist facilities.

Basin Recommendations

1. Educating local school children about the needs of anadromous fish and the importance of preserving these resources can change long term attitudes in the community. Adults should become more aware of the potential benefits to the community of not over exploiting the fish population. If residents, who do not fish or participate in illegal fishing activities, begin to exert social pressure on violators and cooperate with CDF&G on enforcement, then poaching in Orick could be effectively curtailed.

2. Further projects to stabilize areas impacted by past logging are needed. Extensive efforts have been undertaken within Redwood Park, but much of the sediment contributed comes from disturbed private lands. According to studies conducted by RNP, these efforts would focus on maintaining old logging roads or putting them to bed. Future logging

activities in the watershed should not allow such wide spread harvest over such a short period. Closer attention to adequate buffer strips and proper road building and maintenance will help us avoid a repeated cycle of degradation.

3. *Increased enforcement is needed to discourage poaching.* Periodic team sweeps with additional personnel could raise the profile of CDF&G wardens and have a dampening effect on illegal fishing efforts.

4. Avenues should be explored to work with the Army Corp of Engineers to find an alternative management plan for the riparian zone in the levee area which benefits fish populations.

5. A project to link the north slough to the main body of the estuary to increase the estuary's productivity should be considered.

6. Basic information on run sizes and the contribution of wild and hatchery stocks to Redwood Creek should be ascertained. Apart from the summer steelhead, little is known about current levels of return.

7. To increase runs of salmon and steelhead the following suggestions for alternative management, or regulation, should be considered:

   a. Punch cards should be required so that bag limits can be more strictly enforced.

   b. The bag limit for salmon and steelhead should be reduced to two.

   c. Closures are currently enforced to protect salmon in low water conditions in November from Prairie Creek to the mouth. The area upstream from Prairie Creek should also be closed to protect salmon trapped in holes in these reaches.

   d. To protect wild stocks remaining in the main stem of Redwood Creek, fishing regulations could be changed to use of artificial lures only and one fish in possession above Prairie Creek. Such changes would still allow for traditional fishing methods in lower Redwood Creek, but allow for the development of a less consumptive sport fishery in the area of the stream in RNP.

   e. An alternative measure to d. would be to fin clip all hatchery fish and selectively harvest hatchery fish while releasing wild unmarked fish.

   f. Chinook and silver salmon stocks may be so dramatically reduced from historic levels, due to habitat degradation and fishing pressure, that temporary closures to build up seed stock may be prudent.

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Submitted by Pat Higgins

APPENDIX D

LITTLE RIVER BASIN REPORT

Description and History

Little River is a small coastal river emptying into the Pacific Ocean just south of the Humboldt County town of Trinidad. The Little River watershed covers forty square miles and has a main stem twisting and turning for almost sixty miles. Most of the watershed is within a dominating cool, moist coastal weather pattern. It is this moist, even temperature effect that has made Little River a consistent producer of salmon and steelhead trout.

This drainage, like virtually all of the North Coast rivers, has seen extensive disturbance since the early days of settlement. None of the original old growth forests that once crowded the river canyon remain. The early logging of the original forests was completed with little regard for the fish runs of the river. Trees were cut right up to the river and tributaries were often used to skid the giant redwoods out pf tje forest. A lumber mill with its supporting town, railroad, and even a dam historically existed on Little River.

Over the last few decades Little River has been healing from the extremes of abusive land use. A healthy second growth of conifers re-generated on cut over lands and thick riparian vegetation again shades most of the main stem and tributaries. The estuary, though reduced in size, still provides some very productive rearing areas for juvenile salmon and trout.

Current Factors Influencing Salmon Productivity

The current trend in land use will affect the productivity of salmon and trout in Little River for some time into the future. Over 90% of the Little River basin is owned and managed by private lumber companies for the production of lumber. Currently, due to strong markets for forest products, management decisions have been made for intensive harvest within the Little River basin that will continue over the next several years. Logging activity has been accelerating in recent years and is projected to continue until nearly all harvestable trees are cut. Current logging is usually done by management's preferred method of clear cutting. It appears that over half of the basin my be clear cut within a ten year period. Extreme fluctuations of normal runoff patterns are well documented where similar levels of clear cutting have occurred. The cumulative effects of such large scale forest removal are certain to adversely effect the steelhead runs.

Solutions

1. Providing adequate protection for salmon and steelhead habitat when

timber harvesting occurs is needed for Little River. This vital need is best approached with a multi-faceted undertaking that includes incentives to landowners, better enforcement of existing laws, and amending current laws to provide better protection. Many of the details to accomplish this are addressed in the Final Report of the Forest Rules Assessment Team to the State Water Resources Control Board and others will be covered by the ACSST subcommittee on habitat.

2. In some sections of Little River instream structures could be installed to improve spawning conditions that presently exist.

3. Improve habitat conditions in Little River's estuary by the following:
   a. Return the estuary to its original dimensions by dredging or excavation of original channels.
   b. Fence streambanks to prevent overgrazing and replant with native vegetation.
   c. Placement of structures to provide instream cover.
   d. Protecting eroded banks.

Submitted by Mitch Farro

APPENDIX E

MAD RIVER BASIN REPORT

Historical anecdotes provide a context for discussion of the future. Newspaper accounts are the primary source of historical information about the Mad River. Reports in the Arcata Union from the early 1900's indicate run sizes and the local interest in the fishery-

10/12/89 Fish Commissioner Smith's attention is called to the large quantities of sawdust that are being dumped into the river from adjacent mills.

12/1/92 Three tons of fish were caught at the mouth of the river in one day.

11/29/05 In two days, gill net fishermen loaded 30,600 lbs of fish onto the railroad. (The fishermen got $.03/lb.) (The net fishery was outlawed in 1913.)

11/15/17 Photograph of 18 salmon caught with a rod at the mouth of the Mad - one of the fish was 40 lbs., total weight 600 lbs.

Oldtimers interviewed by Ridenhour (1961) all noticed a decline in the fish runs between 1920 and 1930. They also observed that during the early 1900's, the run consisted of three to four chinook for every coho. A decline in size of the fish is apparent, with fish of 30-4- lbs. being common in the early years. The size of chinook runs past Sweasey Dam (see next paragraph) went from a high of 3,139 fish in 1941 to a low of 19 fish in 1959.

One of the most dramatic, recent impacts on Mad River fish populations occurred in the fall of 1970. About six miles upriver from Blue Lake was Sweasey Dam, forty feet high and completely filled with sediment. The dam had supplied water for the City of Eureka for about twenty years, until it filled in. The dam was removed in the summer of 1970 because it was a liability hazard and a barrier to fish unless intensively maintained. The sediment was left in place, to be washed away by the river.

Witnesses surveying the river below the dam after the first storm of the year came upon hundreds of dead and dying chinook, lying on the massive plains of sediment that had been deposited below the dam. These fish were large, 15 to 40 lbs. It appeared that smaller fish could navigate the shallow, braided, extremely turbid channel, but the larger fish could not. Passage has improved since that event but the channel is still very aggraded above and below the dam.

The following discussion of Mad River fisheries issues is based on information gleaned from meetings, questionnaires and interviews conducted during 1986-87. There was general consensus that restoration efforts should focus on salmon, since steelhead are relatively abundant in the basin (except for the summer run). As several specific issues were identified, it became apparent that a comprehensive fisheries management plan for the Mad River Basin would be an extremely useful tool. The summary of problems and recommendations presented next is followed by a discussion of the issues.

Mad River Basin Problems and Recommendations - Summary

HABITAT

Inadequate information is available about condition of habitat

Recommendation: Make appropriate arrangements so that CDF&G can conduct and/or coordinate adequate habitat surveys, on an on-going basis.

Gravel extraction may be limiting formation of pools and growth of riparian vegetation.

Recommendation: Analyze the impacts of gravel extraction and of alternative techniques such as digging deep rather than skimming the surface.

Almost nothing is known about the ecology of the Mad River estuary.

Recommendation: Analyze the role of the Mad River estuary for salmonid production, and identify factors limiting productivity of the estuary.

There are no data regarding the impact of non-human predators on salmonid populations in the Mad River.

Recommendation: Identify the impact of predators on salmonid populations.

Extended periods of turbidity in releases from Ruth Reservoir effect fishability and may effect habitat productivity.

Recommendation: Identify extent of impacts of turbid releases from Ruth Reservoir.

WATER

River flows below Essex at times may not be optimum for fish needs.

Recommendation: Identify instream flow needs below Essex and modify flow agreement with the Humboldt Bay Municipal Water District, if appropriate.

