

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILE 8672
1824 SCOMM 74: SEN. SPEC. COMM. ON DOMESTIC & INTL. FISH., 1991-92.

* Section 1. AS 16.10 is amended by adding a new section to read:

ARTICLE 9A. MANAGEMENT OF FISHERIES.

Sec. 16.10.621. MANAGEMENT OF WILD AND HATCHERY STOCKS OF ANADROMOUS FISH. (a) The Board of Fisheries shall manage fisheries in the state to achieve sustained yield for wild anadromous fish stocks.

(b) In managing hatchery produced anadromous fish stocks, the board shall consider the need of anadromous fish hatcheries to obtain brood stock. The board may manage fisheries in the state to achieve an adequate return of hatchery produced anadromous fish stocks to hatcheries for brood stock; however, management to achieve an adequate return to hatcheries for brood stock may not prevent achievement of sustained yield for wild anadromous fish stocks.

(c) The board may consider the need of hatcheries authorized under AS 16.10.400 to harvest and sell fish produced by the hatchery that are surplus to needs for brood stock to offset the cost of operating the hatchery. The board may exercise its authority under this title as it considers necessary to provide a reasonable return of surplus fish to a hatchery to offset the cost of operating the hatchery. The board may adopt criteria for determining the reasonable needs of hatcheries for surplus fish and may adopt a management plan to provide surplus fish to a hatchery.

Prince William Sound Aquaculture Corporation

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January 14, 1992

Honorable Dick Eliason, President
Alaska State Senate
P.O. Box V
Juneau, Alaska 99811

Dear Senator Eliason:

Prince William Sound Aquaculture Corporation (PWSAC), and its program, was built on pink salmon production and sales. What began as a two-hatchery system expanded to five facilities as PWSAC accepted financial and management responsibilities for three state hatcheries, two of which were incapable of generating cost recovery revenue in 1991.

The total commercial catch of Alaskan salmon in 1991 was a record 185 million fish, of which about 130 million were pink salmon. The abundance of pinks in Prince William Sound revealed the frailty of PWSAC's procedure of inviting daily bids for cost recovery fish. Processors refused to buy pink salmon which were caught at or near hatcheries. Several million pink salmon were wasted.

The failure of the daily bid sales procedure prompted the PWSAC Board to accelerate its plans to seek new markets for its stable supply of salmon, and to facilitate the development of new salmon products. To accomplish these objectives, the Board authorized the pre-sale of hatchery revenue fish which will return in 1992. In addition, the Board authorized multiple year sales and risk-sharing ventures, with the provision that to the extent possible, traditional markets not be impacted.

Our sales team has met with representatives of about 30 seafood processors to present the sales and marketing information included in the enclosed brochure. In addition, we have solicited indications of interest from an additional 80 companies. Results are encouraging. In this year of continued oversupply of pink salmon, we believe we will be able to sell the 20 million pounds of cost recovery pink salmon we have available, although price remains a question.

Our sales and marketing program is an important step in achieving some diversification within the industry. We believe it is the right thing to do.

Thank you for your support of the Prince William Sound salmon program and the industry at large.

Sincerely,

John McMullen, President

TABLE. SOUTHEAST ALASKA STATE HATCHERY CONTRIBUTIONS OF SALMON TO COMMON PROPERTY FISHERIES. DATA ARE FROM FRED DIVISION ANNUAL REPORTS TO THE LEGISLATURE.

Species	Year	Commercial	Sport	% Sport
Chinook	1988	9,688	2,058	17.52%
	1989	8,261	2,829	25.51%
	1990	18,358	3,660	16.62%
	1991	25,878	6,069	19.00%
	Total	62,185	14,616	19.03%
Coho	1988	18,772	3,249	14.75%
	1989	38,392	9,936	20.56%
	1990	57,797	3,187	5.23%
	1991	108,412	4,689	4.15%
	Total	223,373	21,061	8.62%
Pink	1988	68,000	100	0.15%
	1989	299,800	4,000	1.32%
	1990	167,300	1,100	0.65%
	1991	467,600	4,000	0.85%
	Total	1,002,700	9,200	0.91%
Chum	1988	229,011	0	0.00%
	1989	33,160	0	0.00%
	1990	12,194	0	0.00%
	1991	53,362	0	0.00%
	Total	327,727	0	0.00%
Sockeye	1988	20,400	2,200	9.73%
	1989	36,672	0	0.00%
	1990	110,007	50	0.05%
	1991	96,836	200	0.21%
	Total	263,915	2,450	0.92%
TOTAL ALL SPECIES (88-91)		1,879,900	47,327	2.46%
YEARLY AVERAGE (88-91)		375,980	9,465	2.46%

TABLE . SOUTHEAST ALASKA PNP AND RAA HATCHERY CONTRIBUTIONS TO COMMON PROPERTY FISHERIES, AS REPORTED BY HATCHERY OPERATORS.

Species	Year	Seine	Gillnet	Troll	Comm All	Sport	% Sport
Chinook	1988	337	1,355	7,101	8,791	1,990	18.45
	1989	2,155	1,154	9,671	12,980	2,082	13.82
	1990	190	1,176	13,096	16,462	1,508	8.59
	1991	2,911	11,506	17,325	31,742	7,510	19.13
	Total	5,593	15,191	49,193	69,977	13,090	15.76
Coho	1988	6,760	10,130	13,607	30,497	1,282	4.03
	1989	2,829	5,258	33,260	41,347	1,951	4.51
	1990	28,228	45,625	212,545	286,398	8,248	2.80
	1991	44,025	144,898	283,264	472,187	34,329	6.78
	Total	81,842	205,911	542,676	830,429	45,810	5.23
Pink	1988	27,217	19,373	4,195	50,785	850	1.65
	1989	414,977	160,257	52,375	627,609	7,115	1.12
	1990	253,900	28,802	48,684	331,386	4,867	1.43
	1991	545,809	66,038	12,960	624,807	10,550	1.66
	Total	1,241,903	274,470	118,214	1,634,587	23,382	1.41
Chum	1988	463,520	266,702	14,008	744,230	340	0.03
	1989	259,436	163,745	30,573	453,754	2,690	0.59
	1990	296,090	74,208	25,571	395,869	5,332	1.33
	1991	669,750	153,279	452	823,481	5,800	0.70
	Total	1,688,796	657,934	70,604	2,417,334	14,162	0.58
Sockeye	1988	0	0	0	0	0	0.00
	1989	0	0	0	0	0	0.00
	1990	0	0	0	0	0	0.00
	1991	445	1,570	0	2,015	0	0.00
	Total	445	1,570	0	2,015	0	0.00
ALL SPECIES (88-91)		3,018,579	1,155,076	780,687	4,954,362	96,444	1.91

Hatcheries and the Future of Salmon in the Northwest

Ray Hilborn

ABSTRACT

Artificial propagation is often seen as a way to maintain and increase or augment fish stocks that have suffered from habitat loss and overexploitation. Large-scale hatchery programs for salmonids in the Pacific Northwest have largely failed to provide the anticipated benefits; rather than benefiting the salmon populations, these programs may pose the greatest single threat to the long-term maintenance of salmonids. Fisheries scientists, by promoting hatchery technology and giving hatchery tours, have misled the public into thinking that hatcheries are necessary and can truly compensate for habitat loss. I argue that hatchery programs that attempt to add additional fish to existing healthy wild stocks are ill advised and highly dangerous.

Below my office window at the University of Washington School of Fisheries, is our small salmon hatchery. Every fall thousands of school children come to see the chinook salmon, *Oncorhynchus tshawytscha*, and coho salmon, *O. kisutch*, return to their natal waters. Our graduate students show them the fish and demonstrate how eggs are taken, mixed with sperm, and magically the life cycle of salmon is renewed. These tours are the most significant public relations activity of our school, and through these tours most Seattle school children are brought into their most direct touch with a major part of the environmental heritage of the Northwest.

It was only after 3 years of seeing the annual cycle of school visits that I began to wonder if we were really doing the right thing. Hatchery tours are common throughout the Northwest, and I fear that the message they convey is that (1) salmon come from hatcheries, (2) habitat loss and pollution are so widespread that natural spawning fish are dying out or are extinct, and (3) the long-term survival of salmon depends upon hatchery technology. My daughter's fourth grade teacher was planning a field trip to a state-run hatchery for a tour. He was unaware that only 20 minutes away thousands of natural spawning fish can be found and easily seen in streams and that most of our rivers still support runs of

wild spawning salmon. He told me he thought that all of the habitat had been destroyed and there were no wild fish to see.

I believe that fisheries scientists share a collective responsibility for the public belief that the maintenance of salmon runs depends upon hatcheries. This belief is particularly pernicious because it inexorably leads to the acceptance of hatcheries as a mitigative measure for further habitat loss and dam construction. This view can be expressed as "If the wild stocks are doomed anyway, let's just build the hatcheries and get it over with." This belief is not just found among the general public; many professional fisheries scientists also believe that the future of salmonids is in hatcheries. They believe that resources that could go into habitat protection and restoration would be better spent on artificial propagation.

The fisheries community in general is not aware that artificial propagation in the Northwest has failed to live up to expectations and in many cases has been an abysmal failure. Nor is the public or the fisheries community aware that artificial propagation poses a substantial, and perhaps major, threat to the long-term viability of our salmon heritage. Bruce Brown (1982) details the plight of wild salmon in the Northwest, but in the last 10 years even more evidence has accumulated on the failure of hatchery programs and the

threat they pose to the wild stocks of salmonids.

Many believe that the future of fisheries lies with artificial propagation. Indeed, throughout the world most management agencies seem to be relying on some form of artificial propagation to "rebuild" fish stocks that are depleted due to poor fisheries management or poor habitat management. Artificial propagation has been proposed for such diverse species as her- ring, tuna, abalone, and giant clams—the list is nearly endless. Thus, the lessons we have learned with salmonids in our part of North America are of direct and important relevance around the world.

Are Hatcheries Sustainable?

Fisheries management should be a long-term proposition, and our responsibility is to assure that the fisheries resource will be maintained by our generation for the next generation. We need to assure that 20, and even 100 years from now there will still be salmon in our rivers. This means that the time horizon for fisheries scientists and managers must be much longer than the engineering horizon for dams on our rivers. Once the dams have been taken down, we must be sure we will still have fish to use the rivers. While this may seem far-fetched, removal of the Elwah Dams on the Olympic Peninsula and the Hetch Hetchy

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Dam in California are now being considered.

If hatcheries are to be used as mitigative measures we must ask not only do they work now, but will they continue to work, and will they permit the maintenance of natural runs? Unfortunately, most evidence suggests that while hatcheries may work initially, their success decreases after a few years. Figure 1 shows the trends in survival for two major hatchery programs—coho in Oregon and chinook in British Columbia. In each case, as the hatchery programs have developed the success of the hatcheries has decreased. The British Columbia chinook example is an extreme point. Although more hatcheries were built throughout the 1980s (by the middle of the decade there were 10 times more chinook smolts released than in the mid-1970s),

there were no more hatchery chinook being caught; indeed there were fewer! This pattern of declining survival of hatchery-reared fish is found in nearly every hatchery program in North America. The two examples shown in Figure 1 are the longest, most reliable time series available. The one large-scale hatchery program I have examined that does not show a clear declining trend is chinook salmon in the Columbia River. From the mid-1970s to the mid 1980s the survival rates for these stocks varied greatly, with high survival rates in the early 1980s. Given the short time span of the survival estimates and the high variability it is difficult to determine any long-term trend.

There is no well-accepted explanation for the declining survivals from hatcheries (Walters 1988); it may be

genetic changes, predator build up, disease accumulation, or a host of other potential problems. The cause doesn't matter as much as the conclusion—hatchery production may not be sustainable. To assume it will work for a century is a bold assumption indeed and one that puts the salmon resources of our children at great risk.

Impacts of Hatchery Fish on Wild Stocks

I believe we must rely on wild fish for the long-term maintenance of our salmon populations. Wild fish are our heritage and we must, in turn, pass this heritage on to our descendants. The concern for wild fish has mounted, with Nehlsen et al. (1991) listing over 100 stocks from the lower 48 states having a high risk of extinction. Artificial production poses a great threat to the maintenance of wild fish. This threat comes in at least four forms: direct competition for food and other resources between wild and artificial fish, predation of artificial fish on wild fish, genetic dilution of wild fish stocks by artificial fish allowed to spawn in rivers and streams, and increased fishing pressure on wild stocks due to artificial production (Goodman 1990).

There is ample evidence that salmonids compete for resources at most stages of their life history. Figure 2 shows the survival rate of sockeye salmon, *Oncorhynchus nerka*, from Babine Lake, a tributary of the Skeena River in British Columbia. The number of juvenile sockeye leaving Babine Lake was increased by providing artificial spawning channels. The more fish that left Babine Lake and swam down the Skeena River, the smaller the proportion of them that survived their ocean life. A major effect of this change is that the wild runs from the Skeena River have declined approximately 50% (West and Mason 1987). Presumably the other sockeye on the Skeena were affected by the competition that is so obvious in the Babine Lake data. Salmon compete for food and space in fresh water and in the ocean. We should expect that as we increase artificial production these fish will compete with wild fish, and the survival of wild fish will decrease—it is folly to assume otherwise.

Proponents of artificial propagation like to think of their hatcheries augmenting the wild stocks, particularly

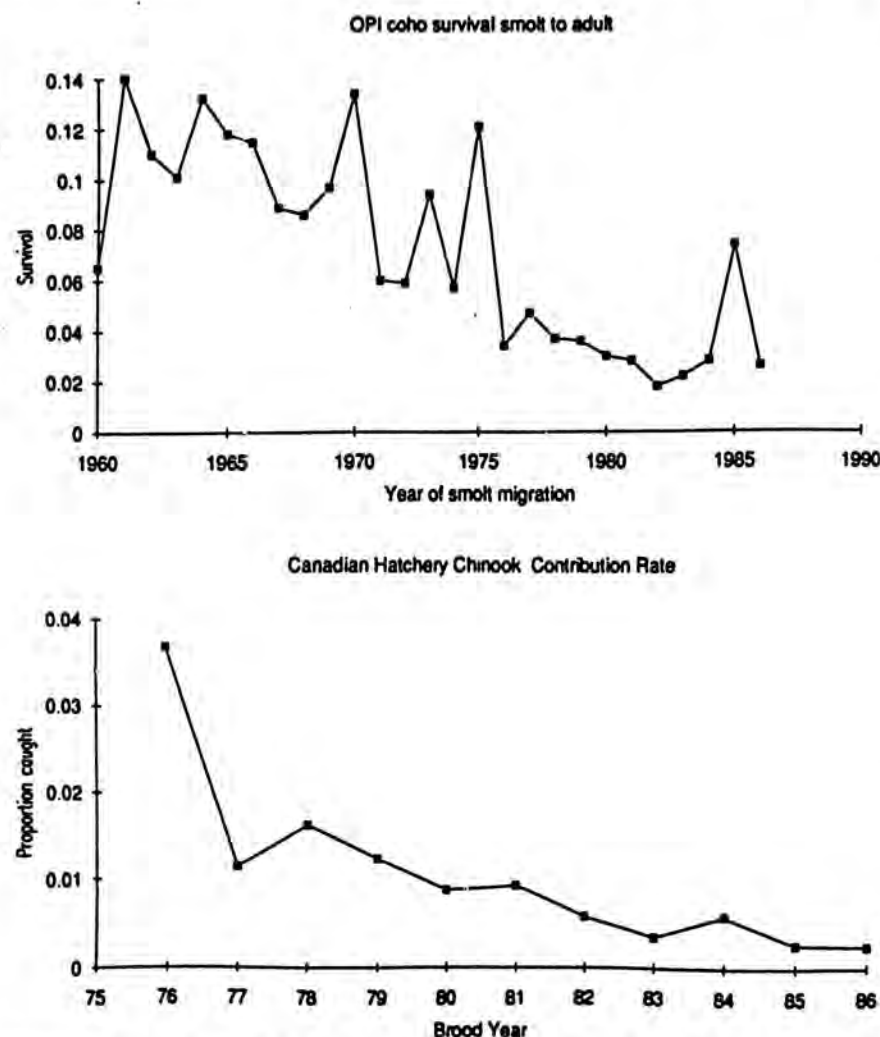


Figure 1. Survival trends in hatchery-produced coho in Oregon and hatchery chinook in British Columbia. Data for Oregon from Nickelson (1986) and Robert Francis (University of Washington, personal communication). Data for British Columbia chinook from P. J. Starr (Canadian Department of Fisheries and Oceans, personal communication).

by allowing surplus hatchery fish to spawn in the wild. These extra spawners, turned away from the hatchery, are hoped to add to the natural spawning population. Accumulating evidence suggests that hatchery fish often do poorly in the wild; the offspring of wild $\times$ hatchery matings do more poorly than wild $\times$ wild matings. Two mechanisms explain this. First, hatchery managers select for fish that do well in hatcheries, that is, fish that can hatch in plastic trays and learn to feed on a man-made diet. In the wild, fish must find mates, lay eggs in gravel, avoid predators, and find natural food. The requirements of a successful hatchery fish are very different from a successful wild fish; it should be no surprise that fish selected for by hatchery conditions may do poorly when they encounter the rigors of a real river. Second, hatchery practice in the past often involved taking fish from one watershed and using them in a hatchery elsewhere.

When hatcheries allow surplus fish to spawn in the wild, they are allowing all of the genes that have been brought in from elsewhere and have been selected for hatchery life to dilute the naturally adapted genes of the wild fish. The net result may be that after a few generations there are no more wild fish—we will, and indeed in many places we now do have, mongrel fish not well-adapted to any particular river. The great genetic diversity of the Northwest of 100 years ago is being lost at a horrifying rate, and hatcheries are accelerating this loss. Waples et al. (1990) review genetic concerns for salmonids.

When hatcheries have a poor return of adults they often capture wild fish to use as brood stock. This "creek robbing" would be a criminal offense if conducted by ordinary citizens and they would be called poachers. However, when conducted by hatchery staff it is somehow considered beneficial for the resource. There are documented instances where wild stocks have been almost totally eliminated by egg takes for hatcheries.

When hatcheries are successful at producing adult fish the potential harvest rate is very high; often 95% of the returning fish can be harvested because so few adults are needed for eggs. There is wide concern throughout the Northwest that we have allowed our

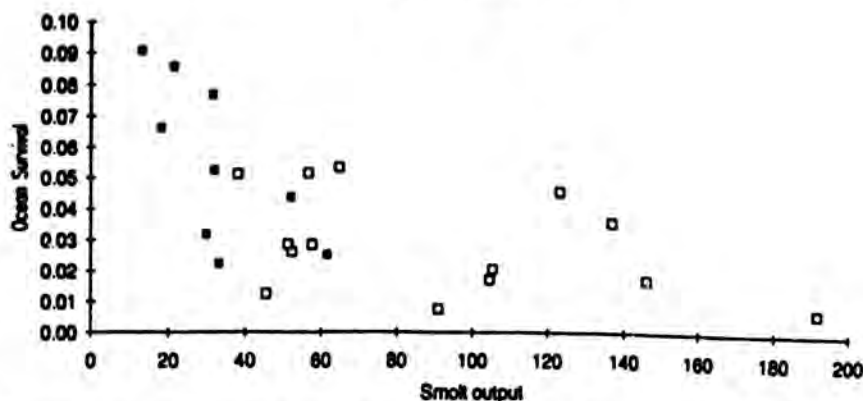


Figure 2. Survival trends of sockeye salmon from Babine Lake. As artificial production increased the total number of smolts leaving Babine Lake, the survival declined dramatically. Data from McDonald and Hume (1984).

fisheries harvest rates to match the potential productivity of hatchery stocks, causing wild stocks to be overfished. In some places this is striking. Parts of Puget Sound have been declared "hatchery management areas," and the harvest rates are so high that few wild fish make it back to spawn. Just north of Puget Sound, in Canadian waters between Vancouver Island and the mainland, harvest rates on coho salmon are as high as 95%; these are sustainable only by the most successful hatchery stocks. The net result of these high harvest rates is that as hatchery production has increased wild stocks have declined, and the Canadians have no more coho now than they did 15 years ago—but now many of their coho come from hatcheries (at great expense) instead of natural streams.

The Real Threat: the Technological Fix Syndrome

The real danger of hatcheries and other forms of artificial production is that they provide an excuse for habitat loss and poor fisheries management. If we believe in hatcheries, then we can allow the rivers to be dammed, silted, and destroyed. Just mitigate with a hatchery. Although it seems we should know better by now, the lessons haven't really sunk in. New hatcheries are still being built in Washington and Oregon. British Columbia and Alaska have both embarked on large-scale hatchery programs even though their catches from wild fish are now at or above historic highs.

Even more dangerous is the spread

of the technological fix syndrome. If hatcheries don't work now, we will try some other form of hatchery technology. The current new idea is "supplementation" in which eggs are incubated in a hatchery and then spread throughout a watershed to rear naturally. We don't know if supplementation will produce the desired increase in adults, but we can be confident that it will greatly alter the genetic structure of the wild stocks. The technological fix has spread beyond salmon hatcheries—now developers throughout the West Coast want to build "artificial" habitat to replace lost wetlands. This is where the fisheries community must accept its responsibility. We have been extremely eager to help in the design and testing of new technology; indeed, fisheries schools have been, in effect, salespersons of the technology.

Great Hatchery Successes

Whenever I speak out against the hatchery fetish, people ask about the great successes: trout in freshwater lakes, salmon in the Great Lakes, and the Japanese chum salmon hatcheries. Many of these programs are undoubtedly successful at narrow objectives. Introduction of exotic species or monoculture often works reasonably well. Rabbits did very well in Australia, starlings do well in North America. The widespread introduction of trout around the world has produced some valuable recreational fisheries. However, in most cases these introductions have replaced indigenous species by

new species, not boosted the production of an existing wild population.

Even with these great successes, we see echoes of our own concern here. Trout management is moving away from hatcheries and toward the nurturing of habitat for wild fish. This is documented by Ray White's (1989) article in *Trout*, "We're Going Wild: A 30-year Transition from Hatcheries to Habitat." In the Great Lakes, where introduced Pacific salmon generated a major recreational fishery, concern is mounting about declining hatchery survivals—they just don't know if their salmon fishery is sustainable. The highly successful chum fishery in northern Japan has produced large catches of chum salmon for Japanese fishers, but it is quite possible that Japanese chum have simply replaced the naturally-occurring mix of six species of salmon with a single species monoculture.

What Should Be Done

Is there a place for hatcheries? I really don't know. Certainly if all hatcheries were now closed, the catch of chinook and coho salmon in the Northwest would drop greatly. We could certainly expect some wild stock production to rebound, particularly if we devoted some of the resources that have gone for hatcheries to habitat protection and improvement. Closing all hatcheries now would certainly cause a lot of pain to recreational, subsistence, and commercial fishermen—but it might ensure the long-term survival of the fish and the fishermen who depend upon them.

On the Columbia River, where much of the habitat has been lost and the series of dams poses a severe barrier to downstream migration of juvenile salmon, most people believe that we must have hatcheries. I am not convinced. The most successful salmon stock on the Columbia is the wild spawning chinook of the Hanford Reach, the one free-flowing section of the main river. If we devoted all of the resources that now go into hatcheries on the Columbia to improving the downstream passage of fish, to reduc-

ing harvest, and to protecting habitat, we might be quite surprised what the natural spawning fish would do if given a chance.

I believe that we should declare a moratorium on building new hatcheries. The large pink salmon hatchery complex in Prince William Sound, and the potential sockeye hatcheries in British Columbia and Alaska seek to add hatchery production on top of very healthy wild stocks. There is no mitigative excuse for these facilities; they are the result of technology being sold by fisheries scientists to unwary fishers motivated by short-term greed. These programs should be terminated.

We have taken an enormous gamble with our children's heritage. Now we must find out what we are doing to the wild fish stocks, how to preserve and rebuild them. Goodman (1990) has proposed that hatcheries must have a federal license that is reviewed periodically. Hatcheries that don't produce adult fish and those that cause serious impacts on wild fish would be shut down. I believe this is an excellent proposal.

We need to make much better use of the hatcheries that we now have. In Washington and Oregon, where much habitat has been lost, there is little if any funding for research on methods of hatchery operation. Instead of building more hatcheries, we need to find out how to operate hatcheries to produce fish in the catch with as little an impact as possible on the wild stocks. Many hatchery managers still receive salary bonuses based on fish released from the hatchery, regardless of the survival of these releases or the impacts on wild stocks. This simply must be changed.

As I look out my window at another group of school children touring our hatchery I wonder what kind of salmon their children will see. Will their world be one of high technology, with genetically-engineered fish returning to computer-controlled hatcheries, or will we maintain and improve our wild streams? Will their classes visit streams instead of hatcheries? Instead of imi-

tating hatcheries by rearing fish in classrooms will the school children of the future adopt sections of streams for protection, know what wild spawning salmon need, and make sure they have it?

Alaska Acknowledgment

An earlier version of this paper appeared in *The Osprey*, a newsletter published by the Steelhead Committee of the Federation of Flyfishers.

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In salmon raising, man's a poor substitute for nature

By Dan Gallagher
The Associated Press

BOISE — While Idaho's once flourishing wild salmon runs sputter and die, salmon advocates say a multimillion-dollar hatchery system is producing little more than genetically inferior cannon fodder for dams.

In the spiral staircase of their DNA, wild salmon developed the genetic strength to migrate down the Columbia River system, then swim to southeastern Alaska before muscling back upstream to Idaho to spawn and die.

But eight hydroelectric dams built on the Columbia and Snake rivers in this century have wreaked havoc on the wild runs. And the millions of salmon produced at the region's federal and state hatcheries to help make up for the loss lack the natural heartiness to ensure their long-term survival.

"Darwin was onto something," said Ed Chaney, director of the Northwest Resource Information Center in Eagle.

"Over all those years, the salmon in the Columbia River Basin adapted to a wide variety of environments from the high desert in Nevada to the alpine country in the Sawtooths. They evolved to be as productive as you can get.

"Hatchery fish are raised in a controlled environment. Those 'hothouse fish' are re-

leased in a formidable environment and expected to perpetuate themselves. That's very unrealistic thinking."

The National Marine Fisheries Service designated the Snake River sockeye an endangered species in November. Last

Along with the wild fish, they must negotiate dam turbines, 345 miles of slack water reservoirs, predators and fishermen's nets to migrate to the Pacific Ocean. More than 95 percent don't make it back to Idaho waters.

gists are working to ensure enough wild fish remain to perpetuate the species.

The one wild female and three male sockeye that returned to Redfish Lake last summer produced about 1,000 fertilized eggs that are being kept at a hatchery in

les, but from a practical view you don't have a range of genetics to tap," said Bill Bakke, endangered species coordinator for Oregon Trout Unlimited. "Agriculture has shown that for a long time. They've saved wild seed for years. In fisheries, we've ignored that."

Bakke suggests a genetic data base to predict if the salmon strains are headed down a dead-end street.

The U.S. Army Corps of Engineers plans a test drawdown on Lower Snake River reservoirs this spring to gauge if the faster flow through the sluggish water will help more salmon smolts migrate downstream.

The corps, which financed some Idaho hatcheries to make up for salmon lost to its dams, now realizes wild fish are an integral part of the solution, said Sarah Wik, a biologist directing the agency's Columbia River mitigation efforts.

"We learned the hatcheries can't solve the problem," she said. "It's a big puzzle. You have to look at all the pieces. If you look at one piece and not the other, you can't solve it."

The corps has been investigating whether there are fall chinook nests, or redds, in Little Goose Reservoir on the Lower Snake that would be destroyed by the drawdown. So far, federal divers have been unable to prove they exist.

▲ Hatchery fish are raised in a controlled environment. Those 'hothouse fish' are released in a formidable environment and expected to perpetuate themselves. That's very unrealistic. . . .

— Ed Chaney, director of the Northwest Resource Information Center in Eagle, Idaho

summer only four sockeye returned to central Idaho's Redfish Lake to spawn.

A decision is expected this month on whether the fall and combined spring-summer chinook runs will get federal protection as threatened species.

About 500,000 wild chinook migrate from Idaho each year.

The Idaho Department of Fish and Game estimates 15 million spring and summer chinook could be produced at federal and state hatcheries in Idaho each year.

But with egg production limited by the number of migrating fish making it back to Idaho, only 6.1 million spring chinook and about 1 million summer chinook were released from Idaho hatcheries in 1991, said Dexter Pitman, anadromous fisheries chief for Fish and Game.

Pitman said Fish and Game intended to use a two-pronged approach, raising hatchery fish to maintain the sheer number of salmon in Idaho's rivers and streams while regularly infusing those populations with their wild counterparts to keep the gene pool vital.

"It's not a choice of only one working. They both have to work," he said.

But both have failed, and the Northwest is moving inexorably toward changing the way dams and reservoirs in the Columbia River Basin are run to help more wild salmon complete their lifetime's journey.

In fact, the Idaho Fish and Game Commission's new five-year migratory fish plan acknowledges that hatchery production is only treading water until migration to the sea becomes less deadly.

While those changes are debated, biolo-

Eagle and 1,000 more at a federal facility in Seattle.

Pitman hopes captive brood stock can be reintroduced to the wild as soon as possible, rather than keeping it in the hatchery for more generations until it is incapable of surviving the river.

But Chaney likens the project to attempts to save the California condor with captive breeding in cages.

He and others contend salmon recovery is a multifaceted problem that hatchery production alone stands no chance of solving.

"There's nothing wrong with hatchery fish. But they are more expensive and less productive. They are raised in an environment that is conducive to disease," he said.

"We're not saying get rid of the hatch-

FRED Division Mission Statement

To sustain and enhance Alaskan fisheries through the development and application of technologies in supplemental production and natural stock rehabilitation.

FRED Division Roles

- ° Develop, implement, and evaluate technology for natural stock and habitat rehabilitation in lake, stream, and marine nearshore environments.
- ° Provide economic evaluation of the statewide fisheries rehabilitation, enhancement, and development aquaculture program.
- ° Facilitate and regulate Alaska's private nonprofit (PNP) salmon enhancement program.
- ° Conduct comprehensive regional fisheries production planning, and maintain and administer annual and basic management plans for hatcheries.
- ° Manage and operate Alaska's public fisheries rehabilitation, enhancement, and development program.
- ° Provide technical services to statewide fisheries rehabilitation, enhancement, and development programs.
- ° Develop and transfer new information and aquaculture technologies to the PNP aquaculture sector and the public at large.
- ° Develop and apply existing and new techniques to evaluate biological and harvest implications of fishery enhancement programs relative to natural stocks.
- ° Develop and facilitate an efficient mix of hatchery contracting and cooperative agreement options that make the best use of the PNP and state hatcheries.
- ° Assess critical areas of need, and implement projects for fisheries rehabilitation, enhancement, and development projects across the state.
- ° Manage and operate hatcheries to stock streams, lakes, and nearshore environments for sport, subsistence, personal, and commercial use.
- ° Restore losses to fisheries caused by natural and manmade disasters.
- ° Develop and maintain a computerized base of information on the fisheries rehabilitation, enhancement, and development program.
- ° Educate, inform, and involve the public in Alaska's fisheries rehabilitation, enhancement, and development program.

SMOLTS

The Journal of the Cook Inlet Aquaculture Association



ISSUE 41

JANUARY 1992

Cook Inlet Aquaculture
Association
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Soldotna, AK 99660

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Coal Creek sockeye project moving toward spring stocking

Coal Creek, CIAA's newest sockeye enhancement project, is entering the final stages of preparation for the upcoming field season. Some minor paperwork needs to be

completed, but staff will soon begin constructing the net pens that will temporarily house over 90,000 sockeye smolt before they are released to Coal Creek, a tributary of

the Kaslof River.

The sockeye, which originated from Tustumena Lake broodstock, are now being held at the Trill Lakes Hatchery. Each fish

(Continued on Page 7)

CIAA Board seat up in election now underway

In the election now in progress one director will be elected to a three-year term on the Association's Board of Directors. Two Director/Alternate teams are contesting for the one at-large commercial fishermen's seat on the Board.

The two Director/Alternate teams are Eric Lindow/Ronald "Sid" Cox and David Blossom/Douglas M. Blossom.

The seat to be filled is currently occupied by the Director/Alternate teams of David Blossom/Douglas M. Blossom, who were elected in 1989.

Each of the two Director/Alternate teams completed a nominating procedure which required them to secure the signa-



Erik Lindow



Ronald J. "Sid" Cox

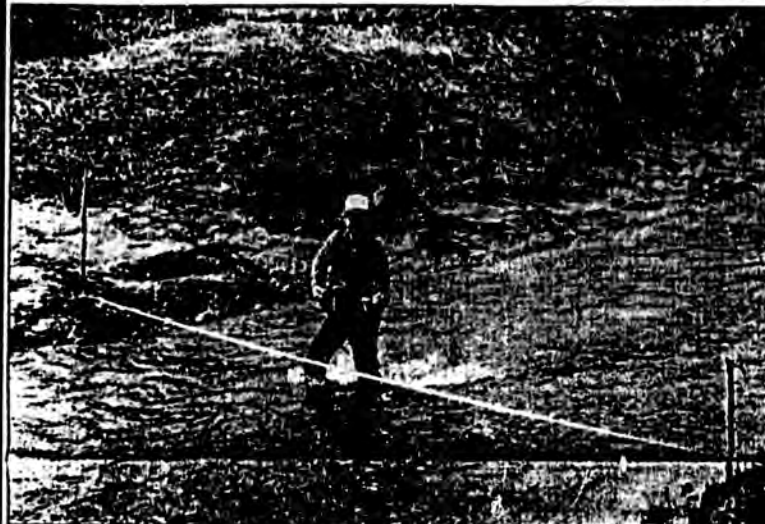


David M. Blossom



Douglas M. Blossom

(Continued on Page 6)



CIAA Biologist Gary Fandrel takes flow measurements in a segment of Coal Creek

CIRPT reviews Port Graham Hatchery proposal

The Cook Inlet Regional Planning Team (CIRPT) held its first meeting since its summer recess on December 13, 1991. The members and the fifteen others in attendance briefly reviewed related events which had taken place since the last meeting and then considered a private non-profit application for a Pink Salmon Hatchery at Port Graham, the Susitna River Unit Plan and selection of the next watersheds to be worked on by the CIRPT.

The Port Graham Hatchery Corporation has submitted an application to the Alaska Department of Fish and Game to construct and operate a private non-profit pink salmon hatchery, which would at capacity production handle 110 million green eggs. The projected adult return from this capacity production would be approximately 3.53 million pink salmon.

In the application the applicant identifies what he expects "to accomplish by the operation of the proposed hatchery" in the following terms.

"The salmon cannery at

Port Graham had long been a mainstay of the economy in both Port Graham and English Bay. It was the principal employer of residents from both villages. During the last 10 years or so the salmon returns to the Port Graham/English Bay area have been decreasing. This made it more difficult to obtain sufficient quantities of salmon to run the cannery at a profit. The shock of the Exxon Valdez oil spill with its resultant restriction in the number of salmon that were harvested was enough to close the cannery. It has not been operated since.

"There was another problem with the Port Graham cannery. It produced, as the name implies, canned salmon. Unfortunately, the market for canned salmon is rapidly diminishing. To compete in today's market, the cannery will need to produce higher quality products.

"The loss of the cannery has caused a large amount of unemployment in both Port Graham and English Bay. Logging in

(Continued on Page 2)

Chelatna Lake data base increasing

Chelatna, located approximately 180 kilometers northwest of Anchorage, Alaska, has been the focus of CIAA enhancement efforts in the northern district of Cook Inlet since 1988. The lake lies at the base of the Alaska Range near Denali National Park where it forms the headwaters of Lake Creek, a tributary of the Yenana River and an important recreational waterway. It is also the largest of the 24 lakes within the Susitna River drainage system known to support sockeye salmon.

Interest in Chelatna Lake as a sockeye salmon rearing area really began in the 1930s and 1940s when the U.S. Fish & Wildlife Service completed several surveys to identify populations of spawning red salmon. Later, in the 1970s and early 1980s, sockeye escapement surveys were completed by the Alaska Department of Fish &

(Continued on Page 7)

Paint River construction and Corps re-evaluation completed

On January 10 Colonel John W. Pierce, Alaska District Engineer for the U.S. Army Corps of Engineers, announced his decision in the reevaluation of CIAA's permit to build the Paint River fish ladder.

"I find that considerations of the overall public interest requires that I make a preliminary finding of no significant impact, and not revoke or suspend

the permit at this time. To ensure that I have the information necessary to determine whether the public interest dictates further modification, suspension, or revocation of the permit, I have initiated steps to modify the permit to add a special condition(s) which will ensure I receive the information essential to determine the additional future action I

must take.", Colonel Pierce said in his findings.

By allowing the permit to remain in force, the ladder can be declared operational, thereby expanding the Sanctuary and establishing the Refuge. This will provide additional protection to the bears, according to the Corps's Environmental

(Continued on Page 4)



Retired ADF&G engineer and CIAA's resident representative at the Paint River construction site finishes off a concrete sample for later testing at a laboratory in Soldotna

FROM THE EXECUTIVE DIRECTOR'S DESK:

Report to Cook Inlet Fishermen

Many Cook Inlet commercial fishermen support payment of the 2% salmon enhancement tax because they feel they probably owe something to, and, therefore, want to take good care of, the fishery which has provided for them over many years. Other fishermen express hope that spending the tax to produce more fish will lessen the intensity of the several long standing harvest allocation disputes. Still other fishermen prefer to look at the 2% salmon enhancement tax strictly as a financial investment like purchasing a new boat, playing the stock market or depositing money in a bank.

By annually investing part of the value of their catch in enhancement projects fishermen expect to be able to harvest fish which would otherwise not exist, thereby providing a substantial monetary return. In the remainder of this article I shall attempt to show how well the salmon enhancement tax investment performed in the 1991 season and offer a projection (sort of a prospectus) of future return on investment.

THE INVESTMENT

The 2% salmon enhancement tax was first collected in the 1981 season. As can be seen in Table 1, the amount collected each year has varied from about \$300,000 to about \$3,000,000. Tax revenues vary so wildly because of dramatic fluctuations in both the number of fish harvested and prices paid to fishermen from year to year. The average amount collected (if we include an estimate for the 1991 season) is about \$1,000,000. While the State makes no distinction between amounts collected from the Upper and Lower Inlet, I estimate that about 95% of the total (\$964,159) is derived from the Upper Inlet.

Table 1- COOK INLET SALMON ENHANCEMENT TAX COLLECTIONS

Season	Amount
1981	\$ 348,575
1982	715,122
1983	677,353
1984	348,028
1985	714,158
1986	934,410
1987	2,330,652
1988	2,516,857
1989	1,289,322
1990	971,466
1991 estimate	320,000
Average	\$1,014,904

THE 1991 ADULT RETURN

Not all CIAA projects are funded by salmon enhancement taxes. Tutka Hatchery (including Halibut Cove and Homer Spit Pink projects), Paint River and all Kachemak Bay-Kamishak Bay Sockeye stocking projects are supported by State and Federal grants or by Lower Inlet "cost recovery" harvest revenues. Table 2 shows only those CIAA tax supported projects to which adult fish returned in 1991. With the exception of Bear Lake coho, all of these projects were in the Upper Inlet.

Utilizing a variety of techniques I estimate that the

commercial harvest value for salmon returning to enhancement tax supported projects in 1991 was \$2,606,275; some 2.7 times the average amount of enhancement tax invested. This rate of return is comparable to 25.7% compounded quarterly over a 4 year period (the age of return of most of the fish harvested this year).

THE 1996 ADULT RETURN

By the 1996 season I would expect the value of tax supported harvests to grow to at least \$4,450,000 in the Upper Inlet and to about \$1,000,000 in the Lower Inlet (Table 3). Both harvest value figures will be much higher if salmon prices

improve from 1991 levels.

Any adult fish attempting to return to Eklutna Hatchery, Chelatna Lake and Habitat Project locations including Shell Creek, Trinity Creek, Threemile Creek, Blahop Creek and Daniels Lake must pass through the Northern District setnet, Central District setnet and drift gillnet fisheries. Adult fish returning to Packers Lake, Hidden Lake, Tustumena Lake, Coal Creek and Habitat Project locations including Blue Lake and Marten Lake must pass through the Central District setnet and drift gillnet fisheries.

Bear Lake and "Age 0" reds are harvested by seiners. Salmon are harvested by recreational fishermen; coho returning to Bear Lake are harvested exclusively by recreational fishermen.

TABLE 2- 1991 ADULT RETURN TO ENHANCEMENT TAX SUPPORTED PROJECTS

Project	Escape-ment	Sport Harvest	%Com Harv	Adult Return	Comm Harv	Avg. Weight	Price (\$)	Commercial Value
Eklutna Chum	4,604	674	85	38,027	30,749	7.0	0.35	\$75,336
Eklutna Coho	286	250	70	1,787	1,251	7.5	0.40	3,752
Packers Reds	44,879	0	69	142,781	97,902	4.5	1.10	484,616
Hidden Reds	35,576	72,060	50	215,272	107,636	4.4	1.10	520,958
Habitat Reds			75	200,000	150,000	5.0	1.10	825,000
Tustumena Reds			75	201,620	151,215	4.2	1.10	698,613
Upper Inlet Total				759,673	506,7531			Value \$2,603,275
				Chum 38,027	30,749			
				Coho 1,787	1,251			
Bear Lake Coho	7,716	3,000	0	10,716	0			

TABLE 3- 1996 ADULT RETURN TO ENHANCEMENT TAX SUPPORTED PROJECTS

Project	Smolts	Size (g)	Surv. (%)	Adult Return	Comm Harv	Avg. Weight	Price (\$)	Commercial Value
Eklutna Chum	7.7 M	5.1	1.00	77,000	65,450	7.0	0.35	\$160,353
Eklutna Reds	1 M	8.34	33.28	332,800	286,240	5.0	1.10	1,464,320
Eklutna Coho	50,000	19	10.00	5,000	3,500	7.5	0.40	10,500
Packers Reds	776,200	4.5	19.33	150,008	105,006	4.5	1.10	519,779
Hidden Reds	300,000	25.4	27.68	83,040	58,128	4.4	1.10	281,340
Chelatna Reds	360,000	4.9	21.20	76,320	53,424	7.2	1.10	423,118
Habitat Reds				200,000	150,000	5.0	1.10	825,000
Coal Creek Reds	100,000	4.73	20.37	20,370	15,278	4.2	1.10	70,582
Tustumena Reds				200,000	150,000	4.2	1.10	693,000
Upper Inlet Subtotal				1,062,538	798,0751			Value 4,447,991
				Chum 77,000	65,450			
				Coho 5,000	3,500			
Bear Lake Coho	90,000	20	7.00	6,300	0			
Bear Lake Reds	440,000	6.59	27.91	122,804	82,279	6.5	1.50	802,217
Age 0 Reds	75,000	14	39.63	29,723	19,914	6.5	1.50	194,162
Lower Inlet Subtotal				152,527	102,193			Value \$996,379

CIRPT... Continued From Page 1

the area has been able to take up some of the slack, but the opportunities are limited plus the logging is scheduled to be completed within 5 years. For the long term, the best opportunity for the village is to get back into fish processing. To achieve this there will need to be a reliable supply of high quality salmon for the processing plant. The solution is to develop a salmon hatchery in the village. This would provide a substan-

tial return directly to the processing plant and, since these fish would be harvested in the immediate vicinity of the plant, they would maintain their quality thus making it possible to produce higher quality products."

After several hours of discussion with a representative of the applicant, the CIRPT voted to forward the following recommendations to the Commissioner of the Alaska Department of Fish and

Game.

"In a regular meeting of the Cook Inlet Regional Planning Team (CIRPT) held on December 13, 1991 the above referenced application was considered by the Team for the purpose of formulating a recommendation to you.

"The CIRPT cannot recommend issuance of a simple permit signifying approval of this application as written. However, it can support issuance of

a permit with stipulations attached which would make the project acceptable.

"The Team discussed the project at length with a representative of the applicant and concluded the discussion by addressing each of the four criteria set out in 5 AAC 40.170.

Will the proposed hatchery make a contribution to the common property fishery? The CIRPT responded, "No".

"As the application

stands there is no way of assuring there will be an annual contribution to the common property fishery. This is true because of the unusual vertical integration of processing in the proposal. A stipulation attached to the permit requiring the hatchery to take no more than one third of the return thereby providing at least two thirds to the common property fishery would address this concern and make the project acceptable to the CIRPT.

able to the CIRPT.

"Several other points you may wish to consider were raised in the discussion related to assuring benefit to the common property fishery.

"There will be one or more life cycles, as the facility is building its broodstock to capacity, when there will not be fish excess to broodstock needs. Under these circumstances the one third limit on the returns avail-

(Continued on Page 7)

NOTE

SMOLTS attempts to make its readers aware of a variety of activities in the Cook Inlet drainage which have some bearing on the future of the salmon resources. This space is usually offered to someone outside the Cook Inlet Aquaculture Association who is involved with the salmon resource to present any message they feel is of significance to salmon users.

This article was prepared and submitted at the request of **SMOLTS** by Heather McCarty of the Prince William Sound Aquaculture Corporation.

The 1991 Prince William Sound pink salmon fishery could have been designed to confuse the public. Confronted with the image of 2.3 million pink salmon being deep-frozen, the public concludes that there are too many fish. Told that uncured pinks are rotting in front of the hatcheries, the public assumes that the hatchery system is making too many pinks. Informed that Governor Hickel, with Exxon money, is sending free fish to Russia, the public believes that the state has lost its ability to respond innovatively to changing world markets.

Was it too many fish, or not enough markets? Are Alaska's hatcheries making too many pinks, or is the processing industry continuing to put most of those pinks into products that the world doesn't want? Has the State — and the fishing industry — lost its head, or can we learn enough about the global fish market in time to save ourselves?

What happened in Prince William Sound in 1991? And what is being done to prevent it from happening in 1992 and beyond?

Anticipating a large pink salmon return both in Prince William Sound and statewide in 1991, Prince William Sound Aquaculture Corporation (PWSAC) began in November, 1990, to determine the intent of traditional processors for the upcoming season. PWSAC had already experienced a \$1.2 million revenue shortfall in 1990, caused by the lack of processor bidding for the cost recovery pinks at the peak of the season. And the projection was for 28 million to return in 1991 to the three PWSAC hatcheries that produce pinks.

Many on-shore processors told PWSAC in the fall of 1990 that they did not intend to process large numbers of PWSAC cost recovery pinks in 1991. PWSAC responded with a plan to sell up to 50% of the pinks pre-season, and with a request to the governor in December, 1990, that the process be initiated to permit entry of foreign processors into state waters to buy fish in 1991.

The state conducted a survey of domestic processing capacity, concluding in May, 1991, that capacity was adequate to process all of the projected salmon returns. Foreign processors were not to be allowed in state waters. Following the announcement in June that the two large Chugach Fisheries plants in Cordova would not operate in 1991, PWSAC and fishermen's groups asked for a review of the capacity survey. The results did not change, even though there 20 former Chugach fishermen without solid markets for

As the seine season began at the end of July, the pinks were late in returning to the Sound. Through the first week in August, PWSAC continued to maintain that all indicators backed up the eventual return of the projected 28 million hatchery fish, while ADF&G downgraded their prediction to 5 million and, later, upped it to 15 million. ADF&G continued to hold off on opening general seine

About ten days late, the pinks hit the Sound in large numbers; on August 10, 2 million pinks were harvested by the commercial fleet in 12 hours in the hatchery sub-districts only. On August 12, additional fishing areas were opened, 3.3 million fish were harvested in 12 hours, and PWSAC received no further daily bids for cost recovery fish.

In addition, many major processors began refusing to buy any fish caught close to the hatcheries, and three hatchery special harvest areas (SHA's) began to fill with pinks. The only fish PWSAC sold after August 12 were small numbers of pinks being taken by the four processors who had signed pre-season contracts with PWSAC. By August 19, all of those buyers had been released from their contracts, as old and new fish mingling in the SHA's produced a quality problem.

On August 13, the state declared a surplus of fish in PWS, but attempts to bring in additional domestic or foreign processors were fruitless. Meanwhile, in the commercial fishery, processors placed daily poundage limits on their fishermen, and many seiners on processor "B" lists were unable to sell fish at all. The fleets of some processors were able to deliver only six to eight days during the season.

To prevent hatchery operational problems, on August 19 PWSAC asked the state for help in clearing unsold common property pinks from the special harvest areas. The state agreed to fund a disposal operation administered by PWSAC, which discarded a total of 2.3 million fish in deep water. Governor Hickel, in a humanitarian gesture, arranged for the Exxon-funded canning of over a million pinks as a gift to the people of Russia.

PWSAC ended the 1991 season with an estimated

total pink return of 27 million — slightly fewer than the year before — a \$8 million revenue shortfall, and the resolution to effect positive changes before pinks returned again. The seiners of Prince William Sound ended their seasons, for the most part, with boat and insurance payments unpaid, a long winter ahead, and grim prospects for 1992.

Based on market research, PWSAC is acting on the conviction that there are not too many fish, but too few markets; not too many pinks produced, but too few consumers attracted by the products traditionally made from those pinks. PWSAC has developed a

The short-term goal, for 1992, is to sell 100% of the PWSAC cost recovery pinks before the season, to ensure that those fish are taken from the water and used. In addition, a number of the pinks will be used to help facilitate the development of new products, and begin the long process of marketing those products both domestically and overseas.

In the long-term, PWSAC will continue to support product and market development, in the belief that the pink salmon can and will be sold in convenient form: that appeal to the younger, health conscious consumer of the nineties.

PRE SEASON:

Concern about processing capacity, and the potential for Prince William Sound Aquaculture Corporation (PWSAC) to meet its cost recovery goal.

- Nov.'90 Processors indicate intent not to process large numbers of PWSAC pinks.
- ADF&G forecasts record pink return statewide
- Dec.'90 PWSAC and fishing groups formally ask state to begin process of permitting foreign processors.
- Jan.'91 PWSAC begins to contact foreign processors in anticipation of state's permission. Staff considers proposals for pre-season fish sales.
- April PWSAC full Board, as special meeting, agrees to pre-season sales, at no less than grounds price plus Refrigerated Sea Water (RSW) and bonuses. Also agrees to front-end loading PWSAC harvest.
- May Salmon Harvest Task Force (SHTF) agrees to front-end PWSAC harvest.

- May State determines domestic capacity adequate, denies requests for foreign processors.
- June Chugach Alaska Fisheries announces non-operation of Cordova canning plant in 1991. PWSAC, fishing groups, City of Cordova ask for review of state capacity survey results; results do not change.

EARLY SEASON:

PWSAC falls behind in cost recovery curve, maintains run late, single year anomaly. Contract buyers begin processing at hatcheries.

- July 26 First pink salmon captured at Armin F. Koenig Hatchery (AFK), six days behind schedule.
- July 26 First pinks sold at Wally Noerenberg Hatchery (WNH), high bid 15 cents, grounds price.



Cannery Creek Hatchery

- July 28 Contract sale begins at AFK with Inlet Salmon, grounds price plus RSW, 15 cents advance.
- July 29 Contract sale begins at WNH and Cannery Creek Hatchery (CCH) with Whitney and Deep Sea, same conditions.
- Aug. 3 ADF&G announces PWSAC harvest 457,794, run 9% complete, indicating 5 million.

(Continued on Page 5)

**CIAA
ANNUAL
MEETING**

**MARCH
28
1992**

**CIAA
BUILDING**

**PUBLIC
IS
WELCOME**

**We spawn success —
one fish at a time.**

Cook Inlet Aquaculture Association produced a return of 790 thousand adult salmon in 1991. More than 500 thousand of those were har-

vested by Cook Inlet fishermen who made over \$2.6 million from an investment of only \$1.5 million. That's what we call success. And it's only going to get better.



CIAA COOK INLET AQUACULTURE ASSOCIATION



(Above) The project as seen from upstream with Kamishak Bay in the background.
(Left) The completed Paint River Fish Ladder
(Below Left) The view inside the 160' channel through which fish will swim from the top of the ladder to the river. The top is grated to prevent bear entry.



Assessment. This will be accomplished by strengthening the management authority of the Alaska Department of Fish and Game and allowing the agency to complete its management plans. ADF&G has told the Corps that the plans will be completed by December 1992, and will specify threshold levels of impacts, how best to prevent impacts, and how to implement these protective procedures.

The proposed conditions to be added to the permit read as follows:

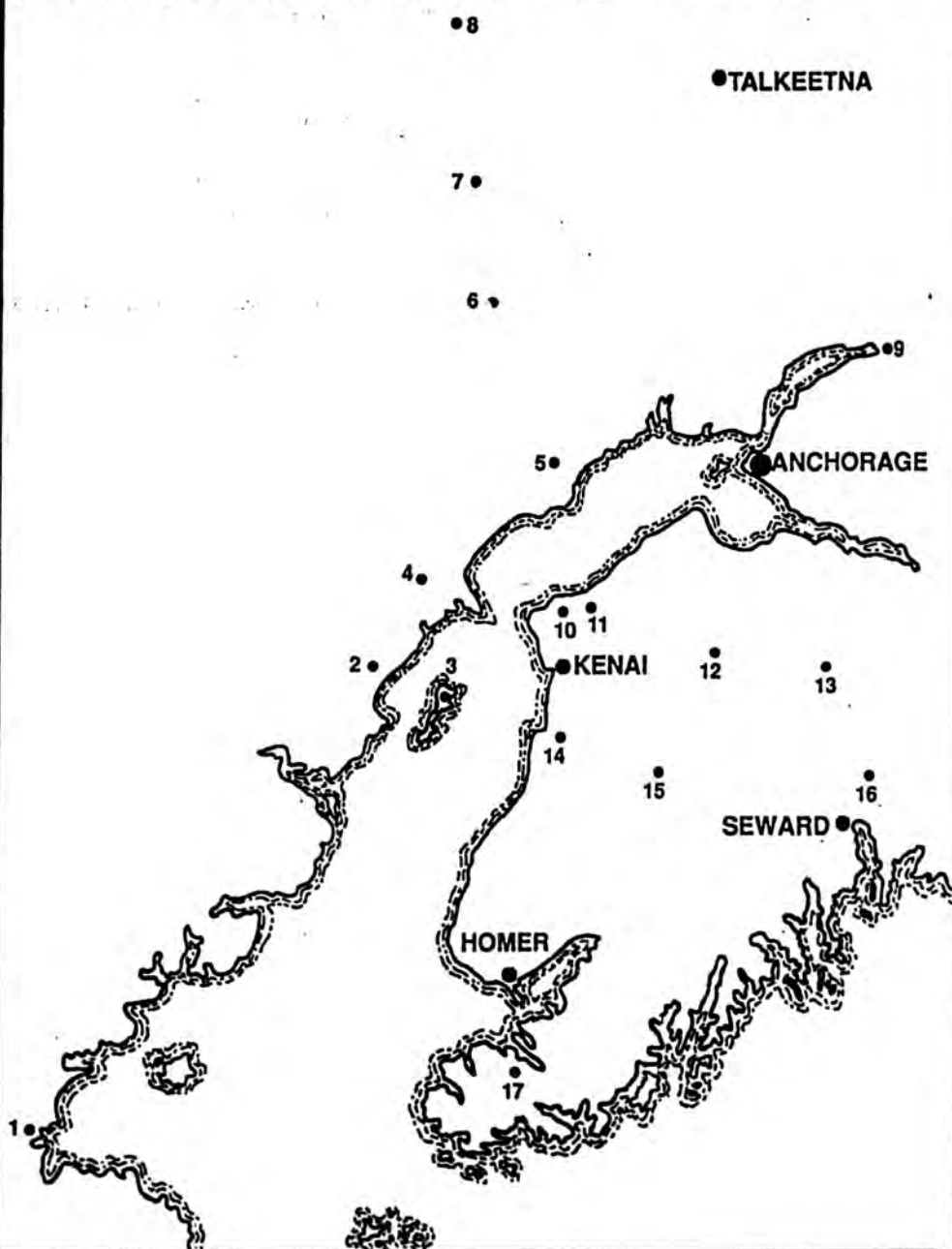
"That the permittee will meet with representatives of appropriate State and Federal agencies (e.g. State of Alaska - Department of Fish and Game and Department of Natural Resources and U.S. De-

partment of the Interior - U.S. Fish and Wildlife Service and the National Park Service) on an annual or emergency basis to determine the levels of impacts from salmon entering the Paint River on brown bear concentrations and behavior at the McNeil River State Game Sanctuary and Refuge and Katmai National park and Preserve. Written reports, including a minority report if there is disagreement among the parties, will be submitted to the District Engineer for review to determine if future modification, suspension or revocation of the permit is warranted."

During the construction of the ladder, two related activities were proceeding; (1) a suit had been filed

(Continued on Page 7)

CIAA project sites mentioned in this issue of SMOLTS



1. Paint River
2. Blue Lake
3. Packers Lake
4. Marten Lake
5. Three Mile Creek

6. Trinity Creek
7. Shell Creek
8. Chelatna Lake
9. Eklutna Hatchery

10. Daniels Lake
11. Bishop Creek
12. Hidden Lake
13. Trail Lakes Hatchery

14. Coal Creek
15. Tustumena Lake
16. Bear Lake
17. Tutka Hatchery

COOK INLET INSIGHT

Continued From Page 3

lion return.

Aug. 15 CPF harvests record 4.37 M fish in 12

Aug. 3-8 PWSAC continues to maintain that the pinks are late, and that they will return at projected strength. Belief based on conditions at fry release, continued low female %, lateness of Valdez Fisheries Development Association (VFDA) return, and the VFDA run strength as forecast.

Aug. 4 Golden Age, fourth and final contract buyer, begins receiving fish at WNH.

Aug. 10 Common Property Fisheries (CPF) harvest 2 M fish in 12 hours, hatchery subdistricts only.

Aug. 11 SHTF convenes; ADF&G ups PWSAC projection to 15 M; PWSAC maintains 28 M.

ADF&G announces opening additional fishing area in SW District.

PEAK WEEK OF PWSAC RETURN

Processors plugged; Special Harvest Areas fill. PWSAC offers all fish at grounds price; contract sales stop.

Aug. 12 CPF harvests 3.3 M fish in 12 hours.

Aug. 12 PWSAC receives no daily bids for fish, and receives no further daily bids after this date.

PWSAC begins offering fish at grounds price instead of on daily bid basis.

Aug. 12 PWSAC begins (continues) search for additional foreign and domestic processors.

Aug. 13 PWSAC puts out 1 M fish for bid; no takers; fish begin to build in SHA's.

Aug. 13 State announces surplus of pinks in Prince William Sound.

Aug. 14 CPF harvest 1.8 M fish in 12 hours, hatchery subdistricts.

Aug. 14 Processors place poundage limits, suspend continuous buying, remove fleets from Special Harvest Areas (SHA's).

Aug. 14 ADF&G opens hatchery SHA's for CPF.

Aug. 15 Inlet ceases buying, quality issue.

Armin F. Koernig Hatchery hours

Aug. 16 Continuous CPF in hatchery subdistricts and SHA's, alternate-day openers in additional SW District areas.

Aug. 16 All PWSAC attempts to bring in additional processors unsuccessful.

Aug. 16 Golden Age and Deep Sea move to AFK.

Aug. 17 Deep Sea ceases buying, quality issue.

Aug. 18 Whitney Foods moves to AFK.

Aug. 19 Whitney, Golden Age cease buying, quality issue.

LATE SEASON:

SHA's must be cleared of unsold fish; disposal, processing of unsold pinks begin.

Aug. 19 PWSAC requests cooperative effort with state for clearing unsold common property pinks from SHA's, to prevent hatchery operational problems.

Aug. 20 ADF&G Commissioner Rosier sends letter of non-objection, state agrees to fund tenders for disposal up to \$150,000, EPA permits fish dumping. PWSAC administers catching, tendering and discharge of fish.

Governor Hickel activates plan to proportion of unsold pinks for humanitarian distribution in Soviet Union. (Exxon later

agrees to fund the processing and tender costs up to \$2 million.)

Aug. 22 Disposal begins at AFK

Aug. 23 Disposal begins at Noerenberg and Cannery Creek; harvest for Soviet project begins at AFK and WNH.

Aug. 24 Disposal and Soviet harvest end at AFK: 284,000 pinks discarded, 107,000 pinks processed by Cook Inlet Processing for Soviets.



Wally Noerenberg Hatchery

Aug. 26 Disposal ends at Cannery Creek: 693,000 pinks discarded.

Disposal temporarily suspended at WNH.

Aug. 30 Harvest for Soviets ends at WNH: 1.03 million pinks processed at North Pacific Processing (NPP) in Cordova, 267,000 pinks processed at Cook Inlet Processing.

Aug. 31 PWSAC gives 164,000 pinks from WNH to Western Alaska for experimental surimi project.

Sept. 3 Pinks continuing to enter SHA at Noerenberg; disposal resumed.

Sept. 3-13 Three shipments of pinks totaling 24,000 fish given away by charities in Anchorage and Fairbanks; donated labor and equipment for catching, delivering, transporting.

Sept. 13 Pink disposal ends at WNH: 1.65 million fish discarded.

CIAA BOARD ELECTION SCHEDULE

The schedule for the eighth at-large election appears below and is repeated in the "Important Dates" column on page 8.

Week of December 9 Nominating petitions will be mailed to all permit holders.

January 17 Deadline for postmarking completed nominating petitions.

January 24 Deadline for hand delivering completed nominating petitions to the CIAA office (5:00 p.m.)

February 7 Mail election ballots to all permit holders.

March 6 Deadline for postmarking ballots to be counted.

March 13 Deadline for hand delivering ballots to CIAA office (5:00 p.m.)

March 15 CIAA staff validates and counts ballots. The candidates are notified of election results

March 28 The newly elected director is seated at the Annual Meeting.



An investment with a high return.

Cook Inlet Aquaculture Association is investing in the future by continuing to bring Cook Inlet hatchery projects to maturity — projects like Coal Creek,

Chelatna Lake and Eklutna. As a result, Cook Inlet fishermen will make in excess of \$20 million over the next five years harvesting CIAA produced salmon. That's a return that benefits everyone.



COOK INLET AQUACULTURE ASSOCIATION

tures of twenty (20) Cook Inlet limited entry salmon permit holders. Those signatures were verified, and ballots will be mailed to all Cook Inlet limited entry

salmon permit holders on February 7, 1992.

There are two deadline dates for returning completed ballots. If the ballot is to be mailed back to

CIAA, it must be postmarked by March 6, 1992. If the ballot is to be hand-delivered, it must be at the CIAA office by 5:00 p.m. on March 13, 1992.

Ballots will be counted on March 18, 1992; and the candidates will be notified of the results on the same day.

The newly elected Di-

rector/Alternate team will be seated at CIAA's Annual Meeting on March 28, 1992.

All of the significant dates for this election pro-

cess can also be found in the column "Important Dates" on page 8 of this issue of SMOLTS.

DAVID M. BLOSSOM - DIRECTOR CANDIDATE

Mr. Blossom is a married Kaslof resident and has been involved in the east set net fishery his entire life. He has been a salmon seiner in Lower Cook Inlet for thirteen years and is a halibut fisherman. He is a herring seiner and a herring gill netter. He has four years' experience seining herring in Prince William Sound and in Togiak.

He is a current CIAA Board member having been elected at large in 1989. He is also a Board member of the Cook Inlet Fishermen's Fund, The Kenai Peninsula Fishermen's Association and a member of the Cook Inlet Seiners Association and the United Fishermen of Alaska.

His other experience includes a family history of over forty years of Cook Inlet fishing with most gear types for most species. He was a class officer for four

years in high school, chairman of the Physical Education Club at Central Washington University and is currently a basketball coach.

In response to a question about what he hopes to achieve and contribute as a member of the CIAA Board Mr. Blossom said, "Commercial and sport fishermen have enjoyed good or record years of fishing in the 1980's. Through our efforts in aquaculture I feel we can maintain these fisheries we already have and through our hatcheries and enhancement work we can develop other systems to their full potential. I would like to see our fisheries resources be here not only for my future but also for my children's future as well. This can be achieved through aquaculture. I feel that I represent all user groups as a Director on CIAA and not just the group from which permit I fish."

DOUGLAS M. BLOSSOM - CANDIDATE ALTERNATE

Mr. Blossom his wife and children are Clam Gulch residents and he has been involved with the east side set net fishery for his entire life. In addition he has thirteen years of experience salmon and herring seining and fifteen years of halibut fishing experience.

He is a member of the Kenai Peninsula Fishermen's Association and the United Fishermen of Alaska.

In response to a question about what he hopes to achieve and contribute as a member of the CIAA Board Mr. Blossom said, "I have lived in the area and have been raised around fishing all of my life and plan to stay fishing and raise my children in the fishing industries. I want to help keep all the current enhancement programs going and help develop new programs that will make more fish for everyone and, therefore, benefit all the fishermen."



David M. Blossom



Douglas M. Blossom



Erik Lindow



Ronald J. (Sid) Cox

ERIK LINDOW - CANDIDATE DIRECTOR

Mr. Lindow, his wife and three children are Kenai/Soldotna area residents; and he has thirteen years of fishing experience. He served one year as a deckhand and has fished his own drift gill net permit for the past twelve years. He has also longlined for halibut for the past six years.

He is a member of the United Cook Inlet Drift Association and the United Fishermen of Alaska.

Mr. Lindow is a journeyman plumber/pipfitter, holds a Coast Guard license as an operator of an uninspected passenger vessel (OUPV or "six-pack" license) and is a member of the Kenai/Soldotna Fish and Game Advisory Committee.

In response to a question about what he hopes to achieve and contribute as a member of the CIAA Board Mr. Lindow said, "As a lifelong Alaskan I believe that this state can provide rewarding lives for its residents and that those lives can be enhanced by increased opportunities for all. I feel CIAA is working to make life better for all, and I would like to be part of it."

RONALD J. (SID) COX - CANDIDATE ALTERNATE

Mr. Cox, his wife and four sons are Clam Gulch residents; and he has a total of eighteen years of fishing experience. He fished set net gear for seven years and has been fishing drift gill net gear for the last fourteen years, the last seven of those under his own permit. He

also fishes for halibut herring and crab.

He is a member of the United Cook Inlet Drift Association and the United Fishermen of Alaska.

His other experience includes two years as an ADF&G FRED Division employee, four years as a cannery worker and five years of college.

In response to a question about what he hopes to achieve and contribute as a member of the CIAA Board Mr. Cox said, "Cook Inlet is a complex drainage with multiple river systems, mixed stocks and varied user groups. The CIAA Board needs people with both the interest and the time to insure fair and intelligent use of the resources available to CIAA to maintain and promote a stable fishery for all parties concerned. I would like to be one of those people."

Trail Lakes Hatchery reports production status

The 1991-1992 production cycle at the Trail Lakes Hatchery is progressing as planned. Over 13 million sockeye salmon eggs were collected from the five brood sources during the 1991 field season. Most of the stocks have completed hatching and will be ponded in the next month or two. If all continues well with the incubation and rearing procedures, approximately 10 million fry will be stocked into Cook Inlet lakes next spring.

Commenting on the production, Assistant Hatchery Manager Robert Blankenship said, "Many of the projects are now maturing; that is they have been done for enough years that we can be reasonably sure there will be adequate broodstock

available each year. This removes a very significant variable from each year's efforts."

The winter months at the hatchery are very busy according to fish culturist Tom Prochazka. "We've already coded wire tagged (CWT) our coho smolts for Bear Lake and the sockeye salmon smolts for Coal Creek. We are presently marking 50,000 of our 800,000 age zero sockeyes destined for release into the Bear Lake/Bear Creek system and will be doing coho fingerling next month."

Another major effort has gone into the thermal marking (otolith banding) program. The staff is finishing cataloging the 1991 marks and getting the information entered into ADF&G's data base. As a

double check the otoliths are also being processed by the Washington Department of Fisheries.

The staff has also sampled and examined the fish marked this winter, and the marks look good. The fish will be resampled prior to release. Another project this spring will be to collect outmigrating smolts from the camps to determine the relative percentages of wild and enhanced smolts.

During December the Seward/Moose Pass area was hit with severe snow storms causing major electrical damage and power outages. The hatchery switched to standby power over 40 times.

CURRENT PRODUCTION STATUS AT TRAIL LAKES HATCHERY

BROODSTOCK	SITE FOR RELEASE	EYED EGGS	SMOLTS
Sockeye salmon			
Hidden Lake	Hidden Lake	2,100,000	
Packers Lake	Packers Lake	3,200,000	
Chelatna Lake	Chelatna Lake	1,350,000	
Upper Russian Lake	Bear Lake	980,000	
Big River Lakes	Bear Lake	1,780,000*	
Tustumena Lake	Coal Creek		90,000
Coho salmon			
Bear Lake	Bear Lake	590,000	75,000
Totals		10,000,000	165,000

* = 600,000 of these sockeye salmon are on an accelerated age growth program

Game.

These early observations suggested Chelatna Lake had the potential to produce large numbers of fish. As many as 100,000 fish were reported in the lake in 1949. However, more recent estimates of escapement were much lower and varied considerably. They have ranged from 0 in 1974, 1978 and 1979 to 23,180 in 1982.

Initially low nutrient levels were thought to be the cause of the poor sockeye production and CIAA, in cooperation with the ADF&G, began an investigation of the nutrient levels. These early studies soon lead to the conclusion that nutrient levels were not the cause of the low sockeye population, but lack of broodstock was. Additional studies based on euphotic volume measurements, i.e. the depth light penetrates in the lake, also suggested that Chelatna Lake could potentially produce more than 300,000 adult sockeye.

The goal of the Chelatna Lake Sockeye Salmon Enhancement Project is to rebuild sockeye salmon broodstock and increase production to levels that approximate the lake's potential.

CIAA began its current

enhancement effort in 1988 by monitoring adult escapement. Escapement monitoring has continued along with the addition of smolt out-migration monitoring and egg collection. The eggs are reared at the Association's Trail Lakes Hatchery and returned to Chelatna Lake as fry. CIAA collects 2 million eggs annually, but hopes to increase this number as more adult fish become available. Eventually, as the number of broodstock returning to the lake increase, egg collection and annual stocking may not be necessary.

CIAA will continue its enhancement efforts in 1992. The number of smolt migrating from the lake should be greater as hatchery reared fish begin to enter the population. The number of adults returning to the lake, however, is expected to be down from the escapements observed in 1990 and 1991. The 1992 escapement will likely approximate the level observed in 1989. As CIAA gains more experience with Chelatna Lake and the enhancement effort matures, the number of fish migrating from and returning to the Lake will increase and approximate historic levels.

Table 1. Chelatna Lake smolt out-migrations, 1989 - 1991

Year	Number	95% CI	Trap Efficiency
1989	36,914	± 9 086	4.13%
1990	375,216	± 81 409	4.83%
1991	262,287	± 153 990	0.903%

'9,102 hatchery fish.

Table 2. Adult Escapement at Chelatna Lake

Date	Estimated Number	Remarks
1988	217	Observation tower count turbid water
1989	3,725	Mark/recapture estimate
1990	5,283	Mark/recapture estimate
1991	7,689	Mark/recapture estimate

Coal Creek... Continued From Page 1

has been marked with an adipose fin clip and is carrying a coded wire tag inserted in its jaw. In addition, a small ear bone called an otolith has been marked by altering the temperature of the rearing water according to a fixed pattern. These marks will make Coal Creek fish recognizable for management of the fishery and project evaluation.

According to Jeff Hetrick, Trail Lakes Hatchery manager, the fish are currently averaging 8 grams in weight and are projected to reach 14 grams by May when they will be transferred to Coal Creek. All fish look very healthy and are expected to do well when released.

Once at Coal Creek the smolt will be held in net pens for two to four weeks to acclimate to the creek water. The smolt will then be released and, if all goes as planned, over 18,000 will return to Cook Inlet as adults in 1994.

Final corrections to the state and federal permits and a lease agreement with the landowner to secure access to the project site are expected to be completed soon. As these steps are completed attention will focus on the final preparations necessary. Net pens will be built and a seasonal camp established at the project site.

able to the facility may not be practical.

"It is conceivable the facility could substantially stretch the intent of "non-profit" in years when one third of the production would generate revenues considerably in excess of the money needed for operation. However, there was recognition that a legitimate item in an annual budget could be a contingency or "rainy day" account by which one could build up an appropriate surplus for those years when the one third harvest would not cover costs.

"Participants in the discussion were uneasy with some of the implications the hatchery's identified role in direct support of the operation of a processing facility. If a method existed or could be developed to provide some type of annual independent fiscal review of the Port Graham Hatchery and the method included some level of control, it would address that uneasiness.

Are there provisions to protect the naturally occurring stocks from any adverse effects originating from the proposed hatchery? Once again the CIRPT responded, "No".

"Concerns were expressed for stocks originating outside of Port Graham which might interact with or compete with stocks from the proposed hatchery. However, the primary interest was in the stock native to the Port Graham River, which will serve as the broodstock for the hatchery. These fish will pass through the Special Harvest Area for the proposed hatchery and will, inevitably, be harvested in that area. While a naturally spawning escapement can be provided through management, that escapement will shortly be made up of hatchery descendants and will differ to some degree from the stock which is now there. Although the Team could not attach a level of significance to this change, it felt the change should be recognized.

Is the proposed hatchery compatible with the goals and objectives of the comprehensive salmon plan for the region? The CIRPT responded, "Yes".

"The goals and objectives of the Cook Inlet Regional Salmon Enhancement Plan 1981-2000 were sufficiently broad to include a project such as the proposed hatchery, and there were no provisions in that Plan which would preclude its implementation. However, the Cook Inlet Regional Planning Team is developing "Phase II" salmon plans

(Continued on Page 8)

against the Corps of Engineers and the Economic Development Administration for permitting and funding the project, and (2) the Corps of Engineers initiated a reevaluation of the permit which they had issued for the project in 1988.

As has been previously reported after CIAA had let the contract to build the ladder, a suit was filed against start up of the project citing potential harm to the bears which feed at the McNeil River State Game Sanctuary and procedural errors on the part of the Corps of Engineers and the Economic Development Administration in issuing a permit and awarding a grant, respectively. Those filing the suit (plaintiffs) were the Friends of McNeil River (FOMR), the Wilderness Society, the National Wildlife Federation, the Alaska Chapter of the Sierra Club and the Wildlife Alliance. That suit remains in place.

Operating on instructions from the District Court the Corps of Engineers opened a reevaluation of the permit they had granted to CIAA in 1988. In this process they advertised the project in the Federal Register and again made a mailing to the individuals and organizations on their lists. The comment period ended on August 31, and over 260 comment letters were received. Colonel Pierce's announcement is the culmination of this process.

RETURNS

LETTERS To Smolts

BIRD TREATMENT AND LEARNING CENTER
PO BOX 230496
ANCHORAGE, ALASKA 99523

October 20, 1991

Dear Sir,

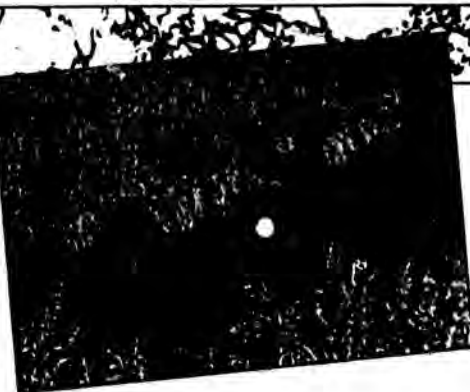
On behalf of the Bird Treatment and Learning Center I would like to express our thanks to the Cook Inlet Aquaculture Association for the donation of salmon for our bald eagles. As a non-profit we are always grateful for donations, but this one seems especially appropriate since it is a good use of the resource. We are aware that these fish become waste if a good use can not be found, so we are happy to provide a place for the fish to be used. It is so important that the bald eagles get quality fish for the long winter. If they were in the wild, they for sure would not dine on this quality of food consistently. We feel, however, that in order to maintain their good health it is imperative that a quality product be fed.

Throughout the year many birds will come through the center. Those who can be brought back to 100% are released. These birds along with our resident non-releasables are helped to a great degree by the quality of the food we provide. Given all we can do and the right medicines or procedures the finish to the job is their ability to rest and rehabilitate. This process is greatly enhanced by providing quality food for them to heal with.

In addition to the thank you for the fish we would like to send special thanks to Jeff Hetrick of the Trail Lakes Hatchery for all of his help and assistance. He is a very special friend to Bird TLC. Many are grateful to him for all of his efforts.

In closing I would like to extend to you a tour of the Flight Center any time you come to town. It is an experience to "walk with the eagles".

Thank you,
Linda D. Simmons
Bird TLC Executive Director



We can't allow this bank to fail.

We believe in putting money in the bank — because healthy river banks are key to healthy salmon spawning grounds and rearing areas. We're work-

ing to protect future salmon runs, and the future harvest of Cook Inlet fishermen, by investing time and resources in protecting habitat. Habitat protection — an investment that pays.



COOK INLET AQUACULTURE ASSOCIATION

IMPORTANT DATES

- February 7** (Friday) Election ballots for the at large election of a director will be mailed to all permit holders.
- February 15** (Saturday) Soldotna - 10 a.m. at the CIAA Building - Monthly meeting of the Cook Inlet Aquaculture Association's Board of Directors.
- March 6** (Friday) Deadline for postmarking valid ballots for the election of an at large director.
- March 13** (Friday) Deadline for hand-delivering valid ballots for the election of an at large director to the CIAA office (5:00 p.m.)
- March 18** (Monday) CIAA staff validated and counts ballots in the election of an at large director. The candidates are notified of the election results.
- March 28** (Saturday) Soldotna - 10 a.m. at the CIAA Building - Annual meeting of the Cook Inlet Aquaculture Association's Board of Directors. The newly elected at large director is seated at the Annual Meeting.
- April 18** (Saturday) Soldotna - 10 a.m. at the CIAA Building - Monthly meeting of the Cook Inlet Aquaculture Association's Board of Directors.
- May 16** (Saturday) Soldotna - 10 a.m., at the CIAA Building - Monthly meeting of the Cook Inlet Aquaculture Association's Board of Directors.
- June 20** (Saturday) Soldotna - 10 a.m. at the CIAA Building - Monthly meeting of the Cook Inlet Aquaculture Association's Board of Directors.

Eklutna Hatchery reports good results

"The incubation and hatching phases of our annual production have gone very well this year," reported CIAA's Eklutna Hatchery Manager Loran Waldron. "Of the 4.0 million green chum salmon eggs we collected in the fall approximately 90 percent (3,600,000) survived to hatch."

All of the chum salmon fry will be placed in raceways ("ponded") in about one month. They will be fed and rear in these raceways until their release in May.

Waldron went on to say, "The survival rate percentage for the 100,000 coho salmon eggs we took appears to be in the mid-90's; and they, too, are doing very well."

Tutka Hatchery

CIAA's Tutka Hatchery Manager Dave Walte reported, "We expect approximately 33 million pink salmon fry to result from this year's cycle of incubation and hatching, and that will mean that our survival rates at each stage of development were good."

About May 1 the staff will move these fish into the 12 foot-by-12 foot net pens in the lagoon for additional rearing prior to their

Walte said, "The incubation and hatching stages were successful despite the potential threat posed by heavy snows and accompanying power outages, the longest of which lasted four days. The heavy snow loads (4.5' or more) required us to be aware of how the structures were handling the burden and move when necessary to clear roofs and floats which were nearing their capacities."

1990 CATCH SUMMARY						
COMMERCIAL CATCH						
	1990	NUMBER OF YEARS WITH CATCH HIGHER THAN 1990	RECORD CATCH	(Regional Plan Base Averages) 10-YEAR ANNUAL AVERAGE CATCH (1971-1980)	ANNUAL AVERAGE CATCH 5 EVEN YEARS (1972, 1974, 1976, 1978, 1980)	
KING	17,665	30 Plus	187,513 (1951)	12,636	13,277	
SOCKEYE	3,807,959	8	9,749,020 (1987)	1,282,931	1,521,043	
COHO	509,728	8	824,103 (1982)	193,258	204,725	
PINK	987,300	30 Plus	4,980,030 (1982)	1,472,494	1,488,549	
CHUM	358,148	30 Plus	1,826,843 (1982)	723,639	548,927	
TOTAL	5,680,800	12	11,072,997 (1987)	3,884,954	3,756,519	
SPORT CATCH						
	1990	HIGHEST CATCH OF THE LAST 14 YEARS	(Regional Plan Base Average) 4-YEAR ANNUAL AVERAGE CATCH 1977-1980	ANNUAL AVERAGE CATCH 2 EVEN YEARS (1978 and 1980)		
KING	58,784	90,691 (1988)	19,181	17,331		
SOCKEYE	197,854	443,043 (1987)	88,075	99,103		
COHO	180,731	177,172 (1988)	69,302	86,631		
PINK	52,230	105,595 (1980)	70,555	105,521		
CHUM	4,018	19,566 (1988)	8,172	12,287		
TOTAL	473,617	670,887 (1987)	253,285	320,873		
NON-SPORT/NON-COMMERCIAL CATCH (SUBSISTENCE/NON-COMMERCIAL SET NET/DIP NET)						
	1990	HIGHEST CATCH OF THE LAST 19 YEARS	(Regional Plan Base Averages) 10-YEAR ANNUAL AVERAGE CATCH (1971-1980)	ANNUAL AVERAGE CATCH 5 EVEN YEARS (1972, 1974, 1976, 1978, 1980)		
KING	1,203	3,123 (1983)	252	466		
SOCKEYE	21,574	61,096 (1989)	1,241	1,136		
COHO	3,956	16,084 (1985)	3,182	3,473		
PINK	885	8,333 (1980)	1,238	1,656		
CHUM	389	517 (1980)	150	163		
TOTAL	28,007	68,861 (1989)	5,968	6,893		
COMBINED CATCH						
	KING	SOCKEYE	COHO	PINK	CHUM	TOTAL
COMMERCIAL	17,665	3,807,959	509,728	987,300	358,148	5,680,800
SPORT	58,784	197,854	180,731	52,230	4,018	473,617
NON-SPORT/ NON-COMMERCIAL	1,203	21,574	3,956	885	389	28,007
TOTAL	77,652	4,027,387	674,415	1,040,415	362,555	6,182,424

CIRPT... Continued From Page 7

for all of Cook Inlet; and the Kachemak Bay Unit has yet to be addressed. It is uncertain how the CIRPT will address pink salmon enhancement for the Kachemak Bay Unit especially considering the current problems with pink salmon enhancement in the nearby Tutka Hatchery.

Would the proposed hatchery make the best use of the site's potential

to benefit the common property fishery? The CIRPT responded, "Yes".

"If the project performs as envisioned, it would make an efficient and productive use of the site's water supply. With the permit stipulation previously mentioned that productive use would benefit the common property fishery.

"The CIRPT has had little experience in review-

ing PNP hatchery proposals, and we understand the processing component of this proposal makes it unlike any other which has been considered in Alaska. We hope these comments will be of assistance to you in making your decision. Please feel free to contact us if any clarification of this letter is needed."

Because of the time consumed in the discussion of the hatchery pro-

posal, working discussion of the Susitna River Unit Plan was deferred. However, the CIRPT did decide that when the Susitna River Unit was completed it would next address the Kamishak Bay Unit and the Westside Unit, which together cover the area from Cape Douglas at the south end of Kamishak Bay to the western side of the mouth of the Susitna River.

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*John [unclear]
sen. develop.*

UCIDA

UNITED COOK INLET DRIFT ASSOCIATION

P.O. Box 4649 • Kenai, Alaska 99611

(907) 283-3600 • FAX (907) 283-3306

Sent by Telefax-hardcopy to follow

January 27, 1992

Commissioner Carl Rosier
Alaska Department of Fish & Game
P.O. BOX 25526
Juneau, AK 99802

RE: Port Graham Hatchery Corporation Private Nonprofit Salmon
Hatchery Application

Dear Commissioner Rosier,

At its last meeting on January 14, 1992, the United Cook Inlet Drift Association (UCIDA) Board of Directors discussed the pending application for a PNP salmon hatchery at Port Graham. UCIDA represents the interests of the 600 salmon drift permit holders in Upper Cook Inlet. While non-intercept activities in Lower Cook Inlet have few if any probable impacts on Upper Cook Inlet, the UCIDA Board has instructed me to make the following objections to the Port Graham application. UCIDA feels that precedents set in this case will eventually have negative impacts on a statewide basis:

A) There is not even a mention of contributions to the common property fisheries. The generally accepted "target" contribution rate for the Cook Inlet area is 66 2/3% to 75%. Furthermore, this is not meant to imply any guaranteed recovery rate and certainly not the "reliable supply of high quality salmon for the processing plant" contemplated in the application. (see p. 3 of application). As presented the operation would not be dissimilar to the fish trap concept of pre-statehood days.

B) The application sets a precedence for a vertically integrated operation whose exclusive goal is to provide jobs outside of the common property fisheries.

C) Given the stated purpose of providing jobs at the Port Graham "cannery", emphasis will clearly be put on maximizing the size of the return and, therefore, minimizing the contribution to the common property fishery.

D) Given the emphasis on jobs and, therefore, wages at the cannery, the operators clearly will be inclined to reduce the price paid for any fish that are harvested in the common property fishery. In other words, dollars not paid to commercial fishermen can be used for wages at the "cannery".

E) The concept of the proposed operation will inevitably be taken up statewide. Our present concerns over demands for "guaranteed cost recovery" at the expense of the common property fisheries will be compounded with a "new critter" never intended by the aquaculture enabling legislation - i.e. an organization purely dedicated to dollar production and wages outside of the common property fisheries.

F) The size of the proposed operation, when combined with the Tutka Hatchery output, raises serious concerns about the carrying capacity of the local region and increased competition with outmigrating fry from the systems of Upper Inlet. Further, the state and CIAA are currently struggling to make the Tutka Hatchery self-sufficient. The added fry competition combined with an increased supply of pink salmon will only serve to undermine the state's interests in Tutka.

G) The lack of financial oversight associated with PNP operations and the "non-profit" requirement for such operations, combined with successful returns could lead to large hidden dollar "profits". This will encourage other such operations statewide - which, in turn, will lead to further demands that common property fisheries be curtailed.

UCIDA requests that you deny this permit application at this time. The impacts of this "new critter" on existing fisheries and the implications for the future need to be considered by the legislature and all user groups prior to the state launching off in a new direction.

Sincerely,

Theo Matthews

Theo Matthews
Administrative Assistant

cc: Senator Paul Fischer
Rep. Mike Navarre
Rep. Gail Phillips
Steve McGee, FRED Division
Molly McCammon, Senate Special Fisheries Committee
UFA
CIAA

ALASKA

DEPARTMENT OF COMMERCE
AND ECONOMIC DEVELOPMENT

WALTER J. HICKEL, GOVERNOR

Division of Economic Development
P.O. Box D (9th Floor State Office Bldg.)
Juneau, Alaska 99811

Ricoh Fax 10
(Automatic)
(907) 586-8399

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Sen Hoffman's Office Rural Development
Coordinator

Number of pages INCLUDING transmittal sheet: 6 DATE: 2/5/92

OPERATOR: _____ TIME: _____

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Project descriptions as
discussed.

Call me - need further info.

FYI - Port & Lacham's need for FY92
is > \$550.0

The total long term cost
of the project ~~is~~ is not
available in our current info.

The Port Graham Salmon Development Project

PROJECT DESCRIPTION

The village of Port Graham has embarked upon a pink salmon development project, the intent of which is to create a sustainable local economy based on high quality value added salmon products. This will create long term employment and business opportunities in the village in an industry that is culturally compatible with village life. The neighboring village of English Bay shares in the fisheries resources of the area and is conducting its own sockeye salmon rehabilitation project. English Bay will also benefit from research and development conducted for Port Graham's fisheries program. The attached project map outlines the major components of the overall salmon development project.

Port Graham plans to become involved in all aspects of the business from obtaining raw material to marketing the resultant products to the consumer. In order to ensure a successful business operation and maximum employment benefits to the village residents, a successful project design must include the following elements: 1) Establish a relatively constant and reasonably priced supply of high quality salmon for the processing plant; 2) Determine market demand for various high value pink salmon products; 3) Design and build a versatile marketing program for salmon products from Port Graham; and 4) Provide Port Graham residents with the skills needed to take advantage of the business and employment opportunities that will result from this program.

For the program to be successful, each step of this approach must be successful. Securing a supply of good quality salmon to process is futile if the processing plant cannot produce high-value products or if there is no marketing effort. Success also depends on the village residents having the skills and the interest to become involved in the operation. The hatchery project has been extremely successful thus far. There are currently 3 million eggs being incubated in the hatchery, and 3 full time and 2 long term part time hatchery employees. An additional 10 part time positions are created for the annual egg take that occurs each August. First returns from the 1991 release of the salmon are expected in June, 1992.

The first major step in the project was initiated in the summer of 1990 and was aimed at establishing a supply of high quality salmon for the processing plant. A study commissioned in late 1989 by the Chugach Regional Resources Commission (CRRC), the non-profit

corporation concerned with resource development in the Chugach Native Region, indicated that there was a good potential for developing a commercial sized pink salmon ocean ranching operation in Port Graham. The salmon ocean ranching process consists of producing juvenile salmon in a hatchery for release into the ocean where they grow to adult size, returning to the point of release to spawn. Developing such an operation in Port Graham will provide the salmon needed for the processing operation. Also, because these salmon are returning to the immediate vicinity of the processing plant, they can be harvested and delivered to the plant in sea bright condition..

The attached five year project plan outlines the various components of the overall salmon development project.

Kake Nonprofit Fisheries Corporation: The Future from the Sea; Economic Development Proposal

Proposal

The Kake Nonprofit Fisheries Corporation is proposing the expansion of our salmon enhancement facility (Gunnuk Creek Hatchery). This project will focus on the economic recovery of the village of Kake. The total cost of this project is 2.52 million dollars. The Kake Nonprofit Fisheries Corporation has secured \$1,260,000 of this funding amount. We are now seeking the participation of other agencies and foundations for the remaining funds needed to bring this project to completion.

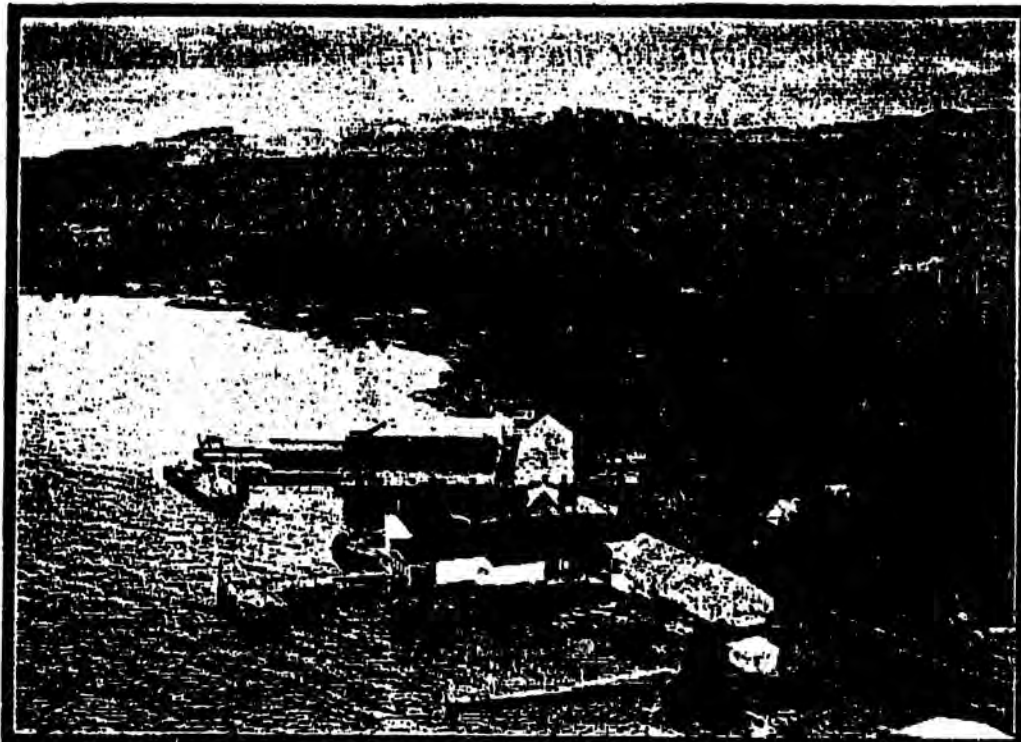
Grant Requests: \$1,260,000

Introduction:

Kake is a small Native community in the Southeast Alaska panhandle. The majority of the population are Tlingit and Haida Indians. A few of the roads through the village were paved for the first time in 1990, but most of the small road system is still dirt and gravel. Kake has is served by several air carriers who make several flights into Kake each day. There are two types of small plane traffic into Kake. Float planes land at the float plane dock, and wheeled aircraft land on our paved runway. It is a forty five minute flight to the nearest community.

Kake is located in the midst of abundant fisheries resources, and historically has always been a fishing village. Logging had replaced fishing as the major form of employment in this community, but the trees are nearly gone now. Opportunities for employment in Kake are

limited, and dwindling. There are no roads connecting Kake to any other community or job markets. The number of fishing boats and permits have declined over the years. Soon, workers may be forced to leave their homes in Kake and move out of town to provide an income for their families.



Kake, Alaska: (From bottom of picture) marine repair facility, deep water port, marine fuel station, cold storage, & cannery. The clearing above and to the right of the cannery is the airport, (1/2 mile from the cold storage).

Kake has the following underutilized infrastructure in place:

1. Boat harbor, with room for expansion.
2. Alaska Marine Highway System ferry terminal
3. deep water port, with regular barge service
4. paved runway and air service

Kake Nonprofit Fisheries Corporation: The Future from the Sea; Economic Development Proposal

5. state-of-the-art cold storage
6. cannery buildings
7. marine repair facility and boat lift
8. marine fuel station.
9. underdeveloped coastal property (suitable for industry)
10. underemployed work force
11. hatchery with developed returns of salmon and room for expansion

Marketing

FOOD PRODUCT DEVELOPMENT CORPORATION

200 Anderson Street, Portland, Maine 04101 (207) 874-0098 FAX (207) 874-0212

TO: HEATHER McCARTY
FROM: BILL SEIDEL
RE: SALMON SAMPLES

FEB. 21, 1992

DEAR HEATHER,

ARRIVING TO YOUR ATTENTION VIA FEDERAL EXPRESS ON TUESDAY FEB. 25 ARE THE SALMON PRODUCTS. EACH ITEM HAS A LETTER DESIGNATION FOR REFERENCE. THE FOLLOWING IS A LIST OF THE SUBMITTED PRODUCTS. YOU MAY CHOOSE THE TWO PRODUCTS TO BE SCALED UP TO 100 LBS. EACH FOR THE SEAFOOD SHOW, WITH THE REMAINING SALMON I WOULD BE HAPPY TO DO SEVERAL OF THE OTHER PRODUCTS FOR THE SHOW ALSO. ALL ITEMS ARE PRECOOKED. NO NEED TO THAW BEFORE COOKING EITHER.

A: SALMON BURGER
B: SALMON BURGER
C: SALMON SAUSAGE
D: SALMON SAUSAGE
E: SALMON HAM
F: SALMON PATTIES/BALLS
G: SALMON PIE
H: SALMON CHOWDER
I: SALMON LASAGNA
J: SLICED COLD SMOKED SALMON
K: HOT SMOKED SALMON
L: COLD SMOKED SALMON (NOT SLICED)

DIRECTIONS: SAUSAGES, PATTIES, BURGERS AND BALLS MAY BE PAN FRIED, MICROWAVED OR EVEN DEEP FAT FRIED. BUT TO TEST, I RECOMMEND BAKING AT 350-375 FOR 14-18 MIN.

PIE- 30 MIN AT 350

HAM- THAW, SLICE AND EAT

SMOKED- " " " "

LASAGNA- 25 MIN AT 350

CHOWDER- BOIL IN BAG FOR 8 MIN OR HEAT IN POT. ADD ALITTLE MILK OR WATER IF YOU LIKE IT THINNER.

Bill

PRINCE WILLIAM SOUND / COPPER RIVER RPT
PROJECT CRITERIA CHECK LIST
January 9, 1992

The PWS/CR RPT will review salmon enhancement projects proposed by any agency or entity. Proposals should address criteria listed within the check list. Salmon projects proposed for PWS/CR should describe project intent and describe how the project goal will be achieved.

This screening is to provide Region-wide coordination of all enhancement efforts and is not intended to be a definitive technical analysis.

The Planning Team will ensure that project funding needs are identified when the actions of one agency/entity require funding on the part of another agency/entity. An example is the need to fund tag/recovery efforts within the fishery and at a hatchery.

GOAL:

Projects will be evaluated on their contribution to achieving objectives of the comprehensive regional plan. Objectives are established to facilitate achieving regional goals. Regional goals support developing and maintaining a comprehensive salmon fishery that addresses fish production, allocation, management, and net benefit. The integration of these four fishery elements is intended to provide the tools and process necessary to plan and implement strategies to fulfill user needs and expectations as outlined in the regional plan and regional allocation policy for enhanced salmon.

AN ACCEPTABLE PROJECT GENERALLY:

1. Addresses the objectives outlined within the regional allocation policy. These objectives provide for:
 - * reduced congestion and or conflict in the fishery,
 - * minimized impact on wild stocks,
 - * promoting highest possible fish quality,
 - * maximizing production,
 - * minimizing impacts to historic and traditional fisheries,
 - * supporting subsistence, sport and personal use needs,
 - * encouraging and supporting research and,
 - * recognition of healthy competition in the fishery.

In addition, an acceptable project generally:

2. Brings non-producing and underutilized areas of PWS/CR Region into production.

3. Rehabilitates stocks which are depleted below the threshold of reproductive viability.

I. PROJECT DESCRIPTION

1. Project location _____
2. Release location _____
3. Harvest location _____
4. Project type
- A. Hatchery
- New _____
- Expansion _____
- Remote release _____
- B. Wild stock rehabilitation _____
- C. Habitat improvement _____
5. Describe any new facilities to be constructed, including water quantity requirements and minimum anticipated discharge from the water source. _____
- _____
- _____
- _____
- _____
6. Target species:
- pink _____ chum _____
- coho _____ sockeye _____
- chinook _____
7. Project purpose
- A. Perceived user need _____
- B. Addresses a particular management issue _____
- C. Efficient use of _____ hatchery _____
- D. Stock is at reduced production level _____
- E. Site specific habitat opportunity _____
- F. Other _____
8. Are evaluation mechanisms included in the proposal?
- A. Hydroacoustic surveys _____
- B. Smolt enumeration _____
- C. Mark and recapture; coded wire tagging _____
- D. Adult contribution, enumeration _____
- E. Other _____

II. PROJECT FEASIBILITY

1. Are enhancement methods proven or experimental? _____

Describe them: _____

2. What is the project's cost recovery requirement? _____

3. What is the project's brood stock requirement? _____

4. How will brood stock be acquired? _____

5. If it is necessary to culture new brood stock, how long will it take? _____

6. How will juveniles be imprinted at release site? _____

7. How will juveniles be transported if remote released? _____

8. Will the project require involvement or permits from agencies other than ADF&G? _____

What agency(s)? _____

9. If implemented, will the project result in a need to revise existing regulations? _____

Please explain: _____

III. LAND USE

1. Is project compatible with adjacent land use policies?

2. The landholder is? _____
3. Can the project be implemented without interfering with existing uses of the area? _____

4. Will the project fully utilize the site potential? _____

IV. MANAGEMENT

1. Can enhanced fish be harvested while protecting natural stocks? _____
How? _____

2. Will the project contribute to a fishery that is manageable in time and area for all users? _____
3. Can the project be managed for corporate brood and cost recovery escapement? _____
4. Can the harvest be managed to achieve high fish quality? _____
5. Where will cost recovery occur to support the project?

V. BIOLOGY

1. Will water utilized by the project reduce habitat for local fish stocks? _____

2. Does the project conform with state genetic policy?

3. Will the proposed project cause disease transmission to local fish stocks? _____

4. What are possible impacts of fry/smolt on marine and aquatic ecosystems? _____

5. How will returning adults impact marine, aquatic and terrestrial ecosystems? _____

6. What is the run timing of the broodstock? _____

7. How will run timing be maintained from one generation to another, i.e. egg take schedule? _____

VI. ALLOCATION

1. Is the project consistent with the allocation policy? _____

2. What user groups will benefit? _____

3. What is the magnitude of the benefit to each user group? _____

4. Is there a loss of harvest opportunity to existing users? _____

5. If so, what mitigation options are proposed? _____

6. Have the most probable harvest scenarios for fish produced by this project been considered? _____
Please describe them: _____

7. Is there publicly owned space to create or expand recreational harvest support facilities? _____
Please identify: _____

8. Can the project be implemented without conflicting with an existing commercial, recreational or subsistence fishery? _____

Please explain: _____

VII. COST

1. What is the cost of the project?
Start-up _____
Annual _____
2. How do you intend to fund implementation? _____

3. How do you intend to fund operational costs? _____

4. Will the project result in costs to other entities? _____
Who? _____

5. Is the project financially feasible? _____

VIII. COST/BENEFIT

1. Of the adult salmon returning to the project, what percentage will be contributed to the CPF (common property fishery)? _____
2. What ex-vessel price are you using to calculate your cost recovery? _____
3. How is the ex-vessel price expected to respond to the production? _____

4. What marketing strategies do you propose for the new production? _____

5. How is the quality of the proposed production expected to effect ex-vessel prices? _____

6. What are the fishery management costs associated with
conducting an orderly fishery? _____

7. What are the hatchery harvest costs? _____

8. What are the costs associated with marking and
evaluation studies? _____

9. What are the capital and operating costs of the
program? _____

10. Other economic information: _____

30 60 125 30 Mgmt. wldstk

* Section 1. AS 16.10 is amended by adding a new section to read:

ARTICLE 9A. MANAGEMENT OF FISHERIES.

Sec. 16.10.621. MANAGEMENT OF WILD AND HATCHERY STOCKS OF ANADROMOUS FISH. (a) The Board of Fisheries shall manage fisheries in the state to achieve sustained yield for wild anadromous fish stocks. []

(b) In managing hatchery produced anadromous fish stocks, the board shall consider the need of anadromous fish hatcheries to obtain brood stock. The board may manage fisheries in the state to achieve an adequate return of hatchery produced anadromous fish stocks to hatcheries for brood stock; however, management to achieve an adequate return to hatcheries for brood stock may not prevent achievement of sustained yield for wild anadromous fish stocks.

(c) The board may consider the need of hatcheries authorized under AS 16.10.400 to harvest and sell fish produced by the hatchery that are surplus to needs for brood stock to offset the cost of operating the hatchery. The board may exercise its authority under this title as it considers necessary to provide a reasonable return of surplus fish to a hatchery to offset the cost of operating the hatchery. The board may adopt criteria for determining the reasonable needs of hatcheries for surplus fish and may adopt a management plan to provide surplus fish to a hatchery.

3/17/92

HATCHERY REVIEW PROJECT
March 18, 1992

- Proposed legislation on wild stock priority

You might want to ask Fish and Game to address what this priority means in terms of weak stocks: i.e., do all stocks have equal priority in terms of meeting sustained yield?

- Is there a need to clarify whether or not the Board has the statutory authority to regulate hatchery production levels? Could this be used as the forum for statewide production review? In terms of allocation conflicts, should the Board have some kind of formal input in the process before a permit is given? The department only manages for conservation, until the Board decides allocation, then the department manages the allocation scheme.
- Tightening up requirements for enhancement loans. Will this take statutory change or can it be done by regulations?
- Biological concerns - when the report from the Cordova conference arrives, and I understand this will be soon, can we have a presentation to the legislature perhaps by Dr. Mathisen, the state geneticist Dr. Jim Seeb, and maybe one other of the scientists that participated in the Cordova conference, so that we can get some more information about the biological concerns and the need for research money?

hatchery stocks

com fish - when they look at management
only have to manage for "conservation",

- * but problems in managing for all trout
need broader public review -
add broad review of all N hatchery
productions before approving permits.

STATE OF ALASKA
THE LEGISLATURE
LEGISLATIVE AFFAIRS AGENCY
Division of Legal Services

P.O. Box Y, State Capitol
Juneau, Alaska 99811
485-2450

ROUTING SLIP

TO: Sen. Ellison ATTN: Mary McDowell

REMARKS: Attached is the first attempt at a "wild stock
priority". Once everyone agrees on the substance of the priority,
I can draft the bill.

FROM: George Utermohlen DATE: 3/9/92

* Sec. 1. AS 16.10 is amended by adding a new section to read:

ARTICLE 9A. MANAGEMENT OF FISHERIES.

Sec. 16.10.621. MANAGEMENT OF WILD AND HATCHERY STOCKS OF ANADROMOUS FISH. (a) The Board of Fisheries shall manage fisheries in the state to achieve ^{Sustained yield} ~~escapement~~ goals for each wild anadromous fish stocks. The board may exercise its authority under this title as it considers necessary to protect weaker stocks of wild anadromous fish and to maintain the biological and genetic integrity of wild anadromous fish stocks.

(b) ^{The (rm)} The board shall manage fisheries in the state to achieve an adequate return of hatchery produced anadromous fish stocks to hatcheries for brood stock; however, management to achieve an adequate return to hatcheries for brood stock may not prevent achievement of escapement goals for wild anadromous fish stocks.

(c) ^{rm} The board shall ~~consider the needs of hatcheries~~ authorized under AS 16.10.400 to harvest and sell fish produced by the hatchery that are surplus to needs for brood stock to offset the costs of operating the hatchery. The board may exercise its authority under this title as it considers necessary to provide a reasonable return of surplus fish to a hatchery to offset the costs of operating the hatchery. The board may adopt criteria for determining the reasonable needs of hatcheries for surplus fish and may adopt a management plan to provide surplus fish to a hatchery.

Molly

To Mary McDowell
From: Kate Troll
Re: Wild Stock Priority

Mary, I am not to trying to make more work for you. . .honestly.
Rather, I am trying to make your job easier. . . (I can hear you
say, "Oh, sure Kate")

So much for the BS eh?

What I have here for you is another way to look at wild stock
priority. This is what SEAS asked the Board of Fisheries to adopt
for Southeast in their 1990/91 cycle of meetings. This is the
proposal that started the whole discussion of statutory intent and
regulatory authority. . .maybe it can end the discussion too. . .who
knows. . .

POLICY ON THE MANAGEMENT OF ENHANCED FISH

When wild and hatchery stocks are mixed, the harvest shall be
managed on the strength of the wild stocks. Deviation from
current management of wild stocks to provide for greater or lessor
access to hatchery fish should not be allowed unless it can be
demonstrated that a change will not jeopardize conservation
concerns for wild stocks nor increase one user groups wild stock
opportunities at the expense of another user group.

* Section 1. AS 16.10 is amended by adding a new section to read:

ARTICLE 9A. MANAGEMENT OF FISHERIES.

Sec. 16.10.621. MANAGEMENT OF WILD AND HATCHERY STOCKS OF ANADROMOUS FISH. (a) The Board of Fisheries shall manage fisheries in the state to achieve sustained yield for wild anadromous fish stocks.

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(c) The board may consider the need of hatcheries authorized under AS 16.10.400 to harvest and sell fish produced by the hatchery that are surplus to needs for brood stock to offset the cost of operating the hatchery. The board may exercise its authority under this title as it considers necessary to provide a reasonable return of surplus fish to a hatchery to offset the cost of operating the hatchery. The board may adopt criteria for determining the reasonable needs of hatcheries for surplus fish and may adopt a management plan to provide surplus fish to a hatchery.

*similar language in
section C . 3/17/92*

*anadromous -
fresh water
to
ocean water*

HATCHERY REVIEW PROJECT

March 18, 1992

- Proposed legislation on wild stock priority

You might want to ask Fish and Game to address what this priority means in terms of weak stocks: i.e., do all stocks have equal priority in terms of meeting sustained yield?

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Fisheries
and Oceans

Pêches
et Océans

Alvin Permitt

Fisheries - Pacific Region
Suite 400 - 555 West Hastings St.
Vancouver, B.C.
V6B 5G3

Pêches - Région du Pacifique
Pièce 400 - 555 rue Hastings ouest
Vancouver (C.-B.)
V6B 5G3

Your file Votre référence

Our file Notre référence

5 March 1992

Ms. Molly McCammon, Legislative Assistant,
Office of Senator Hoffman,
Alaska State Legislature,
State Capital, Juneau, Alaska
#99801 - 1182

Dear Ms. McCammon:

Attached is a copy of the evaluation framework of the Pacific Salmonid Enhancement Program which I agreed to forward to you. This evaluation framework sets out the design and the information requirements of the evaluation study to be initiated later this year.

If you have any questions regarding the report, I would be happy to try to respond to them. I also apologize for the delay in forwarding you this report.

Yours Sincerely

Peter R. Toews (Tel. 604-666-6629)
Enhancement Strategy Evaluator

Canada

DRAFT FOR DISCUSSION ONLY
PROGRAM EVALUATION BRANCH

EVALUATION FRAMEWORK
OF THE
PACIFIC SALMONID
ENHANCEMENT PROGRAM

EXECUTIVE SUMMARY

PROGRAM EVALUATION BRANCH
MARCH, 1988

1. INTRODUCTION

The purpose of this report is to outline a comprehensive evaluation framework for the Pacific Salmonid Enhancement Program, covering the issues, methodology, data and research requirements, scope and timing of both the biological and economic aspects of the evaluation.

SEP consists of a variety of program components, including major facilities (i.e. hatcheries and spawning channels), engineered projects (i.e., fishways), lake enrichment, community economic development, public involvement, small projects and provincial projects. Since its inception in 1977 up to the end of fiscal year 1986/87, over \$300 million has been spent on the program. The principal objective of SEP is to increase salmonid production, with the ultimate economic and social goals of increasing income and benefits from the fisheries, increasing employment, stimulating regional economic development and providing training and employment opportunities for native Indians.

2. THE EVALUATION ISSUES

A future evaluation of SEP must answer two fundamental questions that should be addressed at the total program, program component and project levels. These questions are:

Issue #1

What has been the incremental contribution of SEP to salmonid escapement and catch, taking impacts on wild stocks as well as SEP production into account?

Issue #2

To what extent have the intended economic and social goals of SEP been realized - to what extent has SEP increased net benefits from the fisheries, increased employment, stimulated regional economic development and provided benefits for native Indians?

3. THE EVALUATION APPROACH

Issue #1

To evaluate the incremental contribution of SEP to salmonid escapement and catch, both the production from SEP facilities and the biological impacts that SEP has had on wild stocks must be assessed.

For the assessment of production, it is recommended that fish releases, adult production and long term trends should be documented. Fish releases should be compared with the number of brood stock used to obtain the production in order to assess SEP efficiency relative to wild production. Adult production is the ultimate test of SEP productivity and should not be estimated on the basis of expected survival rates, but rather on the basis of the most up-to-date actual observations, including mark recovery, stock reconstruction and tagging data. The estimation of actual production is so critical to the evaluation that the reliability of the methods and estimates should be investigated as part of the evaluation. Long term productivity trends should be identified as part of the assessment of production. It is important to understand the factors underlying such trends; however, given the timing and complexity of this task, it is not expected that this data will be available for an evaluation carried out in the short term.

For the assessment of SEP's impacts on wild stocks, the evaluation should consider mixed stock/manageability impacts; predation and competition among juveniles; genetic effects; and possible limited marine habitat carrying capacity effects. Data are not available to estimate the specific magnitude of each effect. However the importance of the effects should be examined and it is recommended that this be done by the following means. Expert opinion should be solicited, available research reviewed and a workshop held to identify reasonable ranges of each effect. The workshop could also be used to structure a simulation model which would describe the biological impacts mathematically. Simulation modelling would be particularly useful in helping to identify the types of investigations that future research should focus in on. Modelling would probably not quantify the extent of the biological impacts definitively.

Issue #2

To evaluate the economic and social performance of SEP, a multiple account benefit-cost framework is recommended, with the two basic accounts being economic efficiency and the distributional impacts of the program.

For the assessment of economic efficiency, the incremental benefits and costs of SEP should be identified. Those production and non-production (e.g., training) related benefits and costs which are measurable should be calculated and compared over the life of the facilities to determine overall measured net benefits and benefit-cost ratios. Measurable benefit and cost categories, evaluation methods and factors to consider are outlined in the main report. Those benefits and costs which are not measurable in value terms (e.g., public awareness, education) should be described, and their significance assessed in relation to the measured economic impacts of the program.

For the assessment of distributional impacts, the sub-regional economic impacts; the share of income and benefits accruing to different groups; and the distribution of benefits and costs between user groups and taxpayers should be identified. While economic efficiency should be evaluated at the project-specific as well as the component and total program level, it is recommended that the analysis of distributional impacts only be done at the component and total program levels.

4. PREPARING FOR THE PROGRAM EVALUATION

The evaluation will entail three phases of activity: data compilation and update; new research; and the evaluation analysis itself. With respect to the two "pre-evaluation" phases, involving data compilation and new research, the following should be noted:

The evaluation will require a documentation of SEP projects' background, related fisheries management, production and incremental catch contribution, total benefits and total costs. The evaluation will also require documentation of program components' backgrounds and their project and non-project specific effects. Data sources include the data files in the SEP Evaluation Model, and the EPIC, the fin-clip recovery, stock escapement, sales slip and north coast tagging study data bases.

Much of the data compilation is straight-forward and in many instances is already being done as part of the on-going activities of SEP research, planning and operations staff. For other parts of the data compilation, however, additional effort will be required, including documenting the project backgrounds, up-dating production and catch contribution impacts, documenting natural resource use conflict, fish, estimating employment benefits, identifying various non-measurable benefits and assessing government revenue impacts.

Specific research requirements related to the production and biological impacts of SEP include studies related to assessing and improving the production and catch estimates; studies related to productivity trends; and studies related to assessing the significance of the biological impacts of SEP. Not all of the studies can be completed prior to the evaluation, but they should now be initiated because of their importance for a longer term evaluation.

Specific research requirements related to the economic aspects of SEP include a review and update of harvesting and processing cost impacts of SEP; a review and update of recreational activity impacts and benefits; and estimation of training benefits. The harvesting and processing cost impact review is most critical to the overall evaluation and may require specific survey work.

5. EVALUATION SCOPE AND TIMING

It is recommended that an evaluation of SEP include all projects with sufficient production history upon which to base reasonable estimates of current and projected output. Such a comprehensive assessment of the overall program is necessary in order to fully understand the factors contributing to success or failure.

Following a preliminary evaluation of SEP in 1985 and subsequent Cabinet approval of a continuation of funding for the program, Treasury Board, in 1987, requested that SEP managers submit a 5 year plan identifying expected program expenditures and results to 1991/92. A program evaluation would therefore best be completed in 1991/92 to coincide with and contribute to important decisions on future plans and future funding which will need to be made that year.

6. RECOMMENDATIONS

In order to conduct an evaluation in 1991/92, it is important that the documentation tasks and research efforts described in this report commence very shortly. It is therefore recommended that program managers prepare an action plan describing how they intend to carry out the data compilation, data gathering and preparatory research tasks necessary to conduct the evaluation. The response should include consideration of the scope and costs of varying levels of data gathering and research effort and how this will impact on the accuracy of the data.

A particularly important aspect of the action plan will be one of responding to the need for investigations and research into the biological impacts that SEP production has had on wild stocks. It is therefore recommended that a group of scientific experts including researchers, management biologists and SEP program personnel be formed to plan the necessary data gathering, modelling and research efforts that will be required to address the biological impact issues. It should be noted that some of the research on biological impacts and long term production trends would, of necessity, need to extend into the longer term beyond 1991/92. Data from this research would thus be available for a more futuristic evaluation conducted closer to the end of the century.

Tables 1 and 2 summarize the data compilation and research tasks that the recommended action plan should respond to.

TABLE 1

Summary of Data Compilation Preparatory Tasks Required

	<u>Present Status</u>
Compilation of project backgrounds and related fisheries management information;	- needs to be done
Compilation of historic production and catch contribution by facility;	- needs to be done for smaller facilities
Development of future fisheries management scenarios and facility production forecasts;	- needs to be done
Compilation of information on significant natural resource conflicts or impacts;	- needs to be done
The compilation of project-specific cost data for PIP projects;	- is underway
Compilation of wholesale price forecasts for SEP projects' remaining economic lives;	- is underway
Compilation of the value of surplus fish and egg sales;	- continuing
Compilation of the value of native and non-native terminal fisheries;	- needs to be done
Compilation of information on other benefits, not amenable to quantitative economic efficiency analysis;	- needs to be done
Compilation of estimates of government revenue impacts of SEP.	- is underway

TABLE 2

Summary of Research and Assessment Tasks Required

	<u>Present Status</u>
Paper study compiling key findings, existing research on biological impacts (international symposium is a possible alternative)	- needs to be done
Workshop to scope out the structure of simulation models	- needs to be considered
Making rate experiment to test underlying assumptions of coded wire tag data	- needs to be done
Additional marking of production from spawning channels, selected lake enrichment projects and small hatcheries	- needs to be done
Baseline studies of production in areas whose new spawning channels are now being planned	- needs to be done
Sensitivity analyses of stock reconstruction methodology on selected stock assessments	- some are being done
Further marking studies of Canadian enhanced and wild production to permit catch survival comparisons	- needs to be done
Review and update of harvesting and processing cost impacts	- needs to be done
Review and update of recreational activity impacts and benefits	- is underway
Estimation of training benefits from the program	- needs to be done

DRAFT FOR DISCUSSION ONLY
PROGRAM EVALUATION BRANCH

EVALUATION FRAMEWORK
OF THE
PACIFIC SALMONID
ENHANCEMENT PROGRAM

PROGRAM EVALUATION BRANCH
MARCH, 1988

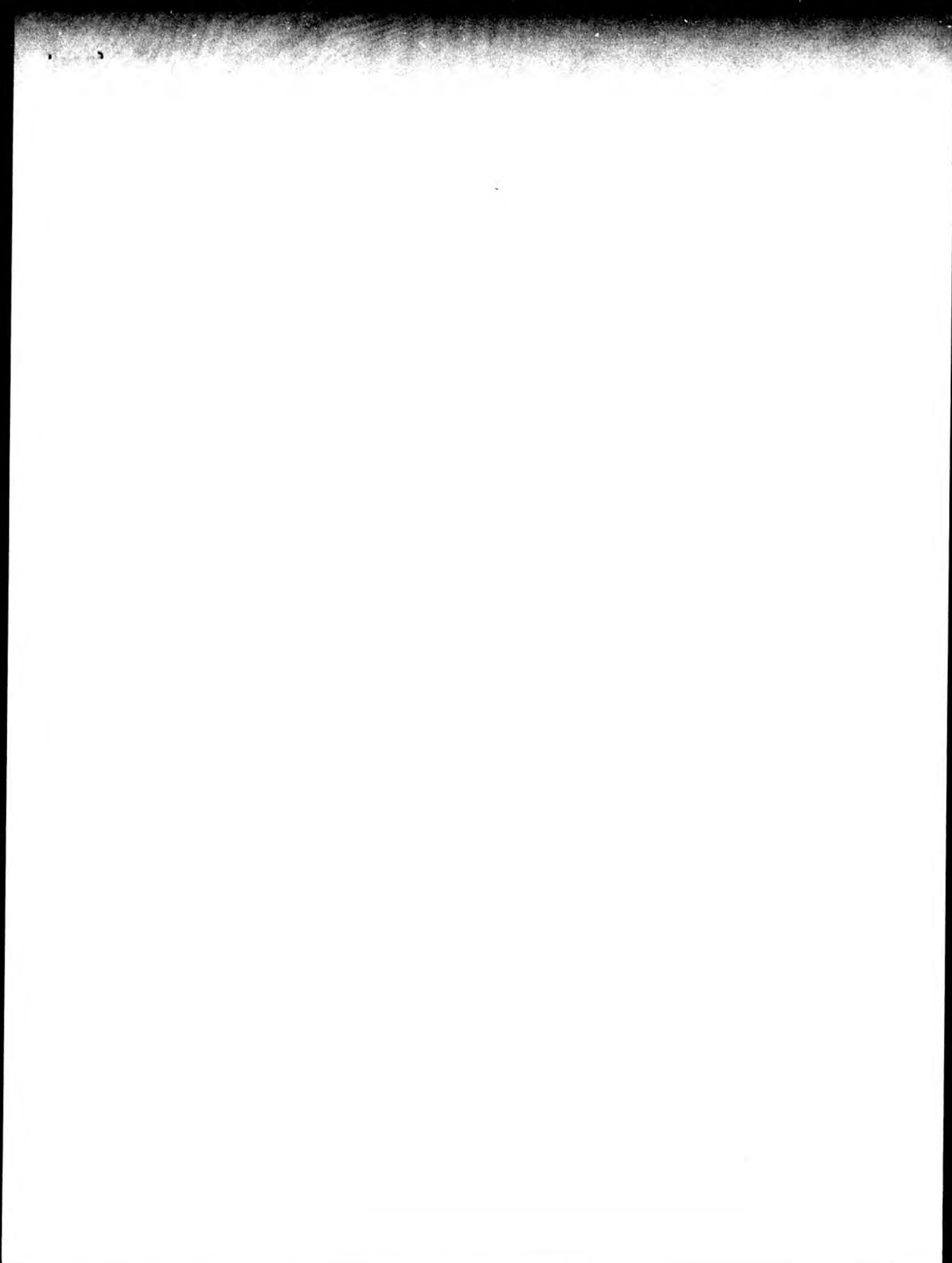


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1.0 INTRODUCTION

1.1 Purpose and Background

The purpose of this report is to outline a recommended framework for a comprehensive evaluation of the Pacific Salmonid Enhancement Program (SEP). Evaluation issues, methodology, data requirements, timing and costs are discussed.

This report builds on previous studies undertaken by the Program Evaluation Branch. In June 1985, a preliminary evaluation study of the first phase of SEP was released. The study concluded that certain components of SEP seemed to be achieving their objectives and that overall, SEP was making a significant contribution to salmon production. However, it was noted that SEP's success was uncertain because of incomplete data. Concerns about long term productivity and biological impacts on natural stocks were also noted.

A major recommendation of this preliminary evaluation study was that a formal evaluation framework be developed by the Program Evaluation Branch in conjunction with DFO program personnel. Consolidation of existing data and compilation of long term survival, harvesting investment and cost impact data were also recommended. Other recommendations included continued close integration of SEP with fisheries management; avoidance of new projects with risks to wild stocks; an emphasis on natural enhancement, habitat restoration and small projects; and explicit recognition of uncertainty in project selection.

As recommended in the preliminary evaluation, Program Evaluation Branch initiated the development of an evaluation framework to identify specific information needs and a future SEP evaluation schedule. A draft report was released in July 1986,

identifying four broad issues that any future evaluation would have to address: value for money (or quantifiable net benefits), other benefits, production efficiency, and biological and stock interaction effects. However, the framework was not completed; the work was halted pending a Cabinet review of future SEP funding.

The Cabinet review is now complete and the funding decision made. Consequently, the Program Evaluation Branch has commissioned a biological and an economic study to refine the evaluation issues and complete the framework. The purpose of this report is to present the consolidated conclusions of these biological and economic studies.

1.2 Advisory Committee

A committee of DFO officials was formed to advise and assist the study team in developing the framework. The committee was struck to try to ensure that the evaluation focussed on those aspects of SEP that not only measure past performance, but also give guidance as to the future directions that the program should take. The committee also provided the study team with appropriate advice regarding the availability and limitations of SEP project data.

1.3 Report Outline

This report is divided into seven sections. Following this first introductory section, section 2 provides a description of SEP and its program components. In section 3, the evaluation issues are outlined. Section 4 contains a discussion of methodology and indicators recommended to address these issues. In section 5, data requirements and their availability are discussed. Research requirements are outlined in section 6.

Section 7 and 8 conclude the report with recommendations on scope, timing as well as actions necessary to prepare for the evaluation.

2.0 PROGRAM DESCRIPTION

2.1 Program History

The Salmonid Enhancement Program (SEP) officially commenced in 1977, after several years of intensive planning. Efforts to build up and protect salmon stocks had begun earlier, particularly after World War II, when a number of major fishways, spawning channels and hatcheries were constructed. However, SEP constituted a formal commitment by the federal and provincial government to an extensive, systematic program of enhancement. SEP initially was intended to consist of two phases, with the second phase contingent on the success of the first. The program was aimed at doubling the stocks of salmon and anadromous trout to their former levels of abundance, implying an increase in annual production of almost 70 million kilograms. The methods by which this was to be accomplished included:

- the construction of fishways to assist migrating fish past barriers to upstream spawning areas;
- the construction of artificial spawning channels to provide optimum conditions for reproduction;
- the construction and operation of hatcheries and other incubation systems to increase the productivity of spawning fish;
- the restoration of freshwater habitat to improve egg deposition and all aspects of freshwater survival; and
- the fertilization of lakes to increase the rearing capacity of natural lakes.

A Federal-Provincial Agreement on SEP was signed by the Minister of Fisheries & Oceans for Canada and the Minister of Environment for British Columbia on March 1, 1979. The agreement stated that while the purpose of the program is to "preserve, rehabilitate and enhance natural salmonid stocks", this was

considered to be a means of achieving a number of clearly specified economic and social objectives, namely:

- (i) to increase national and provincial income;
- (ii) to create employment opportunities for Canadians;
- (iii) to improve economic opportunities for Native people;
- (iv) to foster development of economically disadvantaged communities and regions;
- (v) to increase and improve recreational opportunities.

The agreement called for a high degree of public involvement and a "vigorous program" to foster public awareness of the need to conserve salmonids and their habitats. The agreement also included provisions for the recovery of program expenditures through levies on resource users and for restraining further investment in the fisheries to prevent dissipation of the benefits of higher fish production.

The economic and social objectives for Phase I of SEP were translated into specific program targets:

- (i) to increase the average annual production of salmonids by 22.7 million kilograms, with the expected species composition of this increase as follows:

	<u>Production Target</u> (millions of kilograms)
Sockeye	4.1
Chum	13.1
Pink	1.7
Coho	1.1
Chinook	2.6
Steelhead & Cutthroat	0.1
Total	22.7

- (ii) to achieve an overall benefit-cost ratio of 1.5:1, with a net contribution to national income of \$325 million (\$1980);

- (iii) to provide benefits of \$200 million (\$1980) to areas in British Columbia outside of the lower mainland and southern Vancouver Island;
- (iv) to provide the equivalent of 64 person-years of continuing employment for Indians;
- (v) to generate 458 person-years of new employment in the construction and operation of enhancement facilities.

These targets were based on original plans that included a federal commitment to Phase I of \$150 million (\$1976) and a provincial commitment of \$7.5 million over a 5 year period from 1977 to 1982. Actual federal expenditures for SEP were reduced to \$150 million in current dollars over a 7 year period (1977 to 1984) due to government restraint programs. Inflation and the two-year extension of the program significantly eroded the real purchasing power of SEP funding, and therefore the scale of activities.

The reduced funding, plus other factors (assessment of enrichment potential, political priorities) resulted in some significant shifts in the allocation of Phase I expenditures. Design, construction and operations/maintenance of major fish production facilities (i.e. large, manned hatcheries and spawning channels) and engineered facilities (fishways)¹ comprised a significantly smaller proportion of total Phase I expenditures than originally planned. Of these expenditures, the operations component was much larger and the construction component much smaller than expected. Expenditures on lake enrichment or fertilization were much greater than originally anticipated. Expenditures on research, planning, minor projects, community development, public involvement and general overhead were also significantly greater than planned.

(¹) Program components are defined in more detail in section 2.2 below.

Partly as a result of these major shifts in allocations among SEP activities and enhancement techniques, the species composition of SEP production capacity also changed significantly from original plans. Production capacity for sockeye, chinook and sea-going trout was higher while capacity for pink and chum were lower than originally planned.

Upon completion of Phase I, SEP entered into a so-called "transition" phase in which the emphasis was placed on the operation and maintenance of existing facilities rather than expansion of production capacity. Any expansion which did occur was aimed primarily at rebuilding depressed chinook stocks. The transition phase ended as of June, 1987 with the announcement by the Minister of Fisheries & Oceans of an expansion of the program. The funding commitment of SEP was stabilized at \$42.5 million/year for 5 years. Phase II of the program is to be concerned primarily with the preservation and stabilization of existing stocks, rather than major production of new stocks by artificial means. It is intended that the program will place more emphasis on smaller projects, the rebuilding of depressed chinook stocks, and enhancement techniques such as spawning channels which require lower operating and maintenance costs. Enhancement opportunities for sockeye and pink salmon on the Fraser River will also receive more attention as a result of the U.S.-Canada Pacific Salmon Treaty.

2.2 Program Components

In terms of the different types of projects undertaken by SEP to achieve its fish production and socio-economic objectives, SEP has been categorized by Economics and Planning Branch staff into 7 basic program components: major facilities, engineered projects, lake enrichment, community development projects, small projects, public involvement projects and provincial projects. These components are generally distinguishable by the nature and

scale of the projects undertaken, and also they correspond roughly to SEP's organizational structure.² Major facilities, engineering facilities, lake enrichment and projects funded through provincial contributions to SEP were all designed to contribute to socio-economic goals primarily through fish production. The other program components were designed to increase fish production as well, but were also aimed more directly at increasing employment opportunities for remote communities and natives as well as public participation and awareness. A brief description of each of these components follows below.

2.2.1 Major Facilities

Major facilities, which constitute the largest single expenditure component of SEP, include a number of large, managed hatcheries and spawning channels designed primarily for artificial production. These facilities were constructed prior to the formal initiation of SEP as well as during the Phase I and Transition Phases. Also included under this category are several spawning channels constructed on the Fraser River by the then International Pacific Salmon Fisheries Commission and now operated by SEP. Currently there are 32 major facilities in operation.

(2) The construction, expansion and major maintenance of major facilities and engineered projects is the responsibility of the Engineering Division. The Operations Division is responsible for the day-to-day operations of major facilities. The Fisheries Research Branch is responsible for lake enrichment. Community development, small projects and public participation are each the responsibility of specific programs within the Special Projects Division. A number of experimental or pilot projects were also constructed, eventually taken over by the Operations Division or the Community Economic Development Program. Several pilot projects, found to be not viable, were discontinued.

2.2.2 Engineered Projects

Engineered projects include a number of fishways, obstruction removal projects and unmanned side channels which were constructed prior to and during SEP. Several of these types of projects which were constructed by the International Commission and taken over by SEP are also included in this category. The purpose of these facilities is to assist migrating fish past major barriers to upstream spawning areas and to improve spawning. There are currently six major projects in this category as well as numerous minor ones.

2.2.3 Lake Enrichment

Sockeye lake enrichment began with pre-SEP fertilization experiments undertaken by the Fisheries Research Branch on Great Central Lake on Vancouver Island. Strong returns to this lake in 1976 resulted in lake enrichment being incorporated into the SEP program. Early results were very promising and expenditures on lake enrichment were increased significantly during Phase I. To date, 17 lakes have been included in the program with 7 of these being major lakes, while ten are minor.

2.2.4 Community Economic Development Program (CEDP)

In order to further one of SEP's goals of providing more employment opportunities for Native people, a Native Project Pilot Program (NPPP) was initiated in the 1977/78 fiscal year to determine the potential for contracting out SEP enhancement projects to Indian bands and non-Native communities. This program was jointly funded by Fisheries & Oceans and CEIC.

The NPPP was to meet 6 specific objectives:

- (i) to provide satisfying employment for native people who would otherwise be unemployed or severely underemployed;
- ii) to provide experience that is valuable in terms of personal development and the acquisition of new skills;
- iii) to increase education and job aspirations;
- iv) to contribute to community development through increased community satisfaction, reduced need for out-migration of capable band members, and development of community leaders;
- v) to improve band-DFO relations; and
- vi) to contribute significantly to salmonid enhancement.

An evaluation in 1979³ identified some significant operational and administrative problems, none of which were considered serious enough to terminate the projects. NPPP was redesigned to eliminate these operational problems and re-named the Community Economic Development Program (CEDP) in 1978/79. CEDP was originally jointly funded by Fisheries & Oceans Canada and the Canada Employment and Immigration Commission (through the Economic Growth Fund and the Canada Manpower Industrial Training Program) but later SEP assumed primary responsibility for funding.

The specific objectives of CEDP are almost identical to those described above for its precursor. However, more emphasis was aimed at training and raising education and job aspirations in order to generate positive social benefits and help participants to become self-sufficient. The number and complexity of CEDP projects has grown significantly. Currently, 29 smaller hatcheries have been constructed and contracted out through the program.

(³) D. Rank, Assessment Report on the 1977/78 Native Project Pilot Program, 1979.

2.2.5 Public Involvement

The Public Involvement Program (PIP) was designed to encourage public support for the preservation and enhancement of salmonid stocks in British Columbia. The four formal goals of PIP are stated as:

- i) to promote public awareness of, concern for, and commitment to the protection of stream systems and estuaries as essential elements of a long-term program of salmonid enhancement;
- ii) to provide the concerned public with factual information on the goals, strategies, methods, implementation plans, costs, benefits, and administrative organization of SEP;
- iii) to develop a communication system to ensure that plans for salmonid enhancement reflect the reasonable views and desires of those citizens who will be affected by the program; and
- iv) to provide opportunities for the public to participate in salmonid enhancement.

Specific methods and strategies to achieve these objectives were not defined before the initiation of the program. However, a four-component approach, roughly corresponding to the above goals, evolved through time. These components are described briefly as follows:

- i) education - designed mainly to teach school children the basics of salmon biology, SEP methods and resource interactions by means of an educational package called Salmonids in the Classroom;
- ii) participation - to provide the general public (individuals or groups) with technical help and materials to undertake a variety of enhancement activities including small incubation projects, stream rehabilitation, fry salvage, stocking and feeding, data gathering, and construction of displays or signs; to date, well over 200 public participation projects have been undertaken through the program;

- iii) information - this component handles routine SEP information flow and direct PIP needs including the former Salmonid newsletter (now Pacific Tide), fact sheets and brochures, films and slide shows, displays and other promotional activities;
- iv) advisory - an extensive series of public hearings were held to obtain public feedback on how SEP should proceed; a regional advisory body called the Salmonid Enhancement Task Group (SETG) and comprised of a cross-section of representatives ranging from user groups to the general public was established to provide advice regarding such matters as SEP policies and project selection.

2.2.6 Small Projects

The Small Projects Program (SPP), carried out by the Special Projects Unit (SPU), was created in 1977/78 to provide technical services to CEDP and PIP and to undertake short term projects in stream clearance and fish habitat improvement, often in cooperation with the Field Services Branch of DFO and the Fish & Wildlife Branch of the B.C. Ministry of Environment. The Unit's objectives are:

- i) to enhance production of salmonids by application of appropriate technology;
- ii) to assist other units of SEP, other government agencies and the private sector with salmonid enhancement projects by providing engineering and biological expertise and guidance, as well as financial assistance in some cases;
- iii) to develop and refine salmonid enhancement techniques suited to the application by SPU and other programs and agencies which the Unit assists.

Enhancement projects implemented by SPU emphasize enhancement techniques such as small side channels and stream clearance which do not require a large, continuing operational commitment. In addition to assisting other government fisheries agencies, SPU has undertaken enhancement joint ventures with forestry companies and the B.C. Corrections Branch. SPU has also

initiated a number of pilot-scale salmon hatcheries, most of which were taken over by other divisions within Special Projects and also is responsible for the maintenance of existing DFO fishways. SPU expenditures increased significantly during SEP Phase I, mostly to provide technical support for CEDP and PIP activities. SPU is currently responsible for 22 side channels and 2 small hatcheries.

2.2.7 Provincial Projects

The provincial role in SEP in terms of fish production involves two species of anadromous trout, steelhead and cutthroat. There are currently 2 hatcheries producing these species being operated by the province. In addition cutthroat and particularly steelhead are produced at a number of federal facilities often as a form of mitigation or compensation for stock replacement effects of other SEP projects. The other major area of provincial involvement in SEP is to participate in manageability studies of enhancement activities.

2.2.8 Historical SEP Expenditures by Component

A breakdown of SEP expenditures for Phase I and the transition phase by activity is shown in Table 1 below. The expenditure data were developed for purposes other than evaluation of program components and, while related, do not precisely reflect the categorization of SEP components above. The construction, operation and maintenance costs of major facilities and larger engineering projects are shown as categories "a" and "b". Lake enrichment, CEDP and PIP are shown as categories "c", "d" and "e" respectively. Small projects and smaller engineering projects are shown as category "f". Provincial projects are reported in category "g". Pilot projects

are in category "h".⁴ Expenditures on scientific and economic research by the Fisheries Branch, Research Branch and Economics and Planning Branch are represented by categories "i". Overall program planning and other overheads are shown in category "j".

(⁴) These expenditures refer to projects operated only on an experimental or temporary basis. Pilot projects taken over by the Operations Division or CEDP are included in those latter categories.

TABLE 1
Salmonid Enhancement Program Regional Expenditures
(\$'000)

	1977/78	1978/79	1979/80	PHASE I			1983/84	TRANSITION PHASE		
				1980/81	1981/82	1982/83		1984/85	1985/86 ⁸	1986/87
a. Major and Engineered Facilities ¹	1,621	6,754	11,974	12,847	12,897	9,715	3,455	3,691	4,905	2,877
b. Major Facilities Operations & Maintenance ²	1,344	2,803	3,820	5,777	8,150	9,345	11,711	15,928 ⁷	16,345	17,165
c. Lake Enrichment	307	676	1,095	1,345	1,454	1,801	1,874	2,157	2,285	2,400
d. Community Development Projects	453	1,929	2,813	3,168	2,959	3,672	3,746	4,715	4,543	4,530
e. Public Involvement	505	829	830	874	1,051	1,278	1,234	1,481	1,454	1,520
f. Small Projects ³	252	726	1,098	1,461	1,212	1,211	1,188	1,921	2,465	2,404
g. Provincial Projects ⁴	628	1,154	1,931	1,994	1,625	1,710	1,667	2,241	2,167	1,967
h. Pilot Projects ⁵	283	284	135	244	181	383	211	1,232	1,335	820
i. Scientific and Economic Research ⁶	2,394	2,548	3,576	4,169	2,448	1,973	1,729	4,341	4,346	4,191
j. Program Planning & Direction	791	1,032	1,196	1,633	775	1,361	813	762	863	687
TOTAL	9,342	19,735	28,468	33,512	32,752	32,449	27,628	38,469 ⁷	40,908	40,309

Notes:

1. Design and construction of large hatcheries, spawning channels and fishways.
2. Includes operation of Salmon Commission Facilities beginning in 1985/86.
3. Includes smaller fishways and obstruction removal projects.
4. Includes provincial contribution plus federal funding to mitigate impact of enhancement on anadromous trout.
5. Experimental or temporary projects.
6. Includes expenditures in the following categories: reconnaissance/feasibility studies, manageability and environmental studies, evaluation/assessment studies, research studies.
7. Includes \$300,000 from DFO headquarters for Expo 86 expansions.
8. Does not reflect reductions resulting from freeze on expenditures in 1986.

3.0 EVALUATION ISSUES

3.1 Evaluation Logic Chart

An evaluation logic chart outlines the activities, outputs, intended effects and unintended effects that a program entails. It is useful in developing an evaluation framework because it helps focus the questions and issues that the evaluation must address.

In Figure 1, a logic chart for the salmonid-producing aspects of SEP is presented. This chart outlines the biological mechanisms by which the different types of projects as described in the previous section serve to affect salmonid production, escapement, and catch. Basically, SEP projects are aimed at increasing the deposition of eggs or increasing survival in some stage of the salmonid life cycle. The intended effect is to increase salmonid production, catch and escapement, though a variety of unintended effects on the enhanced and wild stocks can reduce the incremental catch attributable to SEP (the difference in total catch with and without the program).

While the primary focus of SEP is on salmonid production, it is important to recognize that the program is broader in scope, both in terms of its activities and goals. In Figure 2, a logic chart encompassing the full range of SEP activities and objectives is presented. This figure expands on the previous one providing an overview of the entire program.

As shown in Figure 2, in addition to the identification, assessment, selection and implementation of SEP projects there are non-project specific activities related to economics and planning, scientific research, data compilation and the development of SEP-related training, public involvement and education programs.

FIGURE 1

Logic Chart for Salmonid Production

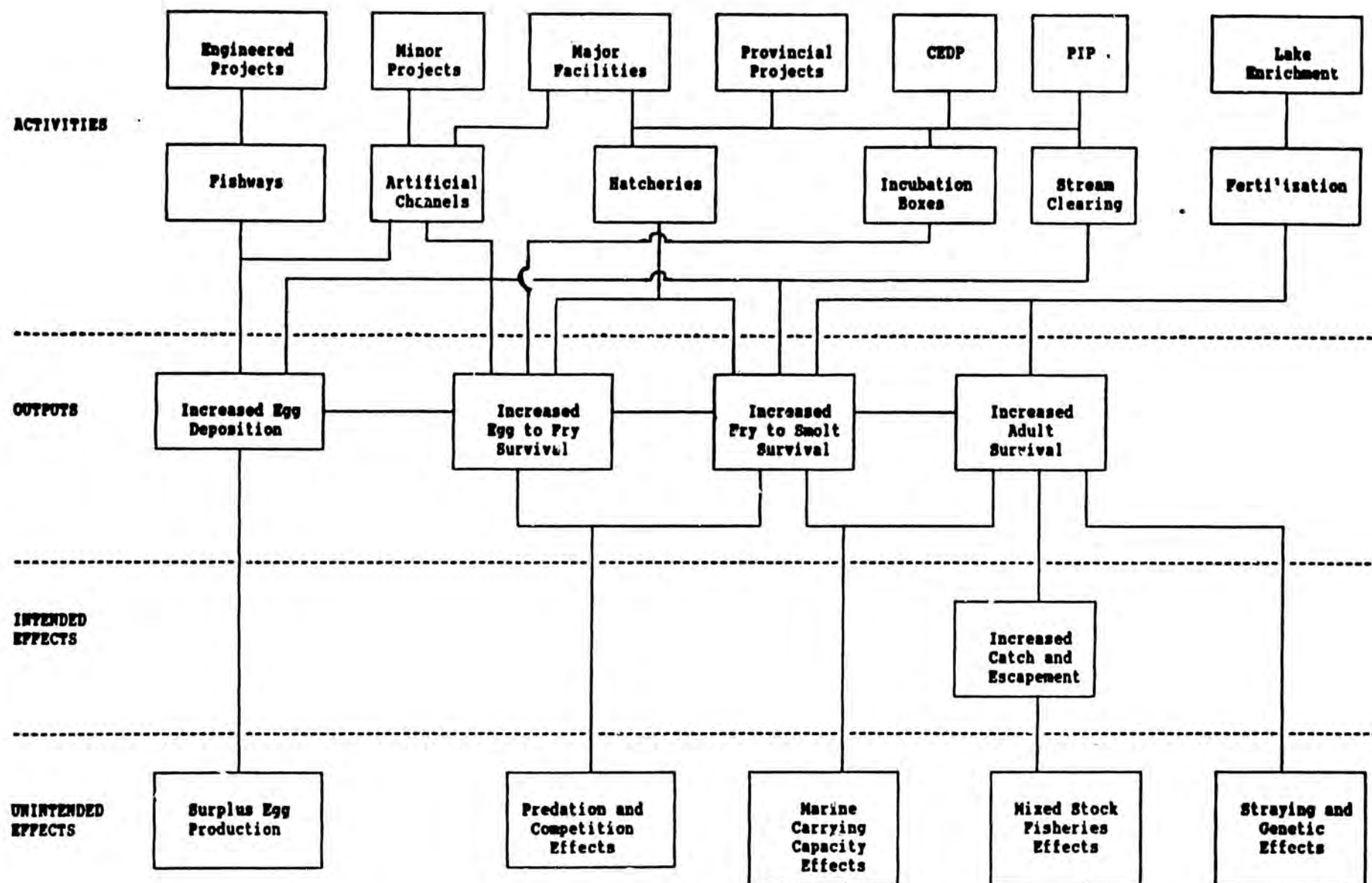
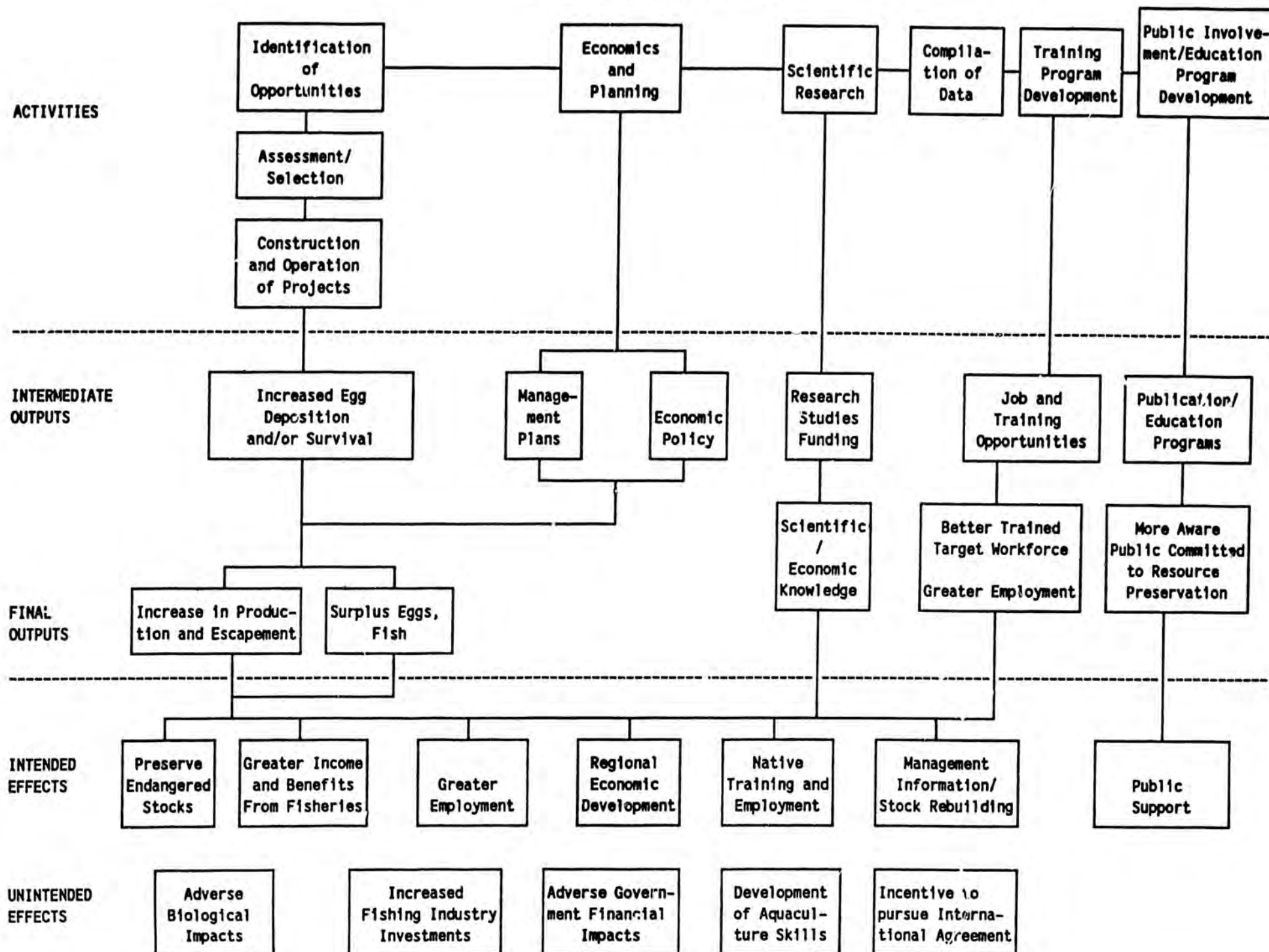


FIGURE 2
SEP EVALUATION LOGIC CHART



The outputs of non-project as well as project-related activities ultimately include greater salmonid production, catch and escapement; greater scientific knowledge and economic understanding of the fisheries; a better trained work force; and a more aware, educated public committed to resource preservation.

The intended effects, in addition to the direct biological and fisheries management goals, are to achieve the full range of social and economic objