REPORT OF THE FIRST CALIFORNIA SALMON AND STEELHEAD RESTORATION CONFERENCE

JANUARY 22-23, 1983
BODEGA BAY, CALIFORNIA

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Cover Photo: In 1982, crews under the supervision of the California Department of Fish and Game opened up more than 200 miles of spawning habitat by the removal of log jams like this one on Bear Haven Creek, a tributary to Ten Mile River in Mendocino County. A recent survey by CEMR (Center for Education and Manpower Resources) of Ten Mile and Big River counted nearly 2,000 log jams totalling 50,000 cubic yards of material which still needs to be removed to bring the streams up to their full fish production potential. Water diversions and past timber harvesting practice have caused a 60 percent decline in salmon populations and an 80 percent decline in steelhead populations in north coast rivers. In a new 20-year program called "Investing in Prosperity", the State is using money from its non-renewable resources such as oil and geothermal energy to help rebuild its renewable resources including fish and wildlife.

California Department of Fish and Game photograph by Jack White

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Edited By:

Christopher Toole - Univ. of California Cooperative Extension Sea Grant Program
Bruce Wyatt - Univ. of California Cooperative Extension Sea Grant Program
Sari Sommarstrom - Mendocino County Fish and Game Advisory Committee
Ken Hashagen - California Department of Fish and Game

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INTRODUCTION

Background

California has a long history of public involvement in salmon and steelhead restoration. The role of the public until recently has primarily been one of advocacy, in which legislators and resource agencies have been encouraged to appropriate funds and perform projects beneficial to the state's anadromous salmonid populations.

In recent years, the role of the public has expanded from encouraging agencies to perform needed habitat and fish restoration work, to actually doing some of that work through local, non-profit organizations. Funded by community donations, county "fine monies", barbeques, service club contributions, and fishermen's assessments, some of these groups have been active since the late 1960's. However, the number of active restoration groups has increased tremendously during the 1980's.

This increase can in part be attributed to passage of AB 951 (Bosco-Keene) in the 1981-82 legislative session. The bill provided for Renewable Resources Investment Funds (RRIF) to be granted to non-profit groups and subdivisions of State government. A total of $925,000 was available for salmon and steelhead rehabilitation along the north coast. AB 951 was a one-time appropriation.

In 1982-83 AB 2513 was also sponsored by Assemblyman Bosco and State Senator Keene, continuing the RRIF monies available for restoration ($900,000) and expanding the grants to include Indian tribes.

In 1983-84, the California Department of Fish and Game (CDF&G) budget has been augmented by $900,000 of RRIF money to continue the restoration grant program.

This program has been variously referred to as the AB 951 program, the Bosco program, and the Bosco-Keene program. It is referred to in the CDF&G budget as the Northcoast Cooperative Salmon and Steelhead project.

Purpose

While many organizations and individuals were doing similar types of restoration work for the last few years, communication between the various groups was limited. It appeared that a forum in which each group could describe its operations and techniques (whether successful or not) to the other organizations would be beneficial. In addition, it also appeared that the universities, the California Department of Fish and Game, and other state fishery programs could contribute technical information which would be of use to the restoration groups.

With this in mind, the four editors began planning a conference in November, 1982. The original intent was to assemble a small group, composed primarily of one or two representatives from each organization funded by state restoration funds. As word of the conference spread, many other people expressed an interest

in attending and eventually a large enough meeting room was obtained to accommodate any who wished to come.

The conference took place January 22-23, 1983, at the Grange Hall in Bodega Bay. The agenda is presented in Appendix A. Approximately 100 people attended and participated. The atmosphere was informal and, based upon comments received afterwards, it appears that the conference succeeded in fulfilling its objectives.

Content

Both during and after the conference, many people asked for a written document that would summarize the presentations. The editors feel that the most important aspect of the conference was the description of each group's activities and this is the focus of the resulting Report. To standardize the descriptions of each organization, we sent out questionnaires to each group in attendance and summarized their responses into a single format. This summary is presented in Section II. A number of organizations that were unable to attend the conference were also contacted, and their responses are included as well. Descriptions of each group include activities which were current as of March, 1983. This Report is 3-hole punched so that updated descriptions, as well as activities of organizations not previously described, can be inserted at a future date.

A number of agencies were also in attendance at the conference and summaries of their restoration activities are presented in Section III. Activities of some of these agencies fit into the format used in Section II but others did not.

The editors did not originally ask speakers at the general sessions to prepare written papers. After the conference we did make this request, but by that time it was very inconvenient for most speakers. As a result, only a few contributed papers are included in this Report in Section IV. Please refer to Appendix A for a complete list of the general session speakers. Tape recordings of all of the presentations are available on loan from Bruce Wyatt, whose address is listed with those of other conference participants in Appendix B.

Use of Report

It is our hope that this Report will serve both as a document of the first California Salmon and Steelhead Restoration Conference and as a resource for those involved in or contemplating restoration work. We anticipate future conferences and reports which will hopefully include any organizations or agencies inadvertantly left out. We also hope that any errors in this Report will be brought to the attention of the editors.

Christopher Toole
Bruce Wyatt
Sari Sommarstrom
Ken Hashagen
August 1983

SECTION II

ACTIVITIES OF SALMON AND STEELHEAD RESTORATION GROUPS

(CURRENT AS OF MARCH 1983)

ASSOCIATION OF NORTHWEST STEELHEADERS

CONTACTS: Dave Walker
P.O. Box 785
Klamath, CA 95548
(707) 482-6542

Robert Bostwick
P.O. Box 128
Klamath, CA 95548
(707) 482-3405

TYPE OF PROJECT: Rearing: hatchbox.

LOCATION OF PROJECT: McGarvey Creek, 4 miles upstream from confluence with Klamath River. (Del Norte County)

PROJECT DESCRIPTION: Feed tributary hatchbox with 40,000 egg capacity located at present site. In 1982, 20,000 steelhead eggs were incubated and 17,000 to 18,000 fry released at emergence. Steelhead stock was from Iron Gate Hatchery (Klamath R.).

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Branch out into other creeks and streams needing restocking due to recent removal of barriers which have previously isolated spawning beds. Six new hatchbox sites are presently under evaluation.

CENTER FOR EDUCATION AND MANPOWER RESOURCES
(C.E.M.R.)

Center Resource Projects Section
Post Office Drawer F
Ukiah, CA 95482
(707) 468-0194

CONTACT: Ron Kusina, Director

TYPES OF PROJECT: Stream restoration: barrier removal, streambank stabilization, habitat development; Monitoring; Stream inventories - barrier assessment.

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

PROJECT DESCRIPTION: Last year the program shifted its priorities from the South Fork Eel River to coastal river systems and ocean-going streams. Working in cooperation with CDF&G, priorities were established and executed. During the 1981-82 season, operations were conducted on 15 separate streams. A total of 96 barriers was removed, comprised of 4300 cubic yards of material, and 24.5 miles of habitat were restored. Assistance was also provided to the Salmon Restoration Assoc. by removing debris upstream from the Hollow Tree egg-taking station and to CalTrans in clearing a debris trap for a culvert. Productivity was increased in the summer of 1982 with the addition of mechanized removal vehicles. Streambank stabilization and erosion controls are carried out where needed following barrier removal. Habitat devices are placed instream in some areas to develop better pool/riffle relationships. During the winter months, earlier worksites are monitored to assess the effectiveness of projects (i.e. the presence of spawning fish).

In the summer of 1982, selected coastal streams were assessed through field work to determine the location of barriers and their priority for removal. Fisheries students from Humboldt State were employed for this assessment work.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Access to work sites is the major problem.

SPECIAL TECHNIQUES OR DEVICES IN USE: A variety of mechanized equipment is used for efficient barrier removal.

FUTURE PLANS: The primary goal of the group is to increase the native stocks of salmon and steelhead trout resources within county watersheds, with particular emphasis on coastal systems.

COASTAL HEADWATERS ASSOCIATION

P.O. Box 12
Whitethorn, CA 95489

CONTACTS: Richard Gienger
Box 283
Whitethorn, CA 95489
(707) 986-7721 or
986-7419

Claire Trower
Secretary-Treasurer
3848 Wilder Ridge Road
Garberville, CA 95440
(707) 986-7688

TYPE OF PROJECT: Stream restoration: barrier removal, streambank stabilization, stream surveys; Monitoring.

LOCATION OF PROJECTS: Indian Creek drainage, tributary to South Fork Eel River; Mattole River. (Humboldt and Mendocino counties)

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

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

Pre-project surveys have provided baseline information which is then monitored following the project's completion.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Gaining landowner permission for access has at times been a problem. Educating landowners about the needs of native salmon and steelhead is difficult.

SPECIAL TECHNIQUES OR DEVICES IN USE: Developed original stream survey methodology and data forms. Juvenile salmonids sampled with small, wire mesh "minnow" traps.

FUTURE PLANS: Continue survey work: in particular, monitoring of rehabilitation work, certain follow-up stream surveys, and continuation of high-water spawning surveys. Initiate a rehabilitation program employing local residents to undertake work not done by CCC, such as seed collection, revegetation, and erosion control. Compile an educational publication for landowners on road maintenance and erosion control.

CORTE MADERA LAGUNITAS CREEK RESTORATION
TROUT UNLIMITED

CONTACT: Leo Cronin
12 San Gabriel Ct.
Fairfax, CA 94930
(415) 453-5370

TYPE OF PROJECT: Stream restoration: fish passage, silt control; Rearing: hatchbox.

LOCATION OF PROJECT: Fish Passage - Corte Madera Creek at Pastori Bridge crossing Fairfax, CA. Silt Control - On a Lagunitas Creek tributary in Woodacre, CA. Hatchboxes - Lagunitas Creek tributaries in Samuel Taylor State Park and below Kent Lake. (Marin County)

PROJECT DESCRIPTION: Fish Passage - This is the third fish passage project completed on Corte Madera Creek. Engineering drawings and a description of the passage can be obtained on request. Silt Control - 24 check dams were placed in the stream to create pools, requiring a total of 850 man hours. A contract study (Lagunitas Creek Watershed Erosion Sites 7/9/83 by Lizbeth Prunuske, 9619 Old Redwood Hwy., Windsor, CA 95492) was completed and used as a guide for placement of check dams. This report is available on request from project leaders. Hatchboxes - Downwelling hatchboxes were used to incubate 45,000 coho salmon eggs and 22,000 fry were eventually released.

PROBLEMS OTHER GROUPS SHOULD WATCH FOR: The opinion was offered that upwelling hatchboxes will work better where high silt loads are present. Seven inches of rain in a single day caused severe silt problems during hatching.

FUTURE PLANS: Continue hatchbox program and stream improvements. Continue marking program.

GARBERVILLE ROTARY CLUB

CONTACTS: Monroe Tobin
734 Cedar Street
Garberville, CA 95440

Steven Anderson
761 Redwood Drive
Garberville, CA 95440

Jim Johnson
601 Hillcrest Drive
Garberville, CA 95440
(707) 923-2293

John McGrath
948 Redwood Drive
Garberville, CA 95440
(707) 923-3450

TYPE OF PROJECT: Rearing: ponds.

LOCATION OF PROJECTS: Ponds are located at 1) confluence of Cedar Creek and Eel River in the South Leggett area; 2) confluence of South Mill Creek and Eel River, 3 miles north of Leggett; 3) Eel River - river bar at the Humboldt - Mendocino county line at Highway 101; 4) confluence of Sprowl Creek and Eel River, 4 miles west of Garberville; 5) confluence of Ohman Creek and Eel River, 2 miles south of Phillipsville; 6) Albee Creek, 8 miles west of Weott; and 7) North Mill Creek, 7 miles west of Weott. (Humboldt and Mendocino counties)

PROJECT DESCRIPTION: Steelhead (Mad River stock) are reared in six "Doughboy" type ponds, each with a capacity of 3,000 fish, and two wash-out ponds, each with a capacity of 25,000 fish. Steelhead are released from"Doughboy"ponds each March at about 3.7/lb. Fish leave wash-out ponds during major storms in the fall. Releases were about 40,000 in 1982, 25,000 in 1981,and 34,000 in 1980.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Reduce dependence on electricity - use gravity flow systems only. Make sure caretakers are trained well.

SPECIAL TECHNIQUES OR DEVICES IN USE: Insuring a total water exchange every 45 min. by keeping water level in"Doughboy" ponds to a minimum; treating fry received from hatchery with terramycin for first 10 days after introduction to ponds; use of demand feeders; continuous use of smog pump aerators - they can be driven with generators in an emergency.

FUTURE PLANS: Continue to raise steelhead to smolt size and branch out to raise chinook salmon.

GUALALA RIVER STEELHEAD PROJECT

P.O. Box 266
Gualala, CA 95445

CONTACT: Leighton Nelson
P.O. Box 7
Gualala, CA 95445
(707) 884-3566

TYPE OF PROJECT: Rearing: ponds.

LOCATION OF PROJECT: Doty Creek, tributary to Gualala River. (Mendocino County)

PROJECT DESCRIPTION: Two "Dough-boy" type pools with a capacity of 50,000 fish are used. In 1982, 8000 steelhead (Mad River stock) were released into the Garcia River. Fish are released at 6/lb. Coho salmon (Warm Springs stock) are being reared in 1983.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Intake pipe plugs up with gravel. A disease problem occurred through transfer from a contaminated CDF&G net.

SPECIAL TECHNIQUES OR DEVICES IN USE: Backup aeration system, which runs off a Honda generator and smog pumps, is in use.

FUTURE PLANS: Expand project.

HUMBOLDT FISH ACTION COUNCIL

P.O. Box 154
Eureka, CA 95501

CONTACTS:		
	David Miller, President	(707) 822-5555
	Jud Ellinwood, Vice President	(707) 822-8358
	Chris Toole, Recording Secretary	(707) 443-8369
	Larry Wunschel, Corresponding Secretary	(707) 445-8601
	Bill Hill, Lillian Hill (Treasurer)	(707) 443-4624
	Sam Mitchell	(707) 442-7255

TYPE OF PROJECT: Rearing: pond, adult trapping.

LOCATION OF PROJECT: Cochran Creek and Freshwater Creek, tributaries of Humboldt Bay. (Humboldt County)

PROJECT DESCRIPTION: Salmon or steelhead are raised in two 125-foot ponds with a capacity of at least 100,000 yearlings or 250,000 fingerlings. In 1983, 23,000 coho salmon (Noyo River and Freshwater Creek stock) were released in April at 16/lb. In 1982, 16,800 coho salmon (Klamath River and Freshwater Creek stock) were released in April at 21/lb. Coho salmon, chinook salmon, and steelhead have been raised in the ponds since 1971.

Adult fish are trapped in Freshwater Creek, eggs are incubated and fry reared at Prairie Creek Hatchery, fish are raised to yearlings at Cochran Creek ponds, and then released into Freshwater Creek.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Otter predation has been a problem the last 2 years. A reliable fence is under construction to alleviate this problem.

SPECIAL TECHNIQUES OR DEVICES IN USE: Demand feeders are working well.

FUTURE PLANS: Construct permanent egg-taking station on Freshwater Creek. Expand rearing sites, possibly utilizing abandoned wastewater ponds near King Salmon.

HUMBOLDT FISHERMEN'S MARKETING ASSOCIATION
SALMON ENHANCEMENT PROGRAM

216 H Street
Eureka, CA 95501
(707) 443-0537

CONTACTS: Pete Daignault
P.O. Box 540
Eureka, CA 95501
(707) 443-7798

Scott Downey
P.O. Box 278
Redway, CA 95560
(707) 923-3459

TYPE OF PROJECT: Rearing: hatchbox.

LOCATION OF PROJECT: Squaw Creek, a tributary of Lindsey Creek, which is a tributary of Mad River. (Humboldt County)

PROJECT DESCRIPTION: Two hatchboxes are located on Squaw Creek and coho and chinook salmon eggs are being incubated. The capacity of the project is 40,000 or more eggs. Button-up fry are released in early spring. In 1982, 26,000 coho salmon fry (Noyo River stock) were released. In 1983, 30,000 coho salmon fry (Iron Gate, Klamath River stock) were released and approximately 10-15,000 chinook salmon eggs (Mad River stock) are being incubated.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: There were some problems servicing eggs with original hatchbox design. These have since been corrected.

SPECIAL TECHNIQUES OR DEVICES IN USE: Project workers have developed expertise installing water lines.

FUTURE PLANS: Expand hatchbox program if egg supply is available. Begin monitoring returns starting in fall of 1983. Begin a restoration project on 3 miles of Mill Creek, 6 miles west of Garberville, beginning in fall 1983. This project will involve barrier removal and pool development, followed by an enhancement program.

JACOBY CREEK CANYON COMMUNITY / NORTHCOAST FLY FISHERS

CONTACTS: Bob Wunner (JCCC)
663½ J Street
Arcata, CA 95521

Karen Wehrstein (JCCC)
Box 43
Bayside, CA 95524

Jon Spillers (NFF)
278 Roundhouse Cr.
Trinidad, CA 95570

Fred Neighbor (NFF)
Old Arcata Road
Eureka, CA 95501

TYPE OF PROJECT: Stream restoration: barrier removal, sediment control, bank stabilization.

LOCATION OF PROJECT: Middle reach of McDonald Creek, tributary to Stone Lagoon (Humboldt County)

PROJECT DESCRIPTION: Approximately two miles of stream restored. Two barriers removed; debris and a yarding area removed from stream channel; cutlog aggredations causing streambank instability removed; and streambanks cribbed and revegetated with native riparian species. Waterbars and appropriate excavations have been made along roads where drainage interruptions can be corrected to prevent erosion.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Continue project, especially instream rehabilitation and roadwork. Monitor results with biological surveys.

MATTOLE WATERSHED SALMON SUPPORT GROUP

P.O. Box 188
Petrolia, CA 95558
(707) 629-3574

CONTACTS: Lynn House
P.O. Box 189
Petrolia, CA 95558

Gary Peterson
P.O. Box 176
Petrolia, CA 95558

David Simpson
P.O. Box 81
Petrolia, CA 95558

TYPE OF PROJECT: Rearing: hatchbox, primary incubation tank, rearing trough, "Doughboy" pools, adult holding tanks, trap; Stream restoration: barrier removal; Monitoring.

LOCATION OF PROJECTS: Confluence of Arcanum Creek and Mattole River (two hatchboxes, one adult holding and fry-rearing tank, primary incubation box); 3 miles upstream from mouth of Bridge Creek (hatchbox); S. Fork of Bear Creek, 2 miles north of Shelter Cove Road (hatchbox and rearing trough); confluence of Mill Creek and Mattole River (one hatchbox, one primary incubation trough, two "Doughboy" pools); Mattole River at A.W. Way County Park (adult holding tank); Mattole River, 1 mile north of Whitethorn (trap site); Mill Creek, 4 miles upstream from mouth of the Mattole (stream restoration). (Humboldt County)

PROJECT DESCRIPTION: Hatchboxes and rearing ponds or troughs placed in above locations throughout Mattole watershed. The system has a capacity of 120,000 chinook salmon and 30,000 coho salmon. Mattole River chinook salmon stock is used wherever possible and trapping and holding facilities are also described above. During 1982, 24,000 chinook salmon (Mattole River stock) and 18,000 coho salmon (Noyo River stock) were released. Chinook salmon are released at 200/lb in March and coho salmon are released at 9-10/lb the following April. In 1981, 30,000 steelhead (Mad River stock) were reared and released. Stream restoration on Mill Creek includes removal of one barrier, modification of one barrier, culvert modification (baffles), and improvement of culvert approach. Monitoring program occurs on Mill Creek. Other streams are monitored by the Coastal Headwaters Association.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Instream buried springboxes, gravel-filled filter barrels, double and triple water supplies, portable trap and wier, inexpensive automatic feeders, simple live-car system, down-welling hatchboxes (Dave Miller design), wide-spread community support.

FUTURE PLANS: Maintain, enhance, and expand range of Mattole native chinook salmon and restore extinct coho salmon run on Mill Creek. The latter includes plans to revegetate upstream banks of Mill Creek.

MONTEREY BAY SALMON AND TROUT PROJECT

P.O. Box 272
Salinas, CA 93902

CONTACTS: Jack Harrell
Chairman, Bd. of Directors
(408) 475-8711

David Felt
Treasurer
(408) 633-5827

Jane Dawson, Secretary
Dale Dawson, Legal Councel
(408) 438-1221

Dave Streig
Fish Culturist
(408) 458-3095

TYPE OF PROJECT: Rearing: ponds; Stream restoration: barrier removal, fish ladder construction, spawning gravel placement.

LOCATION OF PROJECT: Confluence of Big Creek and Scotts Creek (ponds and barrier removal); 3 miles east of Salinas off Old Stage Road (spring-fed farm pond); Newell Creek, tributary of San Lorenzo River (fish ladder and gravel placement); Love Creek, tributary of San Lorenzo River (fish ladder). (Monterey and Santa Cruz counties)

PROJECT DESCRIPTION: A hatchery raceway system on Big Creek and a pen-rearing system in a farm pond off Old Stage Road have a capacity of rearing 300,000 smolt-sized steelhead and coho salmon. In 1982, 55,000 steelhead (Carmel) River stock) and 34,000 steelhead (Mad River stock) were released. Releases in previous years were as follows:

1981	49,000	steelhead	Mad River Stock
1980	19,000	"	" " "
1979	18,000	coho salmon	" " "
1978	17,000	" "	" " "
1977	9,000	" "	" " "

Fish are released at approximately 6/lb prior to the new moon in March.

Fish ladder construction on Newell Creek, in association with CDF&G, opened access to 8 miles of stream; restoration of the Love Creek fish ladder, which was damaged during 1982 floods, has opened 2 miles of habitat. Twenty yards of gravel for spawning were placed in Newell Creek and a log jam was removed on Big Creek.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Low summer water flows.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Complete construction of Big Creek facility and develop reliable water supply system. Expand stream restoration efforts. Possibly expand into hatchbox program.

NEW GROWTH FOREST SERVICES

P.O. Box 61
Ukiah, CA 95482
(707) 485-0414

CONTACTS: Meca Wawona, Ross Walker, Dahinda Meda, Allan Mohr, Harold Appleton, Dick Jordan, Paul Aegerter, Sarah McCarter, Frank Killian

TYPE OF PROJECT: Stream restoration: barrier removal, pool development, sediment control, streambank stabilization; Monitoring.

LOCATION OF PROJECTS: 2½ miles along upper reach of the North Fork Garcia River; 3 miles of mid- and upper reach of Daugherty Creek, a tributary of Big River; Feliz Creek, approximately 4 miles from its confluence with the Russian River; 7 miles of upstream and 3 miles of downstream reaches of Salmon Creek. (Mendocino County)

PROJECT DESCRIPTION: On N. Fork Garcia River five major barriers, four smaller barriers, and five log jams have been removed. This is a two-step operation in which initial clearance took place in fall and winter 1982, gravel will be released by winter flows in 1982-83, and final clearance is taking place in the spring of 1983

On Daugherty Creek 12 barriers and several smaller log jams have been removed; on Feliz Creek a rock barrier was removed in 1982 which opened up 20-30 miles of upstream habitat; and in Salmon Creek 28 large jams and over 100 debris jams were removed in the upper drainage and 9 large and 14 smaller jams were removed in the lower drainage during 1981-82. Seedling plantings and streambank contouring have occurred in the lower part of Salmon Creek to control siltation. Temperature and fishery monitoring by the Dept. of Fish and Game occurs on the Garcia River and Salmon Creek.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: More detailed and accurate survey information from agencies or contractors is needed. These surveys should take land use and ownership, access, fire potential, and other things into consideration when prioritizing work, instead of just describing locations of barriers.

SPECIAL TECHNIQUES OR DEVICES IN USE: Two-step removal of barriers in lower reaches of streams to release accumulated gravel slowly and to let winter flows do much of the work.

FUTURE PLANS: General goals are to take care of existing stream problems such as barrier removal and bank stabilization in the short run, and to promote community awareness of watershed management and re-vitalization of "natural" habitat in the long run. Specific projects for 1983 include continued work on the Garcia River and new work on Bloody Run Creek and Sherwood Creek tributaries of Outlet Creek (Eel River) and Woodman Creek, also a tributary to the Eel River.

PACIFIC LUMBER COMPANY

Scotia, CA 95565
(707) 764-2222

CONTACT: Gene Rothlin

TYPE OF PROJECT: Rearing: ponds, fish-trapping.

LOCATION OF PROJECT: One pond is located at the Pacific Lumber Company main plant at Scotia on the main stem Eel River; two ponds are on Pacific Lumber Company land on Cooper Mill Creek, a tributary of Yager Creek, which is a tributary of the Van Duzen River. (Humboldt County)

PROJECT DESCRIPTION: Concrete raceway pond at Scotia has been raising steelhead since 1973. Pond has a capacity of about 25,000 yearlings. In 1982-83, 10,665 Noyo River stock coho salmon were raised for the first time. Fish are released as yearlings in March or April. A total of 176,793 steelhead has been released since this pond went into production.

Two 125-foot concrete ponds have been in operation on Yager Creek since 1976. Chinook salmon are raised between March and June and released as fingerlings. Stock is from Yager Creek. In 1983, 16,000 chinook salmon are being raised. From June until March steelhead from Prairie Creek or Mad River Hatchery are raised. Warm summer water temperatures limit production to 15-20,000 fish. Total steelhead released since construction is 49,419 fish. A raceway is also in place at the foot of the ponds so fish can be directly released. During fall and winter this structure is modified to become a fish ladder and fish trap.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Warm summer water temperatures and otter predation have been problems at the Yager Creek ponds.

SPECIAL TECHNIQUES OR DEVICES IN USE: Water is pumped from Yager Creek into the ponds when low flows occur in Cooper Mill Creek during the summer. Water is also pumped into the fish trap during the winter to attract more fish.

FUTURE PLANS: Continue ponding programs at both sites. Work on summer water supply improvements at Yager Creek.

ROWDY CREEK FISH HATCHERY, INC.

P.O. Box 328
Smith River, CA 95567

CONTACTS: Art Lawn, Project Director
Tom Smith, Biologist

TYPE OF PROJECT: Rearing: hatchery; Monitoring.

LOCATION OF PROJECT: Fred Haight Drive at North Street, town of Smith River. On Rowdy Creek, tributary of Smith River. (Del Norte County)

PROJECT DESCRIPTION: Private, non-profit hatchery built by donations and sponsored by the Smith River Kiwanis Club. Raises chinook salmon and steelhead. Chinooks are released in October at 12/lb and steelhead are released in April at 7/lb. See attached list for numbers raised and release sites in recent years. Coded-wire tagging and scale analysis have been used to determine hatchery returns and contributions to the fishery.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Delayed fertilization, sperm pools, and omission of water hardening eggs prior to incubation have been used. Results have been 90% or better of the spawned eggs have been converted to fry with a minimum of deformities. Also, new techniques have been developed for initial feeding of fry. Fry are started on mash in troughs or small tanks. This is continued for 7 - 10 days with introduction of 1/32 OMP the last few days in the troughs. The result is less feed is needed to start fry since they are concentrated in a small area. There is also no fouling of ponds due to overfeeding. There is also reduced "pinhead" loss because this is a more conducive environment to initiate feeding. This is the third year the fertilization and initial feeding techniques have been used.

FUTURE PLANS: Continue hatchery construction and present fish-rearing programs.

ROWDY CREEK HATCHERY RELEASES

CHINOOK SALMON

Year	Release Location	# of Fish	Size of fish
1972	Rowdy Creek	47,700	7/lb.
1973	Rowdy Creek	35,200	12/lb.
1977	Rowdy Creek	74,546	55/lb.
	Rowdy Creek	9,117	7/lb.
	Mill Creek	1,500	7/lb.
1978	Rowdy Creek	146,404	55/lb.
	Patricks Creek	4,900	25/lb.
	Mill Creek	3,989	24/lb.
	Rock Creek	991	24/lb.
	Rowdy Creek	9,912	24/lb.
	Siskiyou Forks	20,060	24/lb.
	Rowdy Creek	105,103	13/lb.
1979	Rowdy Creek	62,338	51/lb.
	Rowdy Creek	78,550	14/lb.
1981	Gasquet	10,320	86/lb.
	Patricks Creek	8,688	72/lb.
	Siskiyou Forks	9,600	80/lb.
	Knopki Creek	8,640	72/lb.
	Mill Creek	16,176	67/lb.
	Little Mill Creek	7,152	60/lb.
	Peacock Creek	7,104	60/lb.
	Sultan Creek	3,717	59/lb.
	Rowdy Creek	52,987	14/lb.
1982	Mill Creek	7,548	15/lb.
	Quartz Creek	8,760	15/lb.
	Knopki Creek	9,240	15/lb.
	Rowdy Creek	115,000	12/lb.
	Total	865,242	

STEELHEAD

1979	Rowdy Creek	23,990	5/lb.
1980	Rowdy Creek	31,860	10/lb.
	Van Deventer Park	75,220	14/lb.
1981	Siskiyou Forks	41,245	365/lb.
1982	In Production	11,000	
	Total	183,315	

SALMON RESTORATION ASSOCIATION OF CALIFORNIA, INC.

P.O. Box 1448
Ft. Bragg, CA 95437
(707) 964-5859

CONTACTS:

Don Bradley, President	(same phone)
Frank Welch, Treasurer	(707) 964-6631
Carol Steele, Secretary	(707) 964-6631
Bill Maahs	(707) 964-5832

TYPE OF PROJECT: Rearing: ponds, hatchbox, adult trapping.

LOCATION OF PROJECTS: Hollow Tree Creek, a tributary of the South Fork Eel River (fish trap and wash-out pond); Ten Mile River (wash-out pond); Pudding Creek, a coastal stream (four tomato-tank ponds); and Johnson Creek, a tributary of Big River (hatchbox and cement pond). (Mendocino County)

PROJECT DESCRIPTION: Fall-run chinook salmon are trapped on Hollow Tree Creek, eggs are incubated and fry reared by CDF&G at Yountville, and most of the fish are then returned to Hollow Tree Creek and reared until they are washed out in the fall. Some of the fish are also delivered to Warm Springs Hatchery for release into the Russian River. During 1982-83, 150,000 chinook are being raised at this site.

Fall-run chinook salmon are trapped at Ten Mile River, incubated by CDF&G at Yountville, and reared in wash-out ponds and released into the river in the fall. Up to 410,000 salmon have been raised in these ponds, but the maximum safe level is considered 200,000. In 1982-83 no trapping occurred so 75,000 Wisconsin stock fall-run chinook salmon are being reared.

Four tomato tanks are used for rearing up to 25,000 chinook salmon on Pudding Creek. During 1981-82 and 1982-83 local chinook salmon were not available so Wisconsin fall-run chinooks have been raised.

On Johnson Creek a hatchbox and cement pond are used to rear up to 10,000 coho salmon. Eggs are obtained from Hollow Tree Creek or the Noyo egg-taking station. In 1982, 2500 yearlings were released from this site.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Fiberglass tomato tubs are used for holding fish before spawning and for rearing fingerlings.

FUTURE PLANS: Construct permanent egg-taking station on Hollow Tree Creek. Expand activities into other streams.

SAVE OUR SALMON

CONTACT: Leonard Craig
General Delivery
Pt. Arena, CA 95468
(707) 882-2249

TYPE OF PROJECT: Rearing: ponds.

LOCATION OF PROJECT: Hutton Creek, tributary of Garcia River. (Mendocino County)

PROJECT DESCRIPTIONS: Three wash-out ponds with a capacity of 25,000 yearlings each are used to raise salmon. In 1982, 35,000 coho salmon (Mad River Hatchery stock) were released into the Garcia River during October storms. They were 4/lb. A remaining 40,000 coho salmon were transferred from the ponds to Yountville for later stocking into another drainage. This project has been operating since the mid-1970's, producing 30,000 - 70,000 fish per year.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Back-up aeration system using a generator and smog pump is used.

FUTURE PLANS: Continue present operation as long as funding and site are available. Project can't be expanded at this site because of water limitations.

SMITH RIVER ANGLER'S ASSOCIATION

CONTACTS: Phillip M. Schafer
4001 Wonder Stump Road
Crescent City, CA 95531

John Woolworth
Smith River, CA 95567

M.J. Muldoon
1258 Jaccard Street
Crescent City, CA 95531

TYPE OF PROJECT: Stream restoration: barrier removel; Monitoring

LOCATION OF PROJECTS: Peacock Creek and Little Mill Creek, tributaries of Smith River. (Del Norte County)

PROJECT DESCRIPTION: One major barrier removed on Peacock Creek, ¼ mile above confluence with Smith River. Numerous barriers removed on Little Mill Creek,1 mile above confluence with Smith River. Monitoring consists of live fish counts, carcass counts, and redd counts to determine utilization of cleared areas.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Restore Clark's Creek, located ¼ mile above Peacock Creek on Smith River.

SOUTH FORK TRINITY WATERSHED IMPROVEMENT ASSOCIATION

CONTACT: Dwight Streamfellow
Box 329
Willow Creek, CA 95573
(707) 445-0881 (work)
(707) 443-3023 (home-mobile unit phone)

Tom Stokley
Alderon Laird
Box 1395
Hayfork, CA 96041
(916) 628-4188 (message phone)

TYPE OF PROJECT: Restoration: barrier removal, sediment control.

LOCATION OF PROJECT: Grouse Creek,tributary to the South Fork Trinity River. (Trinity County)

PROJECT DESCRIPTION: Two barriers were removed to open access to 25 miles of spawning and rearing area upstream. Adjacent road was water-barred, culverts were cleaned out, and general road maintenance was performed to prevent erosion.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned

SPECIAL TECHNIQUES OR DEVICES IN USE: Developed portable, hand-carried yarding system. This allowed efficient removal of large logs (2 ft x 3 ft diameter). Entire operation was gravity and hand-powered.

FUTURE PLANS: General goal is to address every tributary of the South Fork Trinity River and to do more preventative work as well as restoration. Specific plans for 1983 involve the following work on Barker Creek: 1) fish ladder over rock falls with three pool steps; 2) baffle placement in the bottom of a culvert; and 3) fish ladder and screening of irrigation diversions.

TRINIDAD BAY FISHERMEN'S MARKETING ASSOCIATION, INC.

P.O. Box 795
Trinidad, CA 95570
(707) 677-3509

CONTACT: Mitch Farro
P.O. Box 291
Trinidad, CA 95570
(707) 677-0618

TYPE OF PROJECT: Rearing: hatchbox; Restoration: barrier removal.

LOCATION OF PROJECT: South Fork of Little River. (Humboldt County)

PROJECT DESCRIPTION: (In planning stage)

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: N/A

SPECIAL TECHNIQUES OR DEVICES IN USE: N/A

FUTURE PLANS: A hatchbox program is proposed, which will use Bandon-style hatchboxes. Chinook salmon eggs have been requested from Fish and Game, but coho salmon eggs may have to be used. Permission to trap fish for an in-river egg source has also be requested. Barrier removal on the river is also proposed. Project should begin in fall 1983.

SECTION III

AGENCIES ACTIVE IN RESTORATION

Note: This is not a complete list of agencies involved in salmon and steelhead restoration in California, but is a list of those represented at the Conference.

CALIFORNIA CONSERVATION CORPS
201 PROJECT

P.O. Box 176
Weott, CA 95571
(707) 946-2262

CONTACTS: Marc Groff
Melvin Kreb

TYPE OF PROJECT: Stream restoration: barrier removal, sediment control, streambank stabilization, reforestation; Rearing: hatchbox, pond.

LOCATION OF PROJECT: Del Norte, Humboldt, and Mendocino counties. See attachment for exact locations.

PROJECT DESCRIPTION: See attachment.

PROBLEMS OTHER GROUPS SHOULD KNOW ABOUT: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Grip hoists and lots of blocking techniques used in remote areas to remove logs without need for roads and heavy equipment.

FUTURE PLANS: Continue present work and expand to other locations.

Project 201 Public Conservation Work
July 1982 - March 1983

The 201 Project crews based at Humboldt Fire Center and the two semi-permanent spike locations in Leggett and McKinleyville worked 39 north coast streams of California:

Ah Pah Creek
Baker Creek
Bear Creek
Blanton Creek
Bond Creek
Cloney Gulch
Cow Creek
South Fork Eel River
Elk River
Elk Creek
Eubanks Creek
Freshwater Creek
Little Freshwater Creek
Main Freshwater Creek
Harris Creek
Hely Creek
Hollow Tree Creek
Little River
South Fork Little River
Leggett Creek
Lynch Creek
East Branch North Fork Mad River
Mattole River
Mattole Canyon Creek
Michaels Creek
Mill Creek
Newman Creek
Pilot Creek
South Fork Redwood Creek
Root Creek
Shaw Creek
Standley Creek
Squaw Creek
Thompson Creek
Upper Mattole River
Van Arkin Creek
Waldron Creek
Weber Creek

A total of 1,702.5 cords and debris were removed and burned; 31.23 miles of stream were reopened. Total Project PSCW hours totaled 67,398.

Two hundred acres of the riparian zone were seeded with Alnus rubra, Ceanothus and Baccharis.

Two miles of stream were planted with 39,120 Alnus rubra and 2,700 willows.

Six hundred deer browse vexars were installed and adjusted.

A total of 54.5 bushels of Alnus rubra cones were picked; 69 bushels of Baccharis seed were collected and dried; 24 bushels of Ceanothus seed broadcast

Crews planted 6,207 Alnus Rubra cuttings.

A fish weir was installed in conjunction with Humboldt Fire Center and the Department of Fish & Game.

Three hatch-boxes were installed with 29,000 steelhead hatched and released.

Five salmonid rearing ponds were installed and maintained in conjunction with Humboldt Fire Center and the Garberville Rotary.

California Conservation Corps
201 Project
P. O. Box 176
Weott, CA 95571

PSCW Summary

February 1980 - December 1980
Stream Enhancement & Barrier Removal:

50.9 miles of stream reopened
317 cords and debris removed & burned
684,424 bd. ft. " " "
1,425,616 cu. ft." " "

70,387 Total PSCW hours

January 1981 - December 1981
Stream Enhancement & Barrier Removal:

92.12 miles reopened
2,765 cords and debris removed & burned
140 pounds of Baccharis seed, tanoak, Ceanothus seed and Alnus rubra seed collected and broadcasted
1 ½ miles of stream planted with 5,000 trees: alders, willows, big leaf maples
10,000 vexar deer browse tubes installed

83,398 Total PSCW hours

January 1982 - December 1982
Stream Enhancement & Barrier Removal:

68.8 miles reopened
2,953.39 cords and debris removed & burned
2 miles of stream planted with 10,000 alders and 2,000 willows
500 vexars installed & adjusted
69 bushels Baccharis seed collected

7,000 Salmonids reared in 5 ponds

91,577 Total PSCW Hours

January 1983 - March 1983
Stream Enhancement & Barrier Removal:

10.49 miles reopened
664 cords and debris removed & burned
69 bushels Baccharis seed broadcasted
37,710 Salmonids fin-clipped
29,000 Salmonids hatched & released
700 willows planted
20,952 alders planted

20,277 Total PSCW Hours

CALIFORNIA DEPARTMENT OF FISH AND GAME

Salmonid Enhancement and Restoration Activities

CONTACT: Bob Rawstron
Ken Hashagen
1416 Ninth Street
Sacramento, CA 95814
(916) 323-7324

The California Department of Fish and Game uses a variety of funding and manpower resources to improve salmon and steelhead populations and their habitat. Basically, their programs can be divided as follows:

Regional Activities. Unit biologists, each responsible for fisheries management in one or more counties, survey streams, conduct population estimates, and coordinate stream rehabilitation and hatchbox/pond rearing efforts with private groups, conservation camps, lumber companies, Native Amercian tribes, and county and city work programs. Funds for this work come from either Fish and Game Preservation funds (from the sale of hunting and fishing licenses) or Dingell-Johnson funds (Federal Aid to Sport Fish Restoration programs).

Salmon Habitat Restoration. Funded with Energy and Resources Funds, this program was funded at the level of $2.9 million in 1980-81, $2.0 million in 1981-82, and $1.0 million in 1983-84. One million each year pays for a contract with the California Conservation Corps for stream rehabilitation work on the north coast. The remaining money has been used to identify sites on the upper Sacramento, the Shasta, and Klamath rivers where spawning gravels can be enhanced. Contracts with the Department of Water Resources have paid for surveying and designing these sites. The first two sites will be constructed on the Shasta River in the summer of 1983. Other work funded by these monies include construction of additional salmon rearing ponds at Thermolito and the Department's share of a three-agency sand removal project on the Trinity River.

"Bosco" Projects (Bosco-Keene projects, AB 951 projects, North Coast Cooperative Salmon and Steelhead Projects). Using Renewable Resources Investment Funds, the Department granted out $925,000 in 1980-81 and $900,000 in 1981-82 for stream rehabilitation and pond rearing/hatchbox programs. Monies went to non-profit groups, subunits of state government, and Native American tribes. In 1983-84 an additional $900,000 is budgeted.

California Forest Improvement Program (CFIP). This program is coordinated by the California Department of Forestry but does provide funds to improve fish and wildlife populations. Funds are derived from the sale of forest products on State lands. A percentage of the money collected must be spent on fish and wildlife and is granted out to landowners owning less than 5,000 acres.

CITY OF ARCATA, DEPT. OF PUBLIC WORKS
AQUACULTURE PROGRAM

736 F Street
Arcata, CA 95521
(707) 822-5951

CONTACTS: Frank R. Klopp, Director of Public Works
George H. Allen, Aquaculture Program Leader

TYPE OF PROJECT: Rearing: ponds, adult fish trap; Stream restoration; diversion weir, spawning channel, sediment basin, water diversion structure, barrier removal; Monitoring.

LOCATION OF PROJECTS: Ponds located at City of Arcata oxidation ponds, north end of Humboldt Bay. Restoration is on ¼ mile of Jolly Giant Creek and 1/10 mile of Janes Creek, both tributaries to Humboldt Bay. (Humboldt County)

PROJECT DESCRIPTION: Salmon are reared in seven ponds with about 2 acres of total area. Brackish water, containing partially treated wastewater is the medium Total capacity is undetermined but is probably 600,000 fish or more. In 1982, 5,000 chinook salmon smolts (Iron Gate Hatchery stock) were released, and in previous years small lots of coastal cutthroat, steelhead, and coho salmon have been released. Coho salmon are released in April or May at an average size of 12.5 cm FL and chinook salmon are released in May at an average size of 7.5 cm FL.

Restoration activities include placement of sediment basins and instream structures to manage the heavy sediment load in this low-gradient stream. Pools and a spawning channel have also been developed. The target species for the channel is steelhead trout.

Since all anadromous fish in these streams are introduced, monitoring of adult returns results in reasonably accurate estimates of the percent of planted fish surviving to return to place of release. Fish are all fin-clipped and coded-wire tagged.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Noxious types of phytoplankton can develop in fertile,brackish waters. They produce stress in juvenile salmonids, resulting at times in vibriosis. This problem has been managed by encouraging a marine macrophyte (Enteromorpha sp.) to dominate the ponds. This binds up nutrients in a form that is heavily grazed upon by marine animals that are eaten by juvenile fish.

SPECIAL TECHNIQUES OR DEVICES IN USE: Voluntary out-migration of coho salmon from ponds; brackish water rearing; salinity control and nutrient enrichment from wastewater oxidation ponds. Virtually no supplemental feeding is necessary. One of the instream structures used for pool formation in Janes Creek is unique.

FUTURE PLANS: A comprehensive and integrated plan for rehabilitation of Arcata urban streams has been drawn up. A trophy-trout recreational fishery is planned for Klopp Lake and a coastal cutthroat streamfishing program will be developed on Janes Creek. An adult fishway and holding pond is also planned.

HOOPA VALLEY BUSINESS COUNCIL - FISHERIES DEPT.

P.O. Box 417
Hoopa, CA 95546
(916) 625-4267

CONTACT: Bill Brock, Project Coordinator

TYPE OF PROJECT: Rearing: hatchery and stream rearing troughs; Stream restoration: barrier removal, sediment control, streambank stabilization; Monitoring.

LOCATION OF PROJECTS: Tributaries of Trinity River: Mill Creek (lower 4 miles), Tish Tang Creek (lower 2½ miles), Supply Creek (lower 1 mile), Pine Creek (lower 5 miles), Hostler Creek (lower 3 miles). Hatchery located on Loop Road in Hoopa. (Humboldt County)

PROJECT DESCRIPTION: Fixed foundation hatchery has 40,000 fry capacity. In 1982, 18,000 coho salmon were raised in the hatchery from 500/lb to 200/lb and 34,000 chinook salmon were raised from 1200/lb to 200/lb. These fish, along with 228,000 coho salmon from the Department of Fish and Game, were released into various creeks on the Hoopa reservation. All fish were from Lewiston Hatchery and were fin-clipped and coded-wire tagged. Previous releases include 30,000 chinook salmon raised in the hatchery in 1978 and another 30,000 chinook in 1977.

Restoration projects include eight barriers removed and terrace revetment placed on Mill Creek; two barriers removed and three gabion weirs placed on Supply Creek; two log barriers removed and bedrock blasting on Pine Creek; and 18 barriers removed, three gabion weirs, and sediment revetment placed on Hostler Creek. Gravel was artificially placed behind weirs and irrigation pipe screens were installed to prevent loss of downstream migrants.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Raise 70,000 chinook from Lewiston Hatchery in 1983. Install 6 ft x 45 ft x 3 ft rearing trough on Tish Tang and, possibly, Mill Creek. Two electroshockers have been purchased and juvenile population estimates are planned for 1983. General plans are to "continue along the same lines" and expand into instream gorge (Trinity R.) sediment control.

HUMBOLDT COUNTY
PRAIRIE CREEK FISH HATCHERY

Orick, CA 95555
(707) 448-2253

CONTACT: Steven D. Sanders, Hatchery Manager

TYPE OF PROJECT: Rearing: hatchery, fish trapping; Support for ponding and hatchbox programs; Restoration: pool development.

LOCATION OF PROJECT: Hatchery located on Highway 101 4 miles north of Orick; on Lost Man Creek, tributary of Prairie Creek. (Humboldt County)

PROJECT DESCRIPTION: Hatchery has capacity for 1½ million 0-age chinook salmon or 100,000 yearling chinooks, 150,000 yearling coho salmon, 50,000 yearling steelhead, and 15-20,000 catchable trout. During 1981-82 the hatchery raised 137,119 coho salmon (Lost Man Creek and Noyo River stock); 14,285 chinook salmon (Lost Man Creek stock); 46,466 steelhead (Lost Man Creek stock); and 18,700 catchable trout. Production during previous years is attached. In addition, all initial rearing of Humboldt Fish Action Council fish has taken place at the hatchery. Chinooks are released in late fall at around 11/lb; coho and steelhead are released in the spring at 10/lb and 6/lb, respectively.

Restoration work on 1 mile of Lost Man Creek has included placement of gabion weirs to develop five pools. Bank stabilization has also been accomplished by rock placement.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: Anyone tidewater trapping or rearing coho salmon from tidewater should be especially alert to Cytophaga psychrophila, more commonly known as "low-temperature disease". Mr. Sanders believes that, along with being "host specific" to coho salmon, it is also sex-linked to females and actually only attacks females. This disease kills the sac-fry as they button up in the incubator.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: At present the hatchery is scheduled to shut down during the summer of 1983. Efforts are underway to raise enough money to keep it open beyond that date.

HATCHERY PRODUCTION RECORD OF PRAIRIE CREEK FISH HATCHERY UNDER HUMBOLDT COUNTY

FISH PRODUCTION BY SPECIES:

			"chinook"		"coho"					
	STEELHEAD		KING SALMON		SILVER SALMON		RAINBOW		COAST CUTTHROAT	
YEAR	NO'S	LBS	NO'S	LBS	NO'S	LBS	NO'S	LBS	NO'S	LBS
1980-81	119,965	14,320	13,000	1,193	19,420	1,928	12,820	3,060	00	00
1979-80	54,048	4,794	52,708	4,217	209,081	9,763	19,195	3,843	2,440	682
1978-79	92,257	11,104	48,448	577	149,209	8,072	16,686	3,715	00	00
1977-78	94,841	8,228	96,511	4,267	136,921	5,590	17,719	4,510	3,489	718
1976-77	40,979	6,746	84,412	3,266	407,710	18,426	13,994	5,338	4,022	1,208
1975-76	128,975	10,824	82,456	4,891	77,570	7,295	29,903	5,730	4,510	1,894
1974-75	122,171	10,832	840,335	11,446	131,000	7,666	27,306	7,491	6,196	842
1973-74	51,116	5,531	1,000,000	7,940	521,800	14,164	16,602	3,864	63	104
1972-73	47,513	9,466	(no eggs available)		313,030	19,342	16,716	7,101	1,762	707
1971-72	NONE - NO SH		1,235,575	13,470	216,295	14,250	7,919	5,277	3,130	2,090
1970-71	PROGRAM AT		000	000	125,000	8,334	1,200	1,200	00	00
1969-70	HATCHERY		465,000	5,740	27,000	1,800	1,000	750	55,000	3,750
1968-69	00		500,000	9,787	95,350	9,535	4,965	1,035	7,667	2,587
1967-68	00		809,850	8,099	151,004	8,457	655	177	10,820	3,031
1966-67	00		1,143,383	13,054	55,034	4,105	3,755	1,293	18,560	4,998
1965-66	00		000	000	53,063	4,824	00	00	5,760	720
1964-65	00		9,996	118	25,015	2,256	00	00	14,060	2,265
1963-64	00		4,675	54	7,872	937	00	00	2,743	880
1962-63	NO PRODUCTION - HATCHERY MODIFICATIONS AND REPAIRS									
1961-62	00		00		00		00		1,916	430

KARUK TRIBE OF CALIFORNIA
(HAPPY CAMP AND ORLEANS DISTRICT)

CONTACT: Dale Risling
P.O. Box 265
Orleans, CA 95556
(707) 627-3297

TYPE OF PROJECT: Rearing: ponds; Stream Restoration: barrier removal, streambank stabilization, instream structures.

LOCATION OF PROJECTS: Red Cap Creek (yearling washout pond); Camp Creek (yearling washout pond); Perch Creek (metal smolt-rearing tank); Indian Creek (yearling washout pond and permanent pond); Thompson Creek (yearling washout pond); upper reach of Bluff Creek, 12 miles NNW of Orleans; east fork of Bluff Creek, 11.5 mlies NW of Orleans; lower reach of Deer Lick Creek, 11 miles NW of Orleans; and lower and middle reaches of Boise Creek, 2.3 miles SW of Orleans. All are tributaries of the Klamath River. (Humboldt, Siskiyou counties)

PROJECT DESCRIPTION: Project was started in 1981. Rearing ponds each have a 40,000 fish capacity, except for the permanent pond on Indian Creek, which has a 100,000 fish capacity. Fall-run chinook salmon (Iron Gate Hatchery stock) are reared until 5-7/lb and released in November. Approximately 150,000 chinook salmon have been released each year. In 1981 fish were nose-tagged and fin-clipped, in 1982 they were fin-clipped only.

There have been 13 barriers removed and boulder weirs, boulders, and log deflectors have been placed in streams to increase habitat diversity. Alders have been planted along stream banks in some areas. Miles of stream receiving work are: 1 mile on Bluff Creek, 1 mile on east fork Bluff Creek, 0.5 miles on Deer Lick Creek, and 1.75 miles on Boise Creek.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: High water temperatures in summer, bacterial diseases (especially bacterial gill disease), young lampreys, and otter predators have been a problem.

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Continue rearing program, remove barriers in the Happy Camp area, place instream structures in the lower reach of Camp Creek, and modify "rough" area of South Fork Salmon River.

MENDOCINO COUNTY FISH & GAME ADVISORY COMMITTEE

Courthouse
Ukiah, CA 95482

CONTACT: Bill Townsend, Chairman
P.O. Box 765
Ukiah, CA 95482
(707) 462-3932

TYPE OF PROJECT: Rearing: pond; Fish rescue; Stream restoration: fish ladders, revegetation, barrier removal.

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

PROJECT DESCRIPTION: The Talmage rearing ponds consist of six "Doughboy" pools with a capacity to rear about 150,000 juvenile fish. In 1982, 100,000 steelhead from the Mad River Hatchery were raised at the ponds. These fish are released as smolts or pre-smolts in March or April into the Russian River and its tributaries, the Navarro River, Noyo River, and Big River. Fish rescue in drying creeks during June and July has been done off and on since the 1950's. These rescued juvenile steelhead are either transferred to a perennial stream or to the rearing ponds for feeding and later release.

The County's stream restoration projects include the construction of fish ladders over barriers in Ackerman and Woodman Creeks and the revegetation of riparian sites with alder and willow along String creek east of Willits. Rock barriers in Sherwood and Woodman creeks are to be blasted under contract with New Growth Forest Services.

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

SPECIAL TECHNIQUES OR DEVICES IN USE: None mentioned.

FUTURE PLANS: Continue present projects and fund new restoration projects to the extent funds are available.

MENDOCINO COUNTY RESOURCE CONSERVATION DISTRICT (RCD)

405 Orchard Ave.
Ukiah, CA 95482
(707) 468-9223

CONTACTS: Tom Schott, Watershed Conservationist
Bob Keiffer, Soil Conservationist

TYPE OF PROJECT: Stream restoration; sediment control, bank stabilization; watershed rehabilitation.

LOCATION OF PROJECT: Tomki Creek, tributary to Eel River. (Mendocino County)

PROJECT DESCRIPTION: This demonstration project began in December 1981, as part of the "208 Water Quality Planning Program" of the State Water Resources Control Board and the U.S. Environmental Protection Agency. One of the project's major purposes is to minimize sedimentation into Tomki Creek and therby improve the quality of the fish habitat.

Methods used by the RCD, in conjunction with the U.S. Soil Conservation Service staff, include: 1) developing conservation plans for landowners which identify specific erosion control measures to be taken; 2) identifying a variety of financial assistance programs to implement the recommended conservation practices; 3) working with a Watershed Advisory Group composed of landowners and representatives of fishery organizations and resource agencies; and 4) designing a water quality and fish habitat monitoring plan.

Erosion control practices being applied by the landowners involve stocking livestock at proper levels, cross-fencing and instream fencing, and revegetation. Several grade stabilization projects using rock-filled gabions have been installed to control the rapid down-cutting of stream in the upper portions of the watershed. Rock check-dams and riprap, along with riparian plantings and streambank stabilization, also will improve stream quality.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Erosion control structures and procedures designed by the SCS staff.

FUTURE PLANS: Completion of Watershed Plan by December 1983, with implementation of each landowner's Conservation Plan to follow. Do similar project for other watersheds.

REDWOOD COMMUNITY ACTION AGENCY
FOREST IMPROVEMENT CENTER

904 G Street
Eureka, CA 95501
(707) 445-0881

CONTACTS: Zuretti Goosby, Director
Nancy Reichard, Water Resource Planner
Dwight Streamfellow, Water Resource Planner

TYPE OF PROJECT: Stream restoration: erosion control, streambank stabilization, livestock exclusion; Habitat inventory; Monitoring.

LOCATION OF PROJECTS: Restoration work is on 1 mile of the lower reach of McDonald Creek, a tributary of Stone Lagoon. (Humboldt County)
Inventory is of all coastal streams in Humboldt and Del Norte counties.

PROJECT DESCRIPTION: McDonald Creek was fenced to exclude livestock and revegetated by planting mixed riparian species along streambanks. Inventory of coastal streams is designed to prioritize restoration projects to be funded by the State Coastal Conservancy or other restoration/enhancement groups.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: None mentioned.

SPECIAL TECHNIQUES OR DEVICES IN USE: Swing gates were used to allow stream flow but exclude livestock; construction-grade paper was used as a mulch around seedlings to retard grass growth and increase survival; "nurse trees" (pines) were used to modify the habitat for more shade-loving riparian species.

FUTURE PLANS: Revegetate another section of McDonald Creek; raise money to fund priority projects identified by the Inventory; encourage local individuals and organizations to adopt a stream for restoration.

REDWOOD NATIONAL PARK

P.O. Box SS
Arcata, CA 95521
(707) 822-7611

CONTACT: Terry Hofstra, Aquatic Ecologist

TYPE OF PROJECT: Estuarine restoration; Monitoring.

LOCATION OF PROJECT: Redwood Creek estuary. (Humboldt County)

PROJECT DESCRIPTION: The mouth of Redwood Creek generally closes during summer months, creating an embayment which becomes a nursery area for chinook salmon and steelhead. In the past, flooding of adjacent agricultural lands has forced landowners to breach the berm in midsummer, draining the estuary and prematurely washing most of the salmonids to sea. Since 1980, RNP biologists have been monitoring anadromous salmonid populations and developing a management plan for the estuary. Controlled breaching was initiated in 1982 to remove water from the estuary to prevent flooding, while at the same time allowing salmon and steelhead to remain in the nursery area. Between 22 May and 25 October the outlet was partially breached 20 times, either manually or with a crawler tractor.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: It is difficult to exactly control the water level in the estuary by this method, although it was definately considered successful. Cooperation with landowners has in some instances been difficult to achieve.

SPECIAL TECHNIQUES OR DEVICES IN USE: Controlled breaching is a unique process.

FUTURE PLANS: Develop a long-term solution to the problem. This may require construction of outflow pipes that will continually regulate the water level, or it may require purchase of adjacent agricultural lands or diking of same to eliminate the detrimental effects of flooding. Hold public hearings to get more input on the best solution.

TRINITY RIVER FISH AND WILDLIFE TASK FORCE

CONTACTS: Ed Barnes
Chairman, Task Force Action Group
Department of Water Resources
P.O. Box 607
Red Bluff, CA 96080
(707) 527-6530

TYPE OF PROJECT: Stream restoration: barrier removal, pool development, streambank stabilization.

LOCATION OF PROJECT: The 35-mile reach of Trinity River from Lewiston to North Fork; Brown's Creek; N. Fork Trinity; Grass Valley Creek. (Trinity and Del Norte counties)

PROJECT DESCRIPTION: This is a multi-agency project designed to restore fish and wildlife habitat in the Trinity River Basin. Restoration to date includes removal of one dam on the Trinity River; removal of a rock barrier on the North Fork Trinity; creation of seven deep pools using a dragline and suction dredging on the Trinity; and streambank stabilization through revegetation, culvert placement, and road outsloping on Grass Valley Creek. Sand dredging has also occurred on the mainstem Trinity and 2 miles of Brown's Creek has been cleared. From 1976 to 1979, 14 spawning riffles were also constructed in the first 8 miles below Lewiston Dam. A comprehensive management plan for restoring the basin's fisheries habitat has been developed.

PROBLEMS OTHER GROUPS SHOULD WATCH OUT FOR: When large spawning areas are constructed, consideration should be given to escape and resting areas such as pools and large rocks. Spawning riffles constructed below Lewiston Dam have received little use, perhaps for this reason.

SPECIAL TECHNIQUES OR DEVICES IN USE: To try and resolve the above problem some of the riffles will be modified in 1983 and others left intact. If the modified riffles receive more use, future spawning riffles can be planned to include escape and resting areas.

FUTURE PLANS: Future plans are summarized in the "Trinity River Basin Fish and Wildlife Management Program". There are 11 action items proposed, which will be funded if HR 1438 by Congressmen Chappie, Bosco, and Shumway is passed.

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
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Cooperative Extension is a branch of the University of California and cooperating state colleges. Its purpose is to provide useful and practical information derived from university and government research to the public, and to encourage the application of that information in commercial and non-commercial settings. Farm advisors (previously known as county agents) have been serving the agriculture industry through Cooperative Extension since 1914. Marine advisors, and funding of applied marine research, originated in 1966 with passage of the National Sea Grant Act.

Some of the Sea Grant research which applies to salmon and has implications for restoration and enhancement are: studies of the use of artificial attractants to increase returns of salmon to hatcheries; genetic studies of salmon populations; studies of smoltification which will determine the best times to release salmon; and studies of diseases of salmon. Sea Grant has sponsored major conferences on salmon smolting and the effects of salmon releases on Pacific ecosystems, and will be holding a conference October 1983 in Bellevue, WA, on advances in salmon reproduction.

Marine advisors in coastal counties with salmon-producing streams have been active in working with enhancement groups such as the Northwest Steelheaders, Humboldt Fish Action Council, S.O.S., Monterey Bay Salmon and Trout Project, and others. Advisors have also helped develop equipment for use in rearing projects (see Section IV), have organized cooperative feed-buying in local areas, and have sponsored workshops and conferences such as this one. Cooperative Extension and the Marine Advisory Program also provide a disease diagnostic program through the U.C. Davis campus and the Bodega Marine Laboratory. A variety of publications are also available.

U.S. FOREST SERVICE
SIX RIVERS NATIONAL FOREST
Anadromous Fish Program

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CONTACT: Kerry Overton, Fisheries Biologist

In 1978, Six Rivers National Forest developed a fisheries and watershed management program aimed at restoring and enhancing anadromous fish populations and habitat. The objectives for the program are: 1) protect and maintain anadromous fish habitat by applying best management practices to all land use activities; 2) restore and enhance watershed values; 3) identify habitat factors that are limiting fish production; and 4) develop and evaluate procedures to restore or enhance chinook salmon and steelhead trout habitat in north coastal California streams.

Four major factors were identified which limit anadromous fish production: 1) the lack of both quantity and suitability of gravels for chinook salmon spawning; 2) the absence of instream shelter for yearling steelhead trout production; 3) the presence of fish migration barriers; and 4) the lack of adult spawners. The 1964 flood, combined with sediment-producing watershed disturbances are the primary agents responsible for the first three limiting factors.

Our surveys and studies have shown that these habitat limiting factors vary from stream to stream. Some streams have available spawning habitat but few adult spawners; whereas in other streams the adult spawners exceed the capacity of the available spawning habitat.

From 1979 to date, the Forest program has consisted of: conducting habitat, watershed, and population surveys; developing drainage plans to outline a systematic approach for restoring and/or enhancing watersheds and fishery habitat; establishing pilot demonstration projects for developing and testing habitat and watershed improvement techniques; and project work on 14 historical anadromous fish producing streams.

Spawning Habitat. To achieve quality spawning habitat conditions, projects have consisted of placing weirs and deflectors constructed of gabion and rock to promote gravel deposition, pool, and shelter formation. A total of 73 structures has been constructed since 1979.

The most successful project has been on Patricks Creek. Chinook salmon spawning increased from a pre-project two redds in 1978 to a post-project annual increase of 35 to 50 redds. Gravel deposition has increased from 35 ft^2 to over 7,500 ft^2. Steelhead spawners have consistently utilized the new gravel deposition sites.

Similar increases in gravel deposition have resulted on other streams as a result of the projects. Approximately 50 to 70% of the spawning that occurred was within constructed spawning areas. However, this has amounted to only a few redds because of the low number of salmon spawners.

Rearing Habitat. To increase steelhead and coho salmon juvenile rearing habitat, projects have consisted of modifying riffles with boulders, logs, root wads, and gabions to create instream shelter, increasing the frequency and depth of pools by blasting bedrock lips and constructing plunge and channel constricting

structures, stabilizing and revegetating banks, and removing and stabilizing channel debris. This work has resulted in two- to four-fold increases in juvenile fish production in project areas. The Forest has treated approximately 25 acres.

Fish Migration Barriers. Numerous miles of suitable habitat for anadromous spawning and rearing is not accessible because of log debris jams, boulder roughs and bedrock falls. Annually, existing and potential barriers are examined for removal or modification.

Caution has to be exercised when dealing with woody debris jams. The instream bioenergy, instream shelter, and the physical make-up of the channel is largely governed by woody debris within the stream. Debris jams are modified to either ensure fish passage, eliminate bank erosion problems, or prevent future barriers. By cutting and/or cable anchoring of large key logs, and removing small debris, the debris jam can be stabilized and shaped to provide for fish passage, instream shelter and bank protection. Forty debris jams have been modified since 1979.

Fry Production. In 1980 the Forest, in cooperation with California Department of Fish and Game, started utilizing streamside egg incubation boxes to restore and enhance salmon and steelhead spawning escapement to streams where projects have increased the quality and quantity of spawning habitat; or where spawning escapement is below the potential habitat capacity. The goal of this program is to reestablish spawning populations within two life cycles, by starting at the egg stage to imprint and adapt the fish to the targeted stream environment.

The Forest is currently operating egg boxes on four streams. The eggs are obtained from the hatcheries that are within the drainage. The egg-to-fry survival has averaged from 80 to 98%. Adequate numbers of chinook salmon eggs have been hard to obtain because of the low returns of adult spawners to the hatcheries.

Watershed Restoration. Several drainages have sediment yields greater than the stream's transport capabilities. This is confirmed by measurements in embeddedness, pebble counts, and substrate sediment composition. Watershed restoration designed to reduce sediment yields to near natural levels will result in increases of fish habitat and augment in-channel habitat improvement projects. Inventories of entire watersheds are conducted to identify continous and potential sediment sources. An evaluation is conducted to determine if the source is treatable (i.e. determination of access, cost-effectiveness of proposed treatments, and benefits accrued), and how it relates to other sediment sources. A restoration plan is developed, all sources are prioritized, and the route of funding and implementing the projects are determined. The majority of the projects consist of structural and vegetal means of reducing sediment.

Watershed restoration projects to date have resulted in revegetating approximately 200 acres of bare erodible soils. The work has consisted of reducing sediment production from two major landslides and several road fill slopes. Benefits accured from these projects have resulted not only in reduction of sediment delivered to the channel, but also include benefits to wildlife, timber, and soil productivity.

Summary. The pilot projects disucssed above have demonstrated that procedures do exist for restoring and enhancing habitat. The goal of Six Rivers National Forest is to increase anadromous fish habitat by 25% over the next few years. Annual fish production is estimated to increase by over 1.5 million pounds in 10 years.

SECTION IV

CONTRIBUTED PAPERS

THE ROLE OF STRUCTURE IN THE PHYSICAL HABITAT OF ANADROMOUS SALMONIDS

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A fundamental difference between a canal and a natural stream is structure. Structure includes all the typical anomalies of natural streams that deflect the general downstream flow, such as bends, bars, bedrock knobs, boulders, landslide deposits, and large woody debris. This results in the storage of watershed products in the channel, and in a great heterogeneity in depth, velocity, stream gradient, and substrate conditions. In this paper, I will discuss these functions of structure in salmon habitat and some implications for restoration of habitat.

Structure and Storage. Watershed products introduced to and stored in stream channels include water, sediment, and organic material. Watershed managers attempt to control the introduction of these products during management activities, but the amounts in channels depend mostly on storage compartments created by structure. In a general sense, storage of watershed products in a stream increases the overall productivity of the aquatic ecosystem. Storage of water in pools and backwaters greatly contributes to the minimum living space available during low flow in summer. Storage of sediment provides spawning gravel and also decreases the impact of large inputs of sediment by slowing and dispersing pulses of sediment as they move downstream (Swanson and Lienkaemper 1978). For instance, in Little Lost Man Creek in the Redwood Creek drainage, Humboldt Co., California, approximately 100 years of bedload sediment are stored behind debris jams. Consequently, the year-to-year variation of sediment production from this third order tributary is relatively low (E. Keller, Univ. of Cal., Santa Barbara, pers. comm. 1982). Organic material provides the greatest source of metabolic energy in forested streams, and its storage during periods of low input maintains a food source for the aquatic ecosystem and provides time for microbial breakdown (Bilby and Likens 1980).

Historical Changes in Structure. Recent archival research indicates that there has been, and continues to be, a tremendous depletion of structure in stream channels in the Pacific Northwest since the coming of European man (Sedell and Luchessa 1981). The accounts of the first explorers depict coastal floodplains as vast complex swamps with backwater areas, beaver dams, multiple channels, and extensive debris jams, together forming a widespread aquatic ecosystem integrated over the entire floodplain. There were huge volumes of water, sediment, and organic debris in storage, and, as we well know, a much greater production of anadromous salmonids. Structure, mostly in the form of large wood, was removed from stream systems first by settlers to farm the floodplains and later by loggers who transported logs from small tributaries to mills at the mouths of mainstem streams. By the end of the 19th century, the original expansive aquatic ecosystems had shrunk to single channel networks with most of the structure removed. In the last few decades, large woody debris has been further depleted by streamside logging and salvage, by large floods which swept

away streamside debris and concentrated it in jams, and by the removal of debris jams to promote fish passage.

Effects of Structure on Channel Morphology. Structure in the form of obstacles deflects the flow and induces strong secondary currents, which scour the bed. Because an obstacle causes locally high energy expenditure, transport capacity is reduced and sediment is deposited downstream of the obstacle. Secondary currents preferentially sweep fine sediment to one side or the other of the scour hole. This sorts the bed material, in some cases creating a favorable spawning environment. All large obstacles on or beside the streambed cause some degree of scour and deposition. The volume of scour depends upon the size of obstacle and the local sedimentary environment. For instance, an obstacle on a bar induces greater deposition and less scour than if the obstacle is in an incipient pool, because deposition is the predominant precess on bars during high flow.

There are some important interactions between channel morphology and obstacles. In Jacoby Creek, near Arcata, California, where we have studied channel processes over the last 5 years, the channel thalweg appears to flow directly from one obstacle to the next (Figure 1). Here, 92% of 46 pools are formed around obstacles, and there are only a few obstacles in the channel that have not scoured a pool. All of these can be explained by recent channel modifications by landowners. This association strongly suggests that thalwegs tend to become attached to obstacles in the channel large enough to deflect the flow and form pools. Scour around an obstacle forms a pool that holds the thalweg. If this tendency is strong, then obstacles not only create heterogeneity in hydraulic and substrate conditions, but they also enhance channel stability.

There is, however, a limit to how many pools can be created by abundant obstacles in the channel. Deposition induced downstream of an obstacle often forms a bar where the tendency for pool formation is reduced (Figure 2). In Jacoby Creek, this imposes a minimum spacing of approximately two channel widths in length between locations where large pools can form. There is wide variation in pool spacing in channels surveyed throughout the world; the mean value is 5 to 7 channel widths (Keller and Melhourn 1978). It appears that, where there are abundant obstacles, pools are closely spaced; pools are widely spaced in straight channels without obstacles.

Although pools provide vital living space during low flow, they do not provide the protection from high velocity needed by juvenile salmonids during winter storm flows. Much of winter habitat is formed by debris jams that span the entire channel width and thereby pond the water upstream at high flow. In some tributaries of Redwood Creek, debris jams form the preponderence of refuge areas during high flow (Keller, pers. comm. 1982).

Implications for restoration and management. Channel structure, both as large obstacles that deflect the flow and as debris jams that pond water and sediment, provides some essential functions for aquatic ecosystems, particularly for anadromous salmonids. Storage of watershed products by structure provides living space in critical low flow and high flow conditions, stores metabolic energy sources, provides cover, disperses large sediment impulses, and creates a heterogeneous and stable stream channel. However, over the last 100 years, structure has been depleted from stream channels for various reasons, some of them obstensibly to improve fish habitat. With this background, what are the implications for restoring and maintaining salmon habitat?

Firstly, managers should be concerned about the abundance of structure in

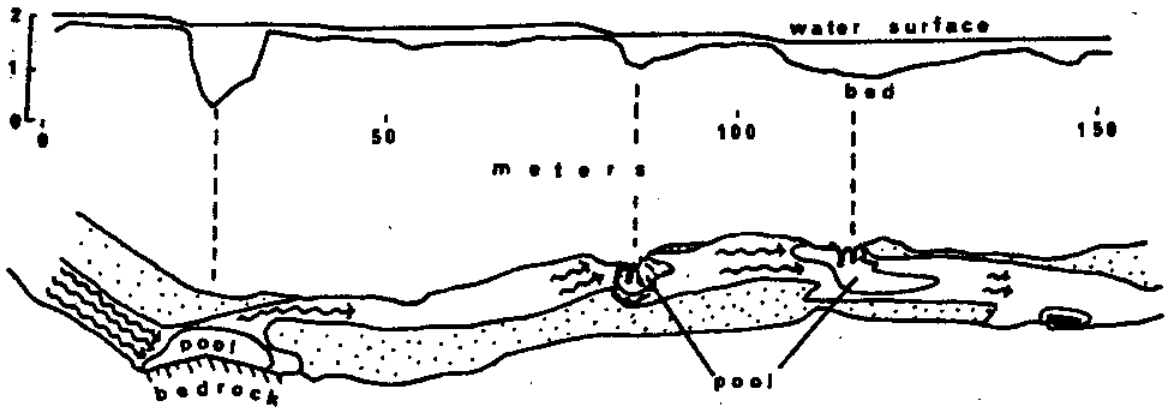

Figure 1. Longitudinal profile and map of a reach of Jacoby Creek. The thalweg course and pool locations are determined by local scour around a bedrock outcrop and two clusters of trees whose roots and trunks protrude into the flow.

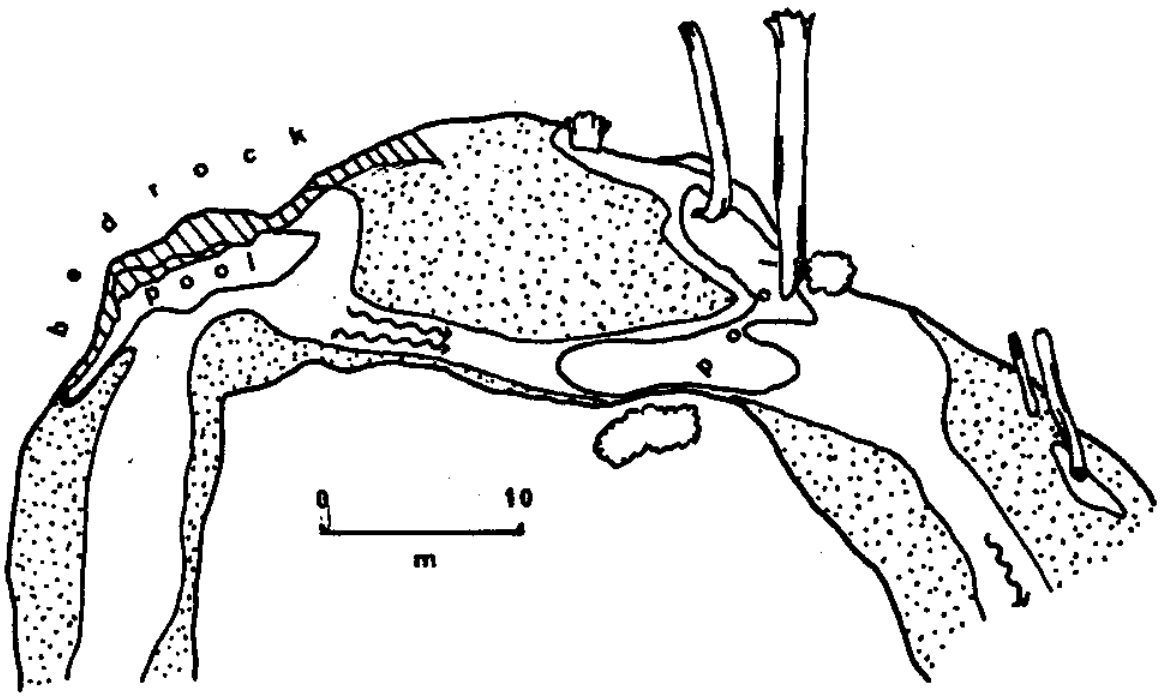

Figure 2. Closely spaced pools in Jacoby Creek separated by a large gravel bar which appears to encroach upon the downstream pool.

stream channels, especially large woody debris. Debris often forms the most abundant structure in forested channels, and it is highly sensitive to management practices. To maximize its benefit to fish habitat, riparian trees and large woody debris in channels should be treated as if they belong to the aquatic ecosystem. In particular, large trees along streams should be left standing so that they may someday enter the channel and replenish the dynamic supply of habitat-forming structure. Salvage of merchantable logs out of stream channels may not be adequately justified in terms of habitat improvement. For instance, new large inputs of woody debris from blowdowns and landslides may create temporary channel instabliity and bank erosion. However, in the long term, the added structure will usually benefit fish habitat.

The removal of debris jams should be critically evaluated. Does the jam present a demonstrable barrier to upstream migration to an important area of usable habitat? Is the removal of barriers from small tributaries worth the loss in sediment storage, and will a large pulse of sediment be released downstream? Is the removal of a potential barrier worth the loss of winter habitat? In view of these trade-offs, how do the costs and benefits of removing jams in small tributaries compare with those of other opportunities for improving habitat in potentially more productive areas downstream? Will the large pieces of the jam be utilized by the manager to retain some structure?

Finally, obstacles can be secured, manipulated, or added piecemeal to increase habitat in productive areas. For instance, large woody debris that effectively enhances habitat can be secured in place, while other pieces that are not functioning as effectively may be moved to where they can, for instance, enhance the depth and cover of a pool. Pieces on adjacent hillslopes and floodplains can be pulled into a channel. This approach demands that one look over many stream reaches for opportunities where structure can be practically manipulated. Ingenuity and much ground work are required to enhance pre-existing channel tendencies to economically improve habitat over a wide area.

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STEP (SALMON AND TROUT ENHANCEMENT PROGRAM) RESTORATION PROJECTS IN OREGON

George Westfall
Oregon Dept. of Fish and Wildlife

George Westfall, STEP Biologist, gave the talk on this program at the Conference. He offered this paper as a substitute, written by Dick Herrig, STEP Supervisor with Oregon Dept. of Fish and Wildlife, entitled "STEP - An Update" and printed in Oregon Wildlife (February 1983). George wanted to preface it with the following quote: "Public sentiment is everything. With public sentiment nothing can fail; without it nothing can succeed." -Abraham Lincoln.

"There ought to be a law!"

That was the sentiment shared in 1981 by fishermen, landowners, the Fish and Wildlife Department, and members of the Oregon Legislature who worked toward passage of House Bill 2992. With passage of that law the Salmon and Trout Enhancement Program (STEP) was born.

The idea behind STEP was simple; that private citizens, groups and businesses would become actively involved in efforts to improve and restore populations of salmon and migratory trout. The program was conceived to produce the most benefit for the least dollars, and the key was volunteer labor and, in many instances, donated materials. This allows a salmon and trout improvement program far larger than limited tax revenues would otherwise support.

The idea of volunteer efforts to help fish was not new. Nor did it originate with the Fish and Wildlife Department. One of the first organized efforts began in 1973 when Tillamook County pioneer Harley Foland and several friends convinced the Oregon Fish Commission to let them hatch salmon eggs using a streamside incubator. With the assistance of Representative Paul Hanneman, these men worked out a program in 1977 to expand their ideas with other interested citizens into the Tillamook Landowner Program. This egg hatching program is one example of many fish enhancement efforts that preceded STEP.

Sportsmen's clubs had long been involved in efforts to improve conditions for fish. A few examples include:

-Klamath Country Flycasters: Began a program in the 1960's to fence streamside habitat along the upper Williamson River to protect from overgrazing. Club members also placed spawning gravel in areas where little had existed.

-Sunriver Anglers: Introduced spawning gravel into Spring River and experimented with trout egg planting using the Whitlock-Vibert plastic egg hatching box.

-Rogue Flyfishers: Have a long history of improving habitat and fish passage in the Rogue River basin. Their efforts to construct fish ladder passage around a dam on the Rogue River earned the club a conservation award from the American Fisheries Society.

Some farsighted coastal educators have long taken advantage of local salmon resources as a stimulus for learning. Neil Maine has conducted classes in Seaside that concentrated on natural resource awareness. His classes have been doing field surveys for spawning salmon as well as studies of juvenile salmon in the estuary. Another north coast teacher, Eldon Korpele, has for many years had classes at Astoria High School and Warrenton High School doing field projects dealing with fish culture. Ponds have been built on school property to raise

salmon, and classes are involved annually at department hatcheries during salmon spawning activities.

On the south coast, George Tinker, Marshfield High School, and Mickey Hurley, Bandon High School, have ongoing programs that include streamside incubators for salmonid eggs, stream habitat enhancement and salmon spawning activities.

House Bill 2992, in effect, formalized the elements of public involvement that had already been in effect in some areas. The new law declared that the program's goal is to restore native stocks of salmon and trout to their former level of abundance in a cost-effective manner. The law details the following:

1) Department personnel will act as advisors to citizen volunteers.
2) They will provide the technical assistance for project development.
3) Volunteer projects must be coordinated with other department activities and programs.
4) Education and information materials will be developed to promote public awareness.
5) Supervision will be provided for citizens developing local fish broodstocks.
6) Provision of available money will be made to citizens to carry out approved projects.

The law outlines the process by which projects are conceived and carried out. It also establishes a 15-member advisory committee appointed by the Governor which reviews the policies of the department and makes recommendations to the Fish and Wildlife Commission on implementation of the program.

Dick Herrig was appointed staff coordinator for the program, and the 1981 Legislature authorized a budget of $352,000 for the first 2 years. The Fish and Wildlife Commission decided to concentrate in the western part of the state initially, and four field biologists were assigned to the program to provide technical assistance and guidance to program volunteers. Geographically, the coast is divided amongst four biologists.

Three more STEP field biologists have been requested in the Fish and Wildlife Department budget under consideration now by the Legislature. They will help meet the demand for expansion of the program in the Rogue, Umpqua and Willamette Valley areas.

How It Works

It is important that volunteer STEP projects dovetail into the department's existing fish management programs and habitat management activities. So all project proposals are carefully reviewed before they are approved. Any group, individual or governmental body can propose a project. Projects currently underway have been initiated by individual citizens, groups of sportsmen and commercial fishermen, schools, educational groups, civic organizations,and city and county governments.

A department guide is available to interested parties wanting to plan enhancement projects. It explains objectives of the program, suggests types of projects and provides forms to help plan and propose a project. Here are some of the kinds of projects that are possible:

Stream Surveys. Surveys evaluate the condition of habitat in and along streams and status of fish runs. This work is a key to planning projects which will most effectively increase fish production.

Stream Side Plant Restoration. The condition of streambanks is important for fish. Shade provided during the hot summer months can decrease temperatures that otherwise might limit or destroy the value of stream habitat for salmon and trout. Erosion is controlled by root systems which help keep silt from the stream

that would clog gravel, smother eggs, and reduce production of water insects that are vital as a food source for fish. Fish need the three essential basics to all life; food, cover and rearing area. Vegetation along streams can help provide all these things. Projects can involve sloping banks, planting or re-seeding and fencing disturbed streamside areas.

Instream Habitat Restoration. The quality of habitat within the stream can limit fish production. Fish need a balance of spawning and rearing areas with some riffles and some pools in a given stream section. Addition of structures can, in some cases, improve the ability of a stream to produce fish. This has been accomplished in a number of areas by placement of sill logs anchored on the stream bottom. Gravel collects behind the log, providing spawning area above the structure and a rearing pool on the downstream side gives cover and living area for larger fish. Rock filled wire baskets called gabions are easily placed and provide for water control at a fraction of the cost of concrete or wooden structures. Although drifting logs and floods can damage these structures, they provide an effective, low-cost way to alter stream habitat and protect against erosion in many Oregon streams.

Boulder placement in a stream can provide a balance between the amount or ratio of riffles to pools. They are most often used where there is too much riffle and not enough pool and hiding area. Although heavy equipment is usually required for placement, these natural instream structures provide good habitat in many otherwise limited areas.

Sometimes gravel of the correct size for spawning needs can be brought in and deposited in a stream to good advantage. Several projects have used this approach.

Barrier Removal. The homing instinct of salmon is well known as the adult fish return from the sea to surge upstream to suitable spawning areas. Logjams, roadway culverts, natural falls, dams or velocity barriers (where water current is too fast) may hamper upstream migration. Many times these conditions can be changed if the area of suitable habitat above each barrier warrants the cost and labor involved. Logjams can be sawed, dragged or blasted away, and structures of concrete, wood or gabions can be added to give easier passage to upstream migrating fish.

Scale Collection. Groups or individuals can assist in collecting scale samples from salmon or steelhead caught in a fishery to assist the department in evaluating contribution of hatchery and naturally reared fish stocks. Better management decisions will be possible because of these efforts.

Education. Education is a primary objective in the legislation that created STEP. This aspect of the program is recognized for the benefits of increasing awareness and understanding by the general public for the needs of fish, for a healthy environment and the necessities of life. The educational benefits of STEP are expected to span both adults involved in enhancement projects and the younger generation in classrooms and field activities.

Stream Stocking. Development of a stream's fish population can be assisted by the planting of locally adapted stocks which will populate spawning and rearing areas. Streamside egg incubator boxes for salmonid eggs have been placed in many areas of the state. A reliable water supply of the proper quality and temperature must be available to assure good hatching conditions. Fry are released into the stream after the hatching process is complete.

Adopt-A-Stream. A group may want to concentrate efforts on a nearby or favorite stream and carry out any or all of the previously listed types of projects.

An excellent approach is to take a good look at the stream and attempt to define "limiting factors" before deciding what enhancement efforts should be undertaken.

What Progress So Far?

When STEP field biologists joined the program in late 1981 they found a rapidly expanding public involvement program and many eager participants. Projects of many kinds were already well underway. Hatchbox programs, habitat enhancement projects, education efforts and a steelhead collection program all were underway. Initially, the egg program was the most pressing demand for time. Project proposals, site inspections and egg distribution for coho and chinook salmon, and steelhead and cutthroat trout kept STEP biologists plenty busy during the fall months.

As with any new program, there were numerous problems initially, but many of them have been ironed out and the program is running more smoothly now. Nature seemed to conspire against the program in the fall and winter of 1981 when worse than normal flooding brought special problems. Silt collected in incubation boxes, drifting leaves and other debris clogged water intakes and in some cases, the high water completely removed the boxes and water intakes. The result was reduced survival of eggs and production of fry.

Much was learned from these experiences, however, and the program will benefit from the inventiveness that volunteers have shown in overcoming minor setbacks.

It is not possible in this article to give credit to all the individuals who have been involved in STEP over the past year. The list would include some thousands of people and more than 10,000 hours of labor. But a summary of some of their accomplishments would include:

Education. A number of coastal educators have been teaching salmonid enhancement for several years, as mentioned earlier in this article. Additional programs have been started in the past year. STEP biologists have been spreading the word about the program by visiting with teachers and their classes. Various classes are getting involved in the program with projects undertaken by students. These have included stream surveys, stocking salmon fry, logjam removal, and egg incubation. Rescue of salmon fry from small tributaries that were drying up this past summer occupied one class. And a workshop was conducted last fall for teachers to help them take advantage of the program as an educational tool.

Volunteer Scale Program. In December 1980, the department and the Association of Northwest Steelheaders announced a cooperative program. Its purpose was to obtain scale samples from angler-caught winter steelhead from Oregon's coastal streams. The program was expanded in 1981 to include both summer and winter steelhead from all streams in the state. Twenty thousand scale envelopes with return address, and several thousand brochures were printed for distribution to Oregon anglers.

The response has been excellent. The department has received and processed more than 1,500 scale samples from the 1981-82 season, representing both coastal and Columbia River tributaries. The scales help determine hatchery/wild ratios in each Oregon stream and will be of value for future steelhead management.

Habitat Enhancement. The list of habitat enhancement projects undertaken in the past year is truly impressive. Development of the different projects is in various stages. Some are just in the planning stage, others are completed. A good many are of a nature that will take an ongoing commitment of maintenance and repair. Projects have been undertaken on nearly 50 streams and tributaries throughout western Oregon.

Egg Incubation Program. In the past year, STEP has advanced well beyond what the department had anticipated for the egg incubation program. That anticipation amounted to simply distributing some salmon eggs that were surplus to hatchery needs for a public involvement program. What really expanded the program beyond this original expectation is the desire of the public to incubate eggs on rivers or streams where there is no suitable hatchery supply of salmon or trout eggs.

In some cases eggs available at a hatchery cannot be transferred to certain river systems either because of stock transfer guidelines (genetic concerns) or disease factors.

The upper Nehalem River, for example, is an area where the department has had egg requests. A disease is present there, however, that prevents using eggs from a hatchery on the North Fork Nehalem. To use this stock, which has a low resistance to the disease, would reduce the resistance of the wild run in the upper river. The department is in the process of developing a new brood stock more resistant to the disease, however, and when returns from this stock increase, eggs will be made available for STEP.

Volunteers have helped in a number of areas to seine, trap or otherwise collect wild fish from river systems to provide eggs. In some cases, these eggs are being used to develop new hatchery broodstocks from stream systems for which no suitable hatchery stock is now available. Eventually, these efforts will help assure adequate eggs for both department and STEP egg incubation programs.

For now, a shortage of coho returning to coastal streams and some hatcheries has provided insufficient eggs to meet all the needs of the STEP program.

STEP is still a program in its infancy. It is evident that there is a huge human resource interested, willing and able to pitch in with time, muscle, money, and perseverence toward enhancement of one of Oregon's most valued natural resources. The combined efforts of all these dedicated people cannot fail to have an important impact on the salmonid resource. But there is another benefit to the program that is equally important, if less measurable. That is the education that comes from working directly with the resource, and the sense of personal achievement that comes from hard work and seeing the benefits from those efforts.

EMERGENCY AERATION FOR SALMONID REARING PONDS

Bruce Wyatt
University of California Cooperative Extension
Sea Grant Program

The Need for Aeration. Water flow failures account for one of the largest losses of fish in rearing pond operations. Since salmon are reared in crowded conditions, they will require more oxygen than the water volume can supply and some method of aeration is needed. Oxygen can be supplied by a constant agitation of water and by aeration devices or both. Most north coast ponds have a constant exchange of water, and the inflow water is sprayed into tanks to further increase oxygen levels.

Stocking densities of fish depend on water exchange rate and aeration. In general from 5 to 20 lb of fish can be reared for each gallon per minute flow. Many factors affect stocking rate and in most culture situations it is determined through experience. Waste build-up and ammonia gas increases are other problems that develop during inadequate water flow to the culture system.

When water flow stops suddenly the sources of oxygen are cut off and unless oxygen can be added to water by another means fish will begin to stress as oxygen concentrations fall to 4 or 5 ppm. If stocking densities are high, oxygen can be used up in minutes. Addition of oxygen will keep fish alive for hours or even days; however, as ammonia gas and waste build-up occurs, fish will again become stressed. Aeration is only a stop-gap measure and water flow should be started as soon as possible, within the same day if practical. The higher the stocking density the greater the urgency for getting the system repaired.

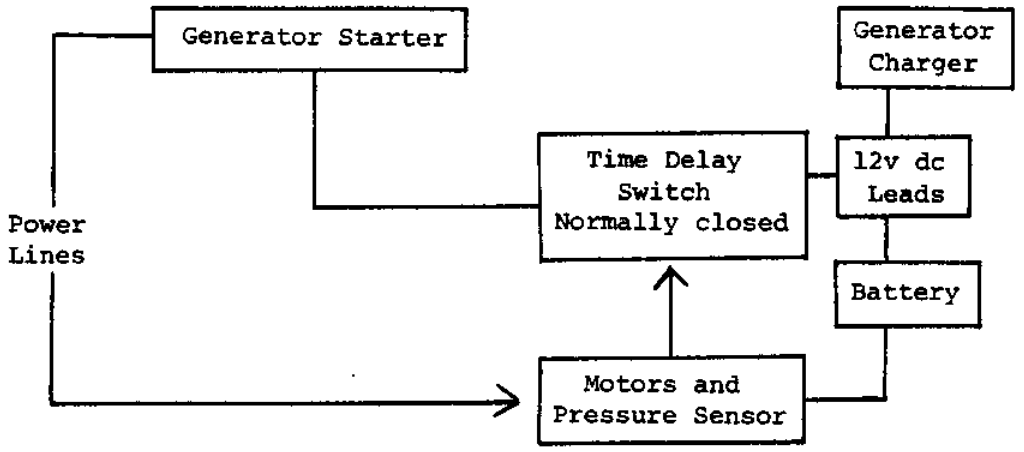
The emergency aeration systems described here were designed by Mr. Jim Ford of Ukiah, California for use in culture tanks at the Mill Creek rearing facility at Talmage, California. Two types of emergency aeration are in common use. One system consists of pumping and agitating the water, the other, which is described here, involves pumping air directly into the water.

Description of the System. The system consists of a motor-driven air pump, an air dispersion system, and a sensor to indicate water flow stopage. This system was designed for 25-foot diameter "Doughboy" pools and if larger water volumes are used, the number of pumps can be increased. The motor should be a 1/3 hp capacitor-starting all weather electric motor, which costs about $175.00. The air pump can be a used smog pump from a wrecked standard size car. The original smog pump pulley or sheave can be used and it should be matched with one of equal size on the motor. The system is belt-driven and an automotive belt can be used.

The air dispersion hose is 5/8" garden hose, preferably of rubber construction to provide flexibility. Holes for air flow are 3/32" diameter and they are drilled an inch apart along the length of the hose. For a 25-foot diameter "Doughboy" pool, 2 hoses placed in a half circle meet in the tank opposite the air pump. About 75 feet of hose will be needed and it should be weighted with lead or other ballast taped to the hose about every foot. Tire weights were used at the Pt. Arena Save Our Salmon (SOS) faciltiy. A pressure switch from a pressure system pump was used to sense the pressure of water flowing into the tank. Electricity is available up to the pressure switch, which is normally open (open circuit). As water flow stops, pressure drops and the switch closes, and

the circuit is completed to start the motor-driven air pump. In cases where the water flow is not under pressure, a float water level switch can be substituted for the pressure switch. The motor-driven air pump can be replaced by water agitation devices made for the aquaculture industry by a number of companies. One such unit is made by Fresh-Flo of Cascade, Wisc. 53091. (Phone: (414) 528-8236). The cost is about $350.00.

Use of Self-Starting Generator. Where public power is not available it will be necessary to use a self-starting generator. For the above system a 4500-watt Honda generator converted for propane is being used at the Pt. Arena SOS ponds. To keep from burning up the generator by over-cranking, it is necessary to add a timed relay switch between the generator charger and the aeration motors. The time relay is placed between the battery and the starter so that the charging system, which will be activated upon starting, will cause the starter to disengage. The relay used was a Potter L. Brumfield 12v dc Model CKD38-20010* (normally closed) and it can be adjusted for various shut-off delays. A simple diagram of the system follows:



The sequence of starting the system follows: 1) The pressure sensor closes when the water flow stops, and power flows through the normally closed relay to the generator starter, 2) As generator starts, the generator charger develops a dc voltage which actuates the time delay relay and it opens the starter circuit (opening the circuit is like turning off the key in your car). The time delay setting for shutting off the starter will have to be determined by trial and error and it is probably only a few seconds between the time the charger is activated, to starter shut-down.

Project leaders wishing to build such a system should keep in contact with Bruce Wyatt (707-527-2621) for new developments in using this equipment.

* available from: Zacks Electronics, San Francisco, (415) 626-1444

TROUT AND SALMON DISEASES

Ron Ducey
California Dept. of Fish and Game
Mad River Hatchery
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When organisms become numerous on a fish, they may cause changes in its behavior or produce other obvious symptoms. Unfortunately, each disease or parasite does not always produce a single symptom or syndrome characteristic in itself. Nevertheless, by observing the symptoms one can usually narrow down the cause of the trouble.

Some of the obvious changes in behavior of fish suffering from a disease, parasite, or other physical affliction are:

1. Loss of appetite
2. Abnormal distribution in pond, such as riding the surface, gathering at the pond sides or in slack water, and crowding the head or tail screens
3. Flashing, scraping on the bottom or projecting objects, darting, whirling, or twisting, and/or loss of equilibrium
4. Loss of vitality, weakness, and loss of ability to stand handling during grading, seining, loading, or transportation

In addition to changes in behavior, disease may produce physical symptoms, or the parasite may be seen by the unaided eye. For microscopic examination, it is necessary to call in a fish disease expert. Symptoms observed may be external or internal, or a combination of both.

Gross external symptoms are:

1. Discolored areas on the body
2. Eroded areas or sores on the surface of the body, head, and fins
3. Swelling on the body or gills
4. Popeye
5. Hemorrhages
6. Cysts containing parasites

Gross internal symptoms are:

1. Color changes of organs or tissue (pale liver or kidney or congested organs)
2. Hemorrhages in organs or other tissues
3. Swollen or boil-like lesions
4. Change in texture of organs or tissues
5. Accumulated fluid in body cavities
6. Cysts containing parasites

APPENDIX A

PROGRAM

JANUARY 22 - 23, 1983

Saturday
January 22, 1983

9:00 a.m. Opening Remarks

Bruce Wyatt, University of California Sea Grant
Marine Advisory Program

Sari Sommarstrom, Mendocino Fish and Game Advisory Commission

Bob Rawstron, California Department of Fish and Game

PART I

FISH REARING PROGRAMS

NEW METHODS, NEW IDEAS, NEW TOOLS

9:30 a.m. "Rehabilitation of a Washington Steelhead Stream Through Fish Culture Techniques"
Speaker: Ted Muller, Washington Dept. of Game

10:00 "Smoltification and Time of Release, Research Results"
Speaker: Mu Iwata (for Richard Nishioka), Dept. of Zoology
University of California

10:30 "Demonstration of Emergency Aeration in Case of Water Flow Failure in Culture Tanks"
Speaker: Bruce Wyatt, Area Marine Advisor,
University of California Sea Grant Program

10:45-11:00 BREAK

11:00 "Evaluation of Hatch Box Design and Success"
Speaker: Derek Poon, former Director of the Northern Southeast Alaska Regional Aquaculture Association

11:30 "The Importance of Native Races of Steelhead and Salmon"
Speaker: Graham Gall, Associate Professor, Dept. of Animal Science
University of California, Davis

12:00 p.m. "Everyday Culture Practices for Ponding Programs"
Speaker: Ron Ducey, Hatchery Manager, Mad River Hatchery,
California Dept. of Fish & Game

12:30-1:45 LUNCH BREAK

12:45-1:30 Tour of Bodega Marine Laboratory with emphasis on lobster aquaculture and salmon projects.

PROJECTS IN PROGRESS

FISH REARING PROGRAMS

1:45 Humboldt Fish Action Council/County of Humboldt/Pacific Lumber Co.
Speaker: David Miller

Monterey Bay Salmon and Trout Project
Speaker: Dave Streig

Prairie Creek Hatchery
Speaker: Steve Sanders

Garberville Rotary Club
Speaker: John McGrath

3:00 BREAK

3:15 Save Our Salmon
Speaker: Leonard Craig

Mattole Watershed Salmon Support Group
Speaker: Linn House

Salmon Restoration Association of California
Speaker: Don Bradley

Humboldt Fishermen's Marketing Association
Speaker: Pete Daignault

4:15 Brief Reports of Projects that Could Not Send Representatives:
Rowdy Creek Hatchery, Gualala River Steelhead Project

4:30-5:00 Summary of Projects: Discussion of Projects for the Future
Speaker: Bruce Wyatt, U.C. Sea Grant
Bob Rawstron, CDF&G

6:30-10:00 p.m. CRAB FEED

9:00 p.m. Discussion of Networking Between Restoration and Enhancement Groups and Possible Joint Lobbying Efforts
Led By: Sari Sommarstrom and Dwight Streamfellow

Sunday

January 23, 1983

PART II

STREAM RESTORATION PROBLEMS

NEW METHODS, NEW IDEAS, NEW TOOLS

8:30 a.m. Opening Remarks

Chris Toole, University of California Cooperative Extension

Ken Hashagen, Calif. Dept. of Fish and Game

9:00 "Use of Instream Structures in Stream Rehabilitation"
Speaker: Kerry Overton, Six Rivers National Forest

9:30 "Planning Restoration Projects Using Stream Dynamic Considerations"
Speaker: Tom Lisle, U.S. Forest Service Southwest Experiment Station

10:00-10:30 BREAK

10:30 "STEP (Salmon and Trout Enhancement Program) Restoration Projects in Oregon"
Speaker: George Westfall, Oregon Dept. of Fish and Wildlife

11:00 "A Look at a Stream From a Soil Conservation Viewpoint"
Speaker: Tom Schott, Mendocino County Resource Conservation District

11:30 "Barrier Removal Techniques--New Methods"
Speaker: Ron Kusina, CEMR (Center for Education and Manpower Resources)
Ukiah, California

12:00-1:00 LUNCH BREAK

PROJECTS IN PROGRESS

STREAM RESTORATION PROGRAMS

1:00 Corte Madera Creek Restoration
Speaker: Leo Cronin

New Growth Forest Services
Speaker: Meca Wawona

Coastal Headwaters Association
Speaker: Gary Peterson (for Richard Gienger)

Jacoby Creek Canyon Community, Inc.
Speaker: Bob Wunner

Fisheries Department, Hoopa Valley Business Council
Speaker: Bill Brock

3:00 South Fork Trinity Watershed Improvement Association
Speaker: Dwight Streamfellow and Tom Stokeley

California Conservation Corps
Speaker: Mel Kreb and Marc Groff

Redwood Community Action/Smith River Alliance
Speaker: Nancy Reichard

Redwood National Park
Speaker: Joe McKeon

Report of Salmon Stamp Program
Speaker: Kevin Collins

4:30 Summary and Prospects for the Future
Speaker: Chris Toole, University of California Cooperative Extension Sea Grant Program
Bob Rawstron, California Department of Fish and Game

APPENDIX B

LIST OF REGISTERED PARTICIPANTS

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Corte Madera Creek (See p. 7)

D

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Ron Ducey
Joan Ducey
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John McGrath
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