LAWS AND LAW ENFORCEMENT

Poaching is a problem in the Mad River basin.

Recommendation: Initiate a localized public awareness program, with the specific goals of increasing peer pressure to "behave" and to increase cooperation with CDF&G wardens.

Increase warden staffing and improve work schedule flexibility.

The sportfishing scene along the lower Mad is getting crowded and over-consumptive.

Recommendation: Initiate the use of punchcards; and/or fishing zones; specialized closures; and limits based on location, flow level, and other factors.

Riparian vegetation is not adequately protected by laws.

Recommendation: Develop specific regulatory protection for riparian habitat, and establish tax incentives which provide positive incentive for protection and restoration of riparian (and instream) habitat.

ARTIFICIAL PROPAGATION

Little is known about the impacts of Mad River Hatchery operations on wild stocks.

Recommendation: Identify the relationships between Mad River Hatchery

and wild fish stocks.

EDUCATION

Lots of public education is needed about all aspects of salmonid management.

Recommendation: Support the development and use of the "salmonid curriculum". Develop and use ways to reach the adult population.

MANAGEMENT

There is no comprehensive management of Mad River fish and fish habitat.

Recommendation: Prepare a Mad River Basin Fisheries Management Plan.

RESEARCH

Little is known about the contribution of the Mad River to commercial and sport ocean fisheries.

Recommendation: Identify and monitor the ocean harvest of Mad River fish.

Discussion of Mad River Problems and Solutions

HABITAT

Current, comprehensive habitat surveys are needed. These should be performed so that factors limiting production can be confidently identified. A minimum of one additional CDF&G seasonal aide position is needed in order to accomplish this task.

There generally appears to be a lack of good quality spawning and rearing habitat due primarily to sedimentation, which is in large part due to erosion of watershed soils from various sources. Some observers think that the existing habitat is underutilized by salmon. Loss of riparian vegetation is also a problem in some areas. The loss of deep pools, especially in the lower river from the Hatchery to the mouth, is well documented by long-time sport fishermen. Fishermen also note that the duration of the period of turbidity after storms appears to have increased over the decades.

Commercial gravel extraction along the lower Mad River may be limiting the formation of pools and the growth of riparian vegetation. If gravel operators were required to "dig deep" for gravel, rather than skimming gravel off a large surface area, pools could be created and less vegetation would be disturbed. A good opportunity exists here to work with the commercial sector to improve habitat in the lower river.

There is very little information about the ecology of the Mad River estuary. Given the known importance of the role of estuaries in the anadromous salmonid life-cycle, it is imperative that the condition and utilization of the estuary be identified.

Ruth Reservoir has extended the periods of turbidity in the river for

at least 10-15 miles downstream, since turbid storm waters are released over a longer period of time than they would be naturally, and because water is released from the bottom of the dam year-round. This turbidity reduces sportfishing opportunities and possibly fish production. More information is needed regarding the extent of the impacts. HBMWD has applied for, but not received, funds from CDF&G in install a multiport outlet in the dam, at a cost of approximately $750,000.

Several sportfishermen expressed concern about predation on salmonids by seals, otters and birds. There are no data regarding the impact that non-human predation has on salmonids in the Mad River. It would be helpful to identify the degree to which predation affects salmonid production.

WATER

Aside from turbidity problems, water quality in the Mad River basin is observed to be generally quite good. There may be some pollution from septic systems in developed areas of the watershed. Temperatures may be higher than desired in some tributaries and in the main stem due to lack of riparian canopy and lack of adequate water depth. Comprehensive stream surveys should be used to identify any pollution, temperature, or dewatering (due to diversions) problems.

Releases from Ruth Reservoir probably improve summer habitat conditions in the main stem, since flows are higher than they would be under natural conditions. Since the reservoir is not operated for flood control, winter storm flows are not usually affected.

The diversion of water by HBMWD at Essex sometimes results in lower than natural flows in the river below Essex. A "gentlemen's agreement" between CDF&G and HBMWD exists regarding maintenance of instream flows. This agreement should be reviewed in conjunction with an analysis of instream flow needs in the river below Essex. A new agreement should be executed if necessary to improve fish production.

LAWS AND LAW ENFORCEMENT

Sportfishing Law A significant amount of poaching is known to occur in the Mad River Basin, particularly in the lower river and its forested tributaries. Tight-lining was possibly the most common technique in the lower river, but with the recent outlawing of weight-below-the-hook, it is felt that this will no longer be a problem. Gill-netting may now be the primary technique. Blasting has been used in the past. No estimate of number of fish poached is available. Both the law-abiding sport fishing public and CDF&G wardens are concerned with inadequate levels of enforcement and inadequate punishment. The need for significantly increased public awareness, application of peer pressure, and increased warden staffing and scheduling flexibility is covered in the discussion of needs common to all the North Coast basins.

Many people expressed support for establishing more intensive management of sportfishing along the Mad, via such things as punchcards, zones which limit the number of people fishing at one time and the number of fish caught, and closures at certain times/locations based on flow levels, hatchery operations, etc.

A positive aspect that is somewhat unique to the Mad River is that fishing activity is concentrated over a relatively small area and consists

largely of local residents. It would not be too difficult to get the word out about a focused effort to stop poaching, as well as making other improvements in the sport fishing scene. From meetings held during this project, it became apparent that there is a significant communications gap between the fishing public and CDF&G, which could probably be cleared up with just one or two public meetings sponsored by CDF&G. These meetings could serve to clarify situations and start to mobilize the concerned citizenry into a protective force working in cooperation with CDF&G. Several sportfishing people who attended our meetings suggested the creation of an ongoing Mad River citizens' group.

Habitat Law Because timber harvesting is the primary land use activity in the Mad River basin, the Forest Practice Rules and their enforcement are probably the most important regulatory issues. These issues are not unique to the Mad and are being addressed by the Habitat Subcommittee of the Advisory Committee.

Ironically, there is very little protection afforded to riparian vegetation unless it is involved as a part of a commercial timber harvest. Riparian vegetation along the lower Mad and its tributaries has been subject to clearing and suppression for agricultural, flood control, gravel extraction, and residential developments. Regulatory protection for riparian habitat should be developed, starting at the state level. A property tax incentive program should be established which encourages both restoration and protection of riparian zones.

ARTIFICIAL PROPAGATION

There is a wide range of layperson and professional opinion regarding the impacts of the Mad River Fish Hatchery. Many professional concerns are related to the lack of information regarding impact of the hatchery on wild stocks. Many sportfishermen expressed concerns that result from a lack of information about hatchery operations. The meetings held during this project did not bring hatchery representatives and critics together at the same time. It is important that this occur in order to reduce polarization of opinion so that there can be more productive cooperation among concerned entities and individuals.

A management plan prepared for the Mad River should include hatchery and wild stock production management objectives, including consideration of the operation of the proposed in-river weir which is being designed to divert more chinook salmon into the hatchery.

EDUCATION

There was almost unanimous opinion that there is a great need for increased public education regarding the importance of salmon and steelhead and their habitat. The curricula currently being prepared for use in the public schools will go a long way towards increasing fisheries awareness at the grade school level. There are two high schools and several grade schools in or near the Mad River basin.

Adult education presents a greater challenge. One advantage that the Mad River has is that most of the people who live and/or work in the basin are concentrated in a relatively small geographic area. Establishment of a Mad River citizen's committee could help with dissemination of information.

MANAGEMENT

A Mad River Basin fisheries management plan should be prepared which

addresses protection, restoration and monitoring of salmonid populations and habitat. At least one seasonal aide position should be added to the Eureka CDF&G office. The recent addition of a second biologist to this region will be very helpful.

RESEARCH

Research needs pertaining to the Mad River are summarized as follows:

1. Assess and monitor habitat conditions throughout the basin.
2. Assess and monitor distribution and abundance of fish throughout the basin.
3. Identify the impacts of hatchery operations on wild stocks.
4. Identify the impacts of predators on fish production.
5. Evaluate the condition and utilization of the estuary.

REFERENCES

A Survey of the Mad River with Special Reference to King Salmon. 1961. Ridenhour, Richard C., and Johnson, A. Kenneth. Humboldt State College, Arcata, CA. Prepared under Interagency Agreement F-1690 with Dept. of Fish and Game.

Interval of Estuarine Residence and Out-Migration of Juvenile Chinook in the Mad River, CA. 1969. A.K. Tanaguchi. Master's Thesis, Humboldt State University, Arcata, CA.

Proceedings of the Mad River Symposium. April 1971. Humboldt State University, Dean of Public Services, Arcata, CA. 133 p.

Biology of Summer Steelhead in the Mad River, CA. 1975. Arthur C. Knutsen. Master's Thesis, Humboldt State University, Arcata, CA.

Mad River Watershed Erosion Investigation. June 1982. California Department of Water Resources, Red Bluff. 89 pp. + maps.

A large amount of information about the Mad River basin and its fishes is contained in the files of:

Department of Fish & Game, 619 Second St., Eureka, CA;
Mad River Hatchery, Hatchery Rd., Blue Lake;
Six Rivers National Forest, Fisheries Dept., 507 F St., Eureka, CA
Redwood Community Action Agency, Natural Resources Division
904 G St., Eureka, CA.

Submitted by Nancy Reichard

APPENDIX F

HUMBOLDT BAY TRIBUTARIES BASIN REPORT

Basin Description

Located approximately 90 miles south of the Oregon border, Humboldt Bay is the largest estuary between San Francisco and Coos Bay. The bay, which is classified as a multi-basin coastal lagoon is separated from the ocean by long narrow sand spits; has a centrally located mouth; is fourteen miles long and from one-half to four miles wide; and has high and low tidal areas of twenty four and eight square miles, respectively. Known for its unpolluted water and diverse biotic community, the bay contains abundant populations of juvenile and adult populations of several economically important fish and shellfish.

The drainage area of the Bay's four major and several minor tributaries encompasses in excess of 120 sq. miles. The four major tributaries - Jacoby Creek, Freshwater Creek, Elk River, and Salmon Creek - are streams that range in length from eleven to twenty-one miles and drain watersheds seventeen to thirty-one sq. miles in area.** The combined drainage areas of the Bay's smaller tributaries drain a total of approximately thirty-five sq. miles.

The headwaters of the bay's tributaries originate in the forest covered hills which rise from the outer edge of an extensive alluvial plain that rims the bay. Winter and summer flows in these streams vary greatly. In normal rainfall years, winter streamflows are elevated by the runoff associated with the frequent occurrence of storm events between November and April. There is virtually no rainfall during the summer and streamflows that are dependent on the release of groundwater steadily diminish as summer progresses. Extreme fluctuations in seasonal rainfall can have profound effects on anadromous salmonid populations. By summer's end in low rainfall years, the amount of suitable juvenile rearing habitat shrinks and increased mortality of juveniles occurs. Extremely heavy winter rainfall will often reduce the spawning success of adults the consequence of flood waters scouring the gravel or depositing silt on top of redd sites.

** The drainage areas, main channel lengths, and stream orders of the Bay's major tributaries are as follows:

	Drainage Area (sq mi)	Length (mi)
Jacoby Creek	17.3	11.1
Freshwater Creek	30.9	16.5
Elk River	28.6	21.1
Salmon Creek	16.8	13.0

Basin Description

Coho salmon and steelhead trout are the predominant anadromous salmonid species in the Bay's 4 major tributaries, although some chinook salmon are also found in most of these streams. Cutthroat trout dwell in headwater areas above impassable barriers as well as in the lower sections of these streams, and are the most numerous salmonid species inhabiting the bay's smaller tributaries. Some of the smaller streams also support extremely small populations of coho salmon.

Over the past hundred years stream environments within the Humboldt Bay basin have been significantly altered by land use. The three activities which have had the largest impact on the streams are logging, residential development, and agricultural development. The forest-covered hillsides have been intensively logged twice: first, between 1870 and 1910 when most of the old growth redwoods were cut and again in the 1940's and 50's when primarily old growth fir as well as second growth redwoods were harvested. Aside from these periods, timber harvesting on a smaller scale has been ongoing throughout the past century. Associated with the logging booms were the establishment of numerous residential areas within the stream corridors and on the edges of the narrow valleys. The coastal plain and much of the marsh land that borders the bay has been converted to grazing land. This was accomplished by the construction of a complex network of dikes, tide gates, and levees that prevented tide water and winter floods from overflowing on to the land. Two recent one hundred year flood events that occurred in 1955 and 1964 have also caused massive habitat destruction within these tributaries.

Since the turn of the century Humboldt Bay salmon and steelhead populations have steadily declined, and only in the past decade has this trend begun to reverse itself. In the case of tributaries such as Ryan Creek and Salmon Creek the salmon populations have been completely destroyed. In others such as Freshwater Creek and Elk River, dramatic increases in salmon spawner escapement have been observed in recent years; although the sobering fact is that these numbers are still low compared to historical run sizes. In the winter of 1985 an estimated 400 coho and 100 chinook spawned in Freshwater Creek. This was considered to be the best return in the past two decades, and was exceeded only by Elk River's escapement.

The salmonid habitat in some of the smaller tributaries has been so degraded that restoration of these streams is economically unfeasible. Disregarding these extreme cases, the remaining tributaries contain enough usable habitat, as well as restorable habitat, that they could support much larger populations of salmon and steelhead than presently exist. However, a significant increase in the size of these populations cannot be achieved by relying solely on population enhancement and habitat restoration. The major problems currently affecting the fish are not all habitat problems; they also include public education, management, and enforcement problems.

Land use problems are of special concern because of the magnitude of their impact on the fisheries and the difficulty of solving them. In recent years some of the causes of the damage done to anadromous salmonid habitat in Bay tributaries (destructive logging practices, for instance) have been partially remedied through regulation. Additionally, a significant amount of degraded stream environment in the Humboldt Bay watershed has been rehabilitated. In spite of this progress, several detrimental land use practices (ie, channelization of the lower sections of the bay's tributaries, installation of tide gates at stream mouths, and the removal of

flood plain riparian vegetation) have yet to be addressed.

It is important to point out that the process of changing traditional land use practices in the bay watershed is made difficult by the existing pattern of land ownership. Virtually all of the land adjoining the Bay's tributaries is owned by timber companies and ranchers. Proposals for stream restoration projects that would require taking land out of production or have the potential for disrupting use of the land are usually rejected by landowners. There is presently little incentive for them to take land out of production without some form of compensation. Conversely, landowners have for the most part cooperated with and often provided assistance to restoration projects when projects did not significantly conflict with the use of their land.

Of the many problems perceived to be affecting Humboldt Bay salmon and steelhead populations, the ones listed below (in descending order of importance) were determined to have the most impact. To make this determination, the six biggest problems identified in each drainage** (all of the small tributaries were treated as if they were in a single drainage) were combined into a single list and each problem was assigned a ranking that corresponded to the number of drainages in which it was a major problem. No attempt was made to take into account the importance of each problem within specific drainages.

Each problem listed below is followed by a set of abbreviations that denote the drainage in which it was considered a major problem; the abbreviations are: (JC) Jacoby Creek, (FC) Freshwater Creek, (ER) Elk River, (SC) Salmon Creek, (ST) small tributaries. The problems are followed by proposed solutions. Among the five drainages only nine problems were perceived to be of major importance. This relatively small number not only emphasizes the degree of similarity of problems between drainages, but more importantly, it indicates that solving a few problems could vastly improve the current situation. It was the consensus of the drainage coordinators that if the first three problems were remedied, tributary production levels might be restored to near optimum levels.

** Information about problems within each drainage was collected by a drainage coordinator and was obtained through personal contacts at public meetings, and from the distribution of questionaires. A list of the coordinators and some of the people who contributed information is provided at the end of this report (some wished to remain anonymous).

Basin Recommendations

1. Increased soil erosion on land adjacent to streams resulting from land use practices such as logging, road building, livestock grazing, etc. Both spawning and rearing habitat have been and continue to be degraded by the deposition of sediment in all tributaries. Increased

sedimentation is considered to be the primary cause of habitat degradation in Humboldt Bay tributaries. (JC, FC, ER, SC, ST)

Recommendation: Tighten land use regulations (especially timber harvest regulations); strengthen revegetation requirements; and provide more incentives to revegetate.

2. Current land use regulations don't adequately protect riparian zones. Widespread destruction of riparian vegetation growing along the banks of the Bay tributaries, especially along the lower reaches, is considered to be another large cause of habitat degradation. Loss of riparian vegetation removes a source of cover, food, shade, and instream structure. Increased water temperatures and lack of cover have made sections of streams uninhabitable that are essential to the juvenile salmonid rearing environment. (JC, FC, ER, SC, ST)

Recommendation: Provide incentives for landowners to take stream corridor areas out of production so that disturbed riparian zones can be revegetated.

3. We believe the public would assume a larger role as stewards of their local salmon and steelhead resource if they became more aware of the need to foster this relationship. Specific problems include the lack of a comprehensive salmonid education program in the local public schools, and little "outreach" by resource management agencies, restoration groups, and local governments. (JC, FC, ER, SC, ST)

Recommendation: Educators in our area have begun to introduce the topic of fisheries resource conservation at most grade levels. Building fisheries conservation concepts into a wide variety of courses at all grade levels will reinforce and expand on the concepts desired by resource users. The County School Board needs to adopt a policy that would integrate fisheries educational material into curricula using a standardized comprehensive approach.

Experience with adults indicates that two methods are most appropriate to promoting conservation of the Bay tributaries salmon and steelhead resources: 1) maintaining a high profile in local media, and 2) concentrating public outreach efforts on community social and charitable organizations whose members are active in community affairs and often wield influence within the business community and, local government.

4. CDF&G's management of the Bay tributaries salmonid resource is often based on inadequate and often inaccurate field information. Virtually no information about the biological role of sloughs' and the Bay's estuarine environment exists despite the fact that lower stream sections have been blocked, filled, diverted, and dredged. Bay fisheries, such as the net harvest of anchovies, may be jeopardizing the survival of smolts and sub-catchable sized adult salmonids. Obtaining this information is essential to the wise development and cost-effective implementation of management policies. (JC, FC, ER, SC)

Recommendation: Provide the necessary manpower and resources needed to collect and update this information. Integrate the information developed by inland and marine fisheries biologists into a comprehensive management plan.

5. Poaching and inadequate enforcement of fish regulations is a major problem in some drainages. Few stream corridor residents are familiar with the regulations that pertain to their stream. (FC, ER, SC)

   Recommendation: More enforcement and public education are considered to be the best solutions to this problem.

6. CDF&G lacks the budget, resources and personnel at the local level to adequately manage the salmon and steelhead resource. (FC, ER, SC)

   Recommendation: Increase CDF&G funding by means other than increasing license fees. Restructure the Department to make it more efficient; if necessary, reduce the number of administrative personnel in order to increase the number of district biologists and seasonal aides.

7. In some tributaries salmon and steelhead populations have decreased because the migration of adults to spawning areas has been blocked by the placement of culverts (Jacoby Creek); the installation of tide gates (mouth of Salmon Creek); or by debris jams. Obstacles that block the downstream passage of juveniles exist in many of the tributaries. (JC, SC, ST)

   Recommendation: In many cases culverts and tide gates can be modified permitting passage of salmonids. Removal of jams is a relatively simple task. Long term funding for local restoration groups needs to be developed. In addition, the California Conservation Corps has contributed greatly to the restoration of Bay tributaries and should receive the financial backing it needs to continue its work in the Bay basin.

8. Inadequate rearing habitat for juvenile salmon and steelhead is a serious problem in at least two drainages. A lack of cover that is normally provided by large woody debris, deep pools, and sufficient canopy are some of the major structural deficiencies that make stretches of these streams uninhabitable. Another harmful practice is the diversion of water for irrigation; lowered water levels make sections of stream uninhabitable and prevent juveniles from moving out of less favorable areas into areas with better habitat. (JC, ST)

   Recommendation: Refer to the solutions proposed for problems 1 and 2.

9. Urban pollution. Many of the small tributaries have been polluted by point and non-point sources within their drainages (septics). (ST)

   Recommendation: More stringent enforcement of existing regulations and enactment of laws that will further restrict the discharge of pollutants within and adjacent to stream corridors.

Restoration and Enhancement Activities

In the past decade, several organizations and agencies have participated in efforts to restore the stream habitat and enhance the salmon and steelhead populations of Humboldt Bay's tributaries. The California Conservation Corp (CCC) has removed and modified debris jams on all of the major tributaries and completed numerous bank stabilization projects. In addition they have provided valuable assistance to other groups doing restoration and enhancement work within the Humboldt Bay watershed. The Redwood Community Action Agency (RCAA) has completed several rehabilitation

projects on Jacoby and Freshwater Creeks and modified a tide gate at the mouth of Salmon Creek that had been blocking the upstream migration of salmon and steelhead for decades.

The Humboldt Fish Action Council (HFAC) has, until this year, been focusing their efforts solely on the restoration of habitat in Freshwater Creek and enhancement of the Creek's salmon populations. It operates a salmon trapping and spawning station on Freshwater Creek and two rearing facilities, one on Cochran Creek and the other at King Salmon. HFAC habitat restoration projects include installation of instream structures and modification of culverts to permit passage of both juvenile and adult salmonids. The City of Arcata, in cooperation with Humboldt State University, has contributed to the enhancement of salmon and steelhead populations in Jacoby and Jolly Giant Creeks. Before being planted, the juvenile salmonids are reared in the City's sewage oxidation ponds. In addition, the City recently completed rehabilitation projects on Janes Creek and Jolly Giant Creek, including restoration of the creek's entire slough channel. Lastly, the Elk River Timber Co. recently completed a large scale rip-rapping project on Elk River.

SURVEY PARTICIPANTS

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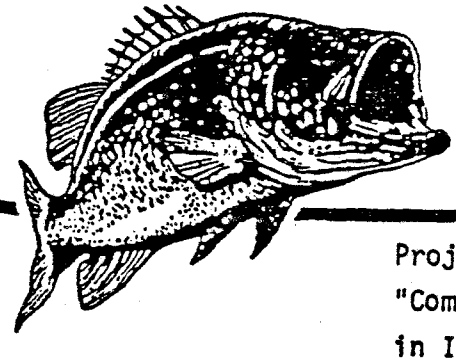
ILLINOIS NATURAL HISTORY SURVEY

FISHERIES ANALYSIS SYSTEM (FAS):
DATA MANAGEMENT AND ANALYSIS FOR FISHERIES MANAGEMENT AND RESEARCH

Aquatic Biology Section

by
Peter B. Bayley and Douglas J. Austen



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"Comparative Analysis of Fish Communities
in Impoundments"

The Fisheries Analysis System (FAS): A Brief Description

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What is the Fisheries Analysis System?

The Fisheries Analysis System (FAS) is a micro-computer based, comprehensive data base management and analysis system for fisheries management and research. The system is designed to help district fisheries biologists organize their data--from planning samples, to entering raw data, to storing data on floppy disks, to analyzing it, to producing tables and graphs for annual reports. Additionally, the system allows us to upload raw data onto a mainframe computer for statistical compilation and statewide fisheries analysis.

Presently in Illinois, FAS is used by all Illinois Department of Conservation (IDOC) district fisheries biologists and several other fisheries personnel. Each biologist has been trained and has been equipped with necessary hardware and software. Each biologsit is responsible for his own data input, quality control, and local analysis. By delegating the responsibility of data input and analysis to field biologists rather than to a central data processing group, we believe that data integrity is maintained at a high level. Local data analysis and the flexibility of FAS allows the field biologist to analyze the data in ways that he considers most appropriate, considering actual field conditions and the vicissitudes of natural systems.

On a statewide basis, FAS allows us to transfer data to a mainframe computer-based management system. This capability, along with recently adopted standard sampling guidelines for data collection by the IDOC, will permit computation of fisheries statistics, such as condition indices and growth rates, statewide. The large size and quality of this data base will give researchers greater statistical power when examining factors influencing fish populations.

Hardware and Software Requirements

The FAS requires:

Apple IIe professional system, C.Itoh Prowriter printer (8510 series), and Graphicard or Grappler+ interface
The General Manager System (Sierra On-Line, Inc.)
FAS program disks:
(1) Working Programs/Blank-Forms.DOC9 and DATA ENTRY:DOC9 disk; and
(2) Working Programs/Blank-Forms.DOC9 and TABULAR OUTPUT disk
Isys Forth Graphics Programs Disk (Illyes Systems, P.O. Box 2516, Station A, Champaign, IL 61821)
Statistical Processing System (optional) (public domain, G. J. Buyhoff, School of Forestry and Wildlife, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061)
Blank diskettes for data storage.

Data Base Organization

FAS uses the commercial hierarchical data base "General Manager" as the foundation of the system. The data base structure, or blank forms, is organized into nine linked screens that describe actual data charactersitics (Appendix 1). This system, called DOC9 data base, handles all information normally collected by fisheries biologists in standard surveys.

Three terms are used to describe the data base components: screens, fields, and records. In DOC9, there are nine screens. Each screen contains a template for a specific data arrangement. For example, screen 2 contains information on the lake, such as name, maximum depth, and acreage. Within each screen are several fields. A field is the title for a specific piece of information. In screen 2, the fields are lake, season, station number, county, acreage, *etc.* A record is the actual data entered. For screen 2, it would be the actual name of the lake, number of acres, *etc.* A screen can have one record, as in screen 1, or it can have thousands, such as screen 8 where data on each individual fish is a separate record. General Manager is flexible in terms of field labels, types, and sizes. For specific uses, field characteristics may be changed and the data reorganized.

Data Input

Prior to sampling a water body, the area is divided into stations and samples. Stations denote large divisions of the lake and are areas where separate water chemistry data are collected. For example, a lake may be divided into two halves by a causeway with one side as station 1 and the other as station 2. Samples refer to the actual fish collection sites for a type of gear. Each gear is given a single letter code (Appendix 2) and each use of that gear in the section is ordered numerically. Thus, in station 1, the first electrofishing run is coded 1-E1 and the second as 1-E2. The first gillnet set in station 1 is 1-G1. Likewise, at station 2 the first electrofishing run is 2-E1.

Station and sample data are recorded on a field data sheet (Appendix 3), which has space for physical and chemical information describing the station and specific information for each individual sample (*i.e.*, date, effort, subsampling, weed cover, comments). Permanent sample information (screen 3) is collected to characterize the sites, such as slope of the shore and amount of rip-rap that may affect sampling efficiency.

FAS was designed not only for ease of data handling once collected but also to increase the efficiency of actual field data collection. Fish data are recorded on separate length frequency-length/weight field data sheets (see example in Appendix 4). All fish are measured to the nearest centimeter and recorded in the length-frequency portion (upper half) of the data sheet. However, only a subsample of fish are measured to the nearest millimeter and gram. For example, IDOC accurately measures and records three fish per centimeter group during standard surveys. FAS then computes a GM length-weight regression from these data and uses that regression to compute total weight of sampled fish from the complete length-frequency information.

Age data are also easily handled by FAS. Envelopes are numbered before a sampling trip. When a scale or otolith sample is taken, the number of the envelope used is recorded on the data sheet. When this information is entered into DOC9, a distinct screen 9 for each fish is automatically created. When the scale or otolith is read, the envelope code is retrieved from the data base and the age entered, circumventing recording additional data on the envelope and saving time.

Subsampling is also accomodated by FAS. Several species or species groups (*i.e.*, gizzard and threadfin shad or black and white crappie) may be subsampled for a certain percentage of an electrofishing run. When the subsampling percentage is entered, the system automatically scales up the length-frequency distribution by that amount.

The data entry program was specifically designed for easy data entry. Formats were programmed to mimic actual data sheets, such as length-frequency distribution and depth profiles. Because the video screen is similar in appearance to the data sheet, data entry is fast and efficient with a minimum of errors.

Space Limitations

General Manager allows a data base to be extended to 117 floppy disks; information on most lakes takes less than one disk. Data from very large water bodies, such as the 10,833-ha (26,000-acre) Carlyle Lake, may be contained on less than two disks.

Analysis and Output of Data

Data output is accomplished through a combination of programs written in Applesoft (for tabular output) and Isys Forth (for graphics) languages. Graphic outputs are in double high-resolution mode and may be "dumped" to any Centronics-type printer (drivers are being developed for Hewlett-Packard plotters).

FAS consists of a set of programs linked to each other by criteria and data files (Appendix 5). Data files may be written as DOS 3.3 files on the disk or saved in auxiliary memory for fast, but temporary, storage and retrieval. Data files may presently be in two forms: (1) a raw length-frequency file (RLF) consisting of the number of fish per centimeter group, or (2) a length-weight-age (LWA) file consisting of individual fish lengths, weights, and ages. These files may be used directly to produce tables or graphics or they may be analyzed by other programs, such as the Statistical Processing System (S.P.S., Buyhoff *et al.* 1982) (the format of RLF and LWA files allows direct input into S.P.S. as data files).

Once in FAS, the production of tables and graphs is simply a matter of choosing selection criteria and determining the output form desired (Appendix 6). FAS automatically creates the data files and calculates the statistics to be graphed or printed in tables.

The user first selects the desired portion of the data base by creating a file of selection criteria, consisting of choices for region, district, lake, season, station, year of sample, and sample codes and species. Any possible combination of stations, samples, and species may be selected. These selection criteria are then stored in the random access text file "criteria."

Once selection criteria are saved, the user chooses one of the several tables or graphic displays. Options include:

1. Stock index table--contains proportional stock density (PSD), young-adult ratio (YAR), and relative stock density (RSD) (Appendix 7).

2. Length-frequency/condition table--contains frequency of fish per length group, percent frequency, mean weight (in English and metric units), mean relative weight (Wr), and mean LeCren condition factor (Kn) per length group (Appendices 8 and 9).

3. Catch per unit effort table--a series of three tables that contain catch in *numbers* and weight (English and metric units) per *time* period for each sample gear and species selected (Appendices 10-12).

4. Summary table--contains list of all species selected, the number in the sample, and the minimum and maximum length of sampled fish (Appendix 13).

5. Length-frequency histogram--plot of number of fish per size group; may include ages if data were obtained (Appendix 14).

6. Length-weight plot--log-log plot of length and weight of sampled fish (Appendix 15).

7. Relative weight per length group plot--relative weight plotted on the ordinate and length group on the abscissa, with 95% confidence intervals (Appendix 16).

8. Length at age plot--shows individual length of aged fish (Appendix 17).

9. Mean length at age plot--plots mean length at age based on user interpretation of length-frequency data (Appendix 17).

10. Grouping--data for relative weight plot and mean length at age plot can easily be grouped into age classes or any other desirable groupings and then plotted.

NORTH COAST BASINS REPORT

PREPARED FOR THE

CALIFORNIA ADVISORY COMMITTEE ON
SALMON AND STEELHEAD TROUT

PREPARED BY

NORTH COAST BASINS WORKING GROUP

AUGUST, 1987

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INTRODUCTION

In 1970, Assembly Concurrent Resolution No. 64 established the Advisory Committee on Salmon and Steelhead Trout, charging them to "develop a program for the preservation, protection, restoration, and enhancement of the salmon and steelhead trout resources of this state...". The Committee produced three reports "An Environmental Tragedy", "A Conservation Opportunity", and "The Time is Now!", which detailed the status of our salmonid populations and the necessary actions needed to protect this valuable and important resource. Despite these reports, the cooperation of the California Legislature and the actions of the Department of Fish and Game, the resource has continued to decline.

In 1983, Senate Joint Resolution No. 19 (Chapter 141) re-established the Advisory Committee on Salmon and Steelhead Trout (ACSST) and provided them with the same directive as the first committee - "to develop a program for the preservation, protection, restoration, and enhancement of the salmon and steelhead trout resources of this state". This new committee has the additional charge of developing a comprehensive salmon and steelhead management plan for the State of California by January 1, 1988.

The ACSST has taken two approaches towards achieving these goals. The first was to have its 11 members (four sport fishing and four commercial fishing representatives, one Native American, one biologist, and one member from the general public) investigate nine issues of general concern that affect state-wide salmonid resources. These issues are: water, economics, habitat, hatcheries, genetics, interagency coordination, law enforcement, research and data collection, and conservation education.

The second approach was to identify 11 geographic regions within the state and establish local working groups in each region. These groups were charged with identifying salmon and steelhead problems and issues at the regional level and developing a Basin Management Plan for each region. They contained a variety of concerned citizens with personal or professional interests in fisheries.

The North Coast Basins Working Group was thusly organized in June, 1985, and has met regularly since that time. The North Coast Basins include the major watersheds from the Oregon border to Humboldt Bay, excluding the Klamath-Trinity basin. The Working Group formed five subcommittees to approach this task on a watershed-by-watershed basis. The subcommittees and their chairpersons were:

Smith River - Jim Waldvogel
Redwood Creek - Jim Harrington/Pat Higgins
Little River - Mitch Farro
Mad River - Nancy Reichard
Humboldt Bay Tributaries - Jud Ellinwood

Each subcommittee met several times in addition to the Working Group meetings. Most of the subcommittees also sponsored public input meetings which were publicized on the radio and television, in newspapers, and by direct mailings. Detailed questionnaires were developed by some subcommittees and distributed to watershed residents, local experts, and others familiar with the drainages. Comments from the public meetings,

analysis of questionnaires, meetings conducted with local experts, and research of published reports and documents were used by the subcommittees and to identify specific problems and solutions within each watershed. Many people contributed to this process by serving on the subcommittees, attending public meetings, filling out questionnaires, or by otherwise providing information. Facilitation of Working Group meetings and report production was provided by local Sea Grant advisors who served as the Working Group "Coordinators".

Early in the process the Working Group decided that for many drainages of the North Coast it would be impossible to develop the comprehensive Basin Plans originally specified by the ACSST. Detailed stream survey data was not available in most cases and none of the volunteers in the Working Group had time to develop this information. It was decided that the best use of our time was to meet with the public and agency experts and develop a list of the major concerns and possible solutions for each basin. The major concerns for the entire north coast area are summarized starting on page 9. Specific concerns and possible solutions are listed for each drainage in Appendices A-F. Those appendices also contain information for each basin which the subcommittees had time or resources to compile.

We hope that this report will support the broad goals of the ACSST in developing legislation to preserve, protect, restore, and enhance the salmon and steelhead resources of the state. We also hope that this report will serve as a blueprint for solving specific problems existing on the North Coast.

DESCRIPTION OF NORTH COAST BASINS

Overview

The North Coast Basins Working Group addressed five drainages in northern California: Smith River, Redwood Creek, Little River, Mad River, and tributaries of Humboldt Bay (Figure 1). With the exception of portions of some Humboldt Bay tributaries, all are in rural, relatively undeveloped areas. The predominant land use along most of the lower drainages is agriculture (predominantly cattle grazing) and timber production is the major land use in the upper reaches. All systems are primarily fed by rainfall and have high flows in the winter and very low flows during summer months. A major hatchery exists on the Mad River and smaller ones are also on the Smith River, Redwood Creek, and along Humboldt Bay. In addition to the hatcheries, enhancement projects are used to supplement salmonid populations in Little River and Humboldt Bay tributaries. Some habitat restoration work has been done in all of the basins.

Smith River Summary

The Smith River is located in the extreme northwestern corner of California in Del Norte County, just south of the Oregon border. The river drains approximately 725 square miles of watershed, most of it within the Six Rivers and Siskiyou National Forests. The Smith River begins in the steep, rocky, densely forested mountains of the Siskiyou Crest and eventually winds its way across a broad flood plain to join the sea approximately 10 miles north of Crescent City.

Fall run chinook salmon and winter run steelhead trout are the major anadromous salmonid species in the Smith River. Coho and chum salmon are not found in great numbers in the Smith River but do spawn in several of the lower river tributaries. Also, remnant runs of spring chinook salmon still exist in the river.

The Smith River is also known as the best sea-run cutthroat trout stream in northern California. Resident rainbow and cutthroat trout are found in the headwaters of many of its tributaries. Runs of anadromous sturgeon, shad, candlefish and lamprey also exist in the system.

Since the disastrous 1955 and 1964 floods, the instream habitat conditions have improved gradually in the Smith River. However, most tributary streams in the Smith are believed to be below optimum fish production. Fish habitat improvement programs conducted by the U.S. Forest Service, state agencies and local enhancement groups have increased in recent years. Habitat problems in the Smith River system still include lack of spawning gravel, sedimentation, and poor summer rearing habitat in several tributaries.

Recent fish populations estimates have not been conducted in the Smith River system. However, accurate California Dept. of Fish and Game estimates for annual production were made in the 1960's. Annual adult production was estimated at 20,000 chinook salmon, 5,000 coho salmon, and 30,000 steelhead trout.**

The Smith River is also known for its scenic beauty, recreational opportunities, outstanding water quality and genetically diverse large chinook salmon and steelhead trout. The California state record steelhead was caught in the Smith River. Portions of the Smith River are in both the state and federal Wild and Scenic River systems and federal wilderness areas are also located within the watershed.

The quality of the watershed of the Smith River system presents some special problems for the salmon and steelhead resources of the river. High levels of some recreational use in the summer (trout fishing, gold mining, etc.) place considerable pressure on juvenile anadromous fish in the system. The ability of the river to clear quickly after heavy rains makes the Smith River the "most fishable river on the North Coast". Sport fishermen can catch adult salmon and steelhead almost every day of the season. These factors increase the pressures on the salmon and steelhead resources of the Smith River.

** A printing error in adult fish production for the Smith River was recorded in the 1986 Annual Report of the Advisory Committee on Steelhead Trout's report "The Tragedy Continues". That estimate was 45,000 chinook, 15,000 coho and 30,000 steelhead.

Redwood Creek Summary

The Redwood Creek basin is entirely within Humboldt County. The basin includes an area of 280 square miles and the creek's main channel length is approximately 63 miles. The basin is characterized by high relief with steep, unstable slopes and narrow valley bottoms. Intensive logging in the watershed began in the 1950's. By 1978, more than 70% of the basin had been logged. This activity, combined with a series of extreme storms, had a severe impact on fish habitat throughout the basin. Redwood National Park and Prairie Creek State Park manage approximately 35% of the watershed. Most of the remaining land is owned by timber corporations.

Populations of chinook and coho salmon, winter and summer steelhead trout and coastal cutthroat are still present in the Redwood Creek system, but at reduced levels compared to historic population estimates. The county operated Prairie Creek Fish Hatchery has been in existence on a tributary of Redwood Creek since 1936.

Redwood National Park is implementing a 15 year, $33 million watershed rehabilitation program designed to reduce erosion and sedimentation within the Park. The Park also conducts a sediment monitoring program and an extensive estuarine management program to provide habitat for salmonid summer rearing. Unfortunately, very little watershed restoration work has occurred in the 65% of the basin that is not under Park management.

Little River Summary

The Little River enters the Pacific Ocean south of Trinidad in Humboldt

County. The 50 square miles of watershed has seen extensive logging activity and is now primarily forested with mature second growth timber. Livestock grazing occurs along the lower few miles of the stream. Chinook and coho salmon, and steelhead and cutthroat trout all utilize Little River. Habitat in Little River is generally in better condition now than it was 30 years ago; however, excellent opportunities still exist for restoration and enhancement of salmonid populations.

Mad River Summary

The Mad River flows northwesterly through 500 square miles of watershed. From its headwaters in Trinity County, it travels almost 100 miles to its mouth at the Pacific Ocean, north of Eureka (Humboldt County). Most of the upper half of the basin is managed by Six Rivers National Forest. Approximately one-third of the watershed is owned by large timber corporations. The remainder is under numerous smaller private ownerships. Forestry is the predominate land use. Livestock grazing and residential development occur over a much smaller area. The Humboldt Bay Municipal Water District's Ruth Reservoir, on the Mad River, stores and controls water which is diverted at a rate of approximately 75 million gallons per day, from a basin at a point 75 miles downstream. The Mad River has populations of coho and chinook salmon and winter and summer steelhead trout.

The lower Mad River receives heavy sportfishing pressure due to its proximity to Humboldt County's population center, and due to large steelhead runs in recent years.

The Department of Fish and Game's Mad River Fish Hatchery has been in operation since 1970. Unlike other state hatcheries, the Mad River Hatchery was built to enhance existing fish populations, rather than as mitigation for habitat destruction. Production goals are 5 million chinook salmon, 1 million coho salmon and 200,000 steelhead. Annual hatchery productin between 1972 and 1985 was extremely variable for each species but averaged 174,000 chinook, 85,000 coho and 603,000 steelhead. General observations of naturally-reproducing fish populations in the watershed indicate that steelhead are relatively abundant and chinook and coho are relatively scarce.

Fisheries restoration and enhancement work in the basin, other than the Hatchery, has been limited. The CCC's have done some barrier removal work in a few tributaries. The Forest Service has done some erosion control work along Pilot Creek, and worked with CDF&G to blast a boulder barrier in the river near Bug Creek in order to improve access for steelhead. The Humboldt Fisherman's Marketing Association reared and released salmon in Lindsay Creek in 1982-83. Redwood Community Action Agency has done various types of habitat improvement work in and along Powers, Mill and Maple Creeks during 1984 to the present.

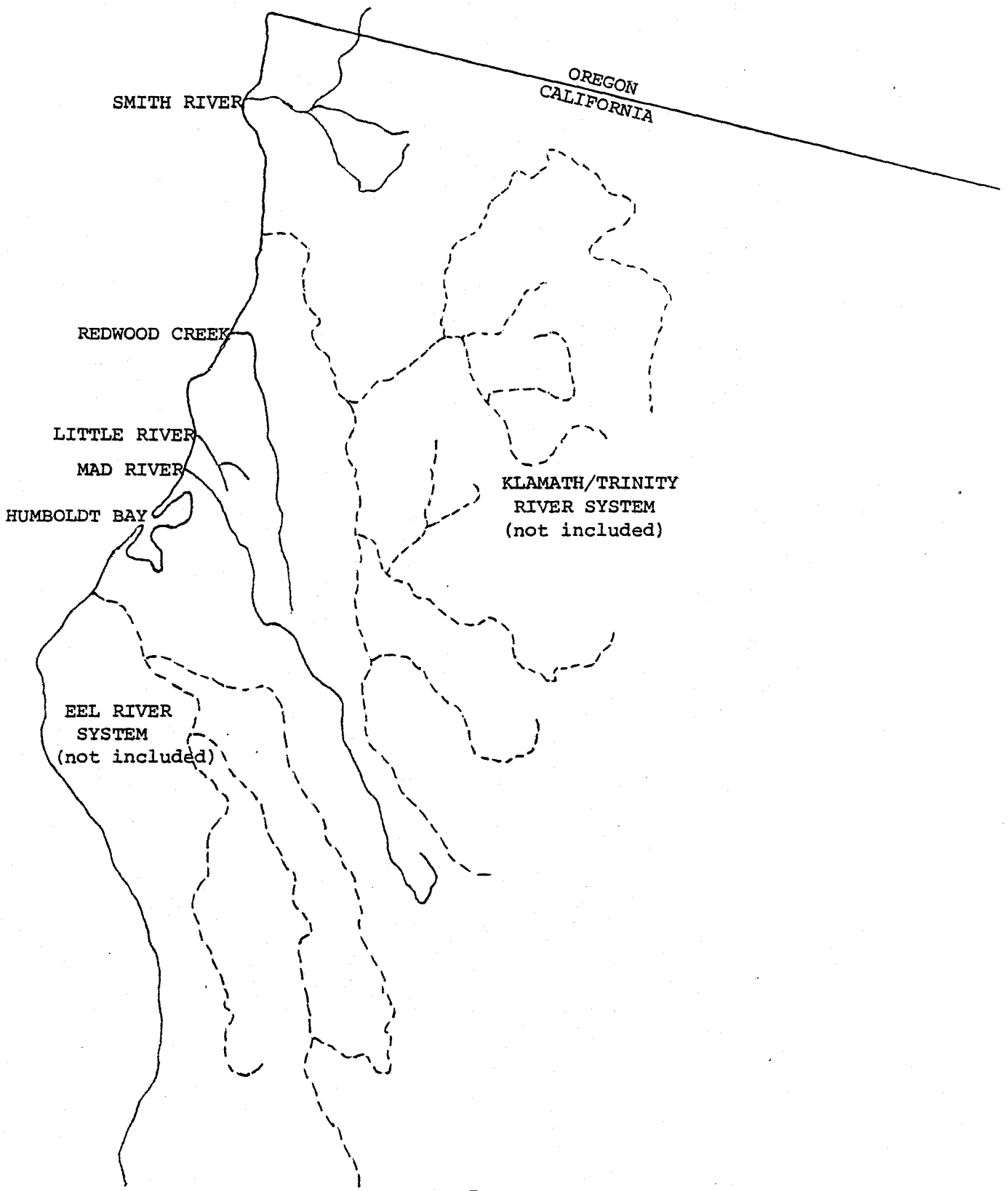
Humboldt Bay Tributaries Summary

Humboldt Bay is the largest estuary between San Francisco and Coos Bay, Oregon. Four major tributaries - Jacoby Creek, Freshwater Creek, Elk River and Salmon Creek - and several smaller streams occupy watersheds totalling

approximately 120 square miles in area.

Coho salmon and steelhead trout are the predominant anadromous species present in the tributaries, with some populations of chinook salmon and cutthroat trout. Much of the habitat historically utilized by salmon and steelhead has been degraded as a result of the logging, agricultural development, and residential expansion that has occurred within tributary watersheds. The floods of 1955 and 1964 also caused major damage to the tributary habitats. Over the years, the salmon and steelhead populations have steadily declined. Recent habitat restoration and population enhancement efforts have begun to reverse this trend; although several persistent problems - the most serious of which are a result of inadequately regulated land use practices - continue to limit the restoration of tributary salmon populations.

FIGURE 1. *Locations of drainages covered by the North Coast Basins Working Group*



MAJOR PROBLEMS/CONCERNS AND RECOMMENDED SOLUTIONS

The following is a description of the five major areas of concern identified by the Working Group. This list is a synthesis of similar lists prepared by each of the five watershed subcommittees (Appendices B - F) All five areas of concern are considered of great importance, so no prioritization is implied by the order of presentation. If a specific problem is not discussed below it does not mean it isn't important. Some problems had insufficient information available to access them or even identify them properly.

I. Enforcement of Existing Sportfishing Laws and Regulations

This issue was considered extremely important by the Smith River, Redwood Creek, and Mad River subcommittees and was also a major concern of the other two subcommittees. Many types of illegal activity were reported, including snagging, gaffing, gillnetting, fishing with hand grenades, and exceeding fish limits. Most people reporting to the subcommittees did not feel that wardens were able to cover north coast drainages adequately.

Until recently, wardens interviewed by the committee considered snagging to be a major law enforcement problem. This is because it was nearly impossible to prove that someone was snagging with a tightline rig (ie, weights below the hook). However, new regulations outlawing tightlining on north coast rivers should minimize or eliminate snagging, in the wardens' opinion. Most of the other illegal activities occur irregularly and, even if staffing was increased several times, the primary way these activities can be stopped is through tips from residents or other fishermen. They considered it extremely important to increase the public's use of CALTIP and for fishermen to exert peer pressure on each other to obey the regulations. Local wardens suggested that by adding two new "floating" warden positions, which could be moved to various drainages as needed and also handle marine enforcement, this district would be adequately covered.

The wardens also stated that a bigger problem than total manpower is the lack of flexibility in hours, caused by recent personnel management decisions at the state level. Previously, wardens would work as many hours as necessary during peak seasons, and either build up "comp time" or be paid overtime for the extra hours. Under present restrictions, if a warden receives a tip regarding illegal activity and he has already used up his hours for the week, he can not respond to it. Needless to say, this has compounded the Department's public relations problems.

The committee recommends the following actions to help remedy the above problems with law enforcement:

1. Increase staffing of CDF&G Wardens by at least two positions in Humboldt and Del Norte counties. This funding should be in addition to existing CDF&G operating costs for this geographical area; they should not be re-distributed from other CDF&G activities. The ACSST should use all in power to influence the legislature to allocate these funds.

2. The Department of Fish and Game should arrange for a variance for

wardens regarding accumulation of "comp time" and overtime. It is our understanding that such a variance already exists for hatchery personnel; it should be used for wardens!

3. Public education should be increased to encourage people to obey fishing regulations, to exert pressure on their peers to obey fishing regulations, and to use CALTIP to report violators. (See Section V - Public Education.)

II. Habitat and Land Use

All subcommittees except the Smith River group indicated that habitat degradation, both instream and in the upper watersheds, was a major problem affecting salmonid populations. Depending on the particular drainage, problems included lack of spawning habitat, lack of rearing habitat, riparian zone degradation, and some cases of severe erosion and siltation. Some Humboldt Bay tributaries have fish passage problems caused by tide gates and culverts.

In many areas poor land use practices during timber harvesting and livestock grazing appeared to be the cause of these problems. On the Mad River, gravel extraction may also be a problem. The subcommittees uncovered a number of "horror stories" of poor land use practices resulting from either ignorance or disregard of proper procedures, and there was concern that existing timber harvest regulations are not always properly enforced.

In some drainages, very site-specific descriptions of problem areas are available (ie, Redwood Creek), but for most drainages there are no comprehensive inventories of fisheries habitat or estimates of population size and distribution. The committee considers this a major problem which must be addressed in order for habitat programs to be corrected most effectively.

The committee recommends the following actions to help remedy the habitat and land use problems described above:

1. Promote better land use practices. Viable incentives for landowners to protect riparian zones and control erosion upslope from riparian areas should be instituted. Specifically, we are suggesting financial incentives in the form of tax breaks or rebates at the federal and state levels to supplement the relatively meager tax breaks available at the county level. We also support expansion of programs such as CFIP to provide matching funds to landowners to correct existing problems. We urge the ACSST to use its power to encourage the legislation to provide these incentives. Existing regulations should be vigorously enforced and fines and other punishments should be severe enough to discourage people from violating them and to pay for restoration of habitat lost due to illegal activities.

2. Improve education of landowners, managers, and equipment operators so that they understand why land use regulations exist and how they

specifically protect fish populations. Many committee members have had experience working with landowners on fisheries restoration projects and have found that after explaining habitat needs of fish many landowners are willing to change their practices. For example, whether or not a tractor operator understands the value of an intermittant stream can have a direct impact on how he treats it. (See Section V - Public Education.)

3. The Department of Fish and Game and other agencies should inventory all salmonid streams on a regular basis and in a uniform manner, and should maintain the resulting data in an accessible format. Our conversations with CDF&G biologists indicate (and our personal observations confirm) that this is impossible at the present staffing levels. The ACSST should use its power to influence the legislature to allocate sufficient funds to accomplish the recommendations listed in Section IV - Data Collection and Research. We estimate that for Humboldt and Del Norte counties this would require at least two additional field biologists and two more seasonal aides.

4. This committee agrees with the adage, "An ounce of conservation is worth a pound of restoration", and believes that protection of existing habitat should always be a priority. Restoration activities should never be used as a trade-off to justify continuing loss of fisheries habitat; however, restoration is a very valuable tool for correcting past mistakes. This committee fully supports local, state, and federal programs to finance restoration activities to improve habitat and re-establish fish populations lost through past practices. We urge the ACSST to use its power to influence the legislature to expand those programs with long term, stable funding.

III. Management

The committee had one general and several specific recommendations regarding fisheries management practices.

1. With the exception of the Smith River, parts of which are designated as a "Wild and Scenic River", and the portions of Redwood Creek in Redwood National Park, no written management plans or goals exist for salmonid populations in the drainages considered by this committee. Such management plans would greatly aid the public in understanding and evaluating proposed fishery activities. (ie, the construction of a permanent diversion weir at the Mad River Hatchery and prioritization of restoration and enhancement projects in the north coast area). We strongly support the Department's plan to develop an EIS for the Mad River weir, and assume that it will address the management goals for the Mad River basin and show how the hatchery's goals coincide with these. We also strongly suggest that management plans for each basin be developed which address the following questions:

   a) What salmonid species are present and what are their population estimates? Have populations been increasing, decreasing, or staying constant?

b) For each species: are populations spawner-limited? If so, is supplemental seeding appropriate? If so, what should be the genetic source of eggs for re-seeding? Do fishing regulations need to be modified or enforcement activities increased to protect spawners?

c) For each species: is habitat the limiting factor? If so, is it spawning habitat, rearing habitat, or barriers to migration? Is habitat modification (restoration) feasible? If so, what species and life stage should be the primary target of these activities? What is the secondary species and life stage that should be targeted? Are there any ongoing land-use problems that are contributing to continued loss of habitat? If so, what are goals for reducing or eliminating these land use problems?

d) As part of this management plan a map showing the distribution of species within the watershed and locations of major habitat problems should be included.

2. The committee expressed concern that present regulations regarding closure of the sport fishery during low water periods were inadequate since they are rigidly tied to gauging station flow rates, and other factors may often apply. We recommend that CDF&G district biologists be given the authority to close a fishery in areas where fish are obviously schooled up and vulnerable, even when flow rates have not dropped to the prescribed level. We urge the ACSST to work with the Fish and Game Commission to accomplish this goal.

3. Punch cards are currently required for the ocean sport fishery and for the Klamath-Trinity sport fishery. Punch cards are useful for limiting the catch of salmonids during the season, verifying that daily limits are adhered to, and for providing trends on catch rates and catch areas that are of use to biologists. We urge the ACSST to work with the Fish and Game Commission to expand the use of punch cards for salmon and steelhead to the other north coast river systems! Users of north coast rivers strongly endorse this management tool.

4. There is presently a daily bag limit of 3 steelhead per fisherman in California. The Smith River subcommittee strongly suggested, and the other groups concurred, that a 2 steelhead daily limit would be more than adequate for any fisherman. We urge the ACSST to work with the Fish and Game Commission to change the steelhead daily bag limit.

5. There was great concern among all subcommittees about the summer "trout" fishery in north coast rivers. We know that most "trout" caught are actually salmon and steelhead smolts and that a summer closure would be justified in some north coast drainages. We urge the ACSST to work with the Fish and Game Commission to reduce the take of salmon and steelhead smolts from north coast streams.

IV. Data Collection and Research

As already mentioned, there is a lack of accessible, standardized data reports for most north coast streams. Different agencies collect information in different ways and for different purposes, and most stream surveys end up stuffed away in file cabinets in various offices within Fish

and Game and Forest Service offices. Similarly, many surveys and projects performed by students and professors from HSU and other academic institutions, or by salmonid enhancement volunteers and contractors end up filed away in equally obscure locations. This information needs to be collected in some standardized manner to provide easy access.

We feel that there is a need for a central computerized data bank which will accept survey information from a variety of sources. The state of Illinois has what they call a "Fisheries Analysis System (FAS)" which approaches what we feel is needed. This is a microcomputer based, comprehensive data base management and analysis system for fisheries management and research. The system is designed to help district fisheries biologists organize their data - from planning samples, to enter raw data, to store data on floppy discs, to analyze it, and to produce tables and graphs for annual reports. Data is uploaded onto a mainframe computer for statistical compilation and statewide fisheries analysis. A description of the system is included in Appendix G. We feel that development of a similar system (one more geared towards stream surveys) should be a priority of the Department of Fish and Game, in conjunction with other agencies and universities. The ACSST should work with the state legislature to obtain funding for this purpose.

A second problem with data collections is the small number of field biologists positions. As described in Section II, the present staff size is inadequate for the number of streams on the north coast which should be regularly inventoried. Again, the ACSST should work with the legislature to provide adequate funding for field staff.

Four major areas which require further research were suggested by the committees. We suggest that the ACSST pursue various sources of funding to insure that this research is conducted

1. Estuaries: Whate role do estuaries play in the lifecycle of north coast salmon and steelhead? Enhancement groups need to know if they should be doing more in the way of protecting and enhancing the estuaries, relative to the work being performed upstream? What are the most effective means of doing this?

2. Economics: What is the economic value of north coast salmon and steelhead in terms of commercial and sport fisheries and their values to "non-consumptive" recreationists? What percentage of the local economy is dependent upon this resource? What is the cost|benefit ratio of restoration and enhancement activities?

3. Predators: What is the effect of predators on salmonid populations in north coast streams? In particular, what component of a run is consumed by mammals and birds? Is this increasing, decreasing, or remaining constant?

4. Genetics: Particularly for Smith River chinook salmon, what is the basic biology of the species? Where do they migrate, are they a unique genetic stock, and what affects the timing of their run? The same questions could also be asked for most of the other north coast salmonid populations.

V. Public Education

LACK OF PUBLIC EDUCATION WAS CONSIDERED THE ROOT CAUSE OF MOST PROBLEMS FACING NORTH COAST SALMON AND STEELHEAD POPULATIONS. This committee feels that the most effective way to deal with this is through a longterm comprehensive program for young people through the county schools. Several programs are being developed along these lines in Humboldt County, including:

1. Classroom aquariums to hatch out steelhead and associated class activities stressing habitat requirements of salmonids are being used in 30 schools. Many agencies and volunteers are helping teachers with this project.

2. The Eureka City School District is developing a "model stream" project which will teach students about stream ecology and which will serve as an extended rearing facility for steelhead fry from the classroom aquariums.

3. The local chapter of the American Fisheries Society has set up a "speakers bureau" of students from Humboldt State University, who will go into elementary and secondary schools to talk about salmon and steelhead ecology.

4. Many local agencies are sending speakers to public schools and providing field trips at hatcheries and other sites for students. A notable example is a ranger from Redwood National Park who has developed the "Salmon Survival Game" which he takes to classrooms for students to learn about various perils faced by salmonids trying to return to spawn.

5. Many salmonid enhancement and restoration groups have involved nearby schools in their projects.

In Del Norte County some of these same activities include:

6. A local 4-H group "adopted" a section of Peacock Creek and Clark's Creek on the Smith River to put in some gravel retention weirs and clear debris jams as a club project while learning about salmon and steelhead biology.

In spite of these activities, local schools are still a long way from having a comprehensive program that will keep reinforcing values learned in some of the special projects mentioned above. It is important to maintain a longterm program that will encourage youth to be good stewards of north coast streams. We are encouraged that a graduate student in education at HSU is working on a comprehensive curriculum on stream ecology and salmonid biology for local school, and strongly support this and similar activities.

Public education for adults is a more difficult problem because it is harder to break old habits than develop new ones. One approach which ties

in to the research needs described in Section IV is to point out the economic value of salmon and steelhead to the local community and the economic consequences of habitat degradation. Neighborhood "Adopt-A-Stream" programs would be ideal, especially in more urban areas along the Humboldt Bay tributaries. There are very few organized sport fishing groups on the north coast, but many can provide a means of developing positive attitudes through educational programs. Wardens suggested that it would be useful to have interpretive displays near intensive fishing areas (such as the lower Mad River) which explain regulations and why they are important. All of these are good ideas which should be pursued locally as well as at the state level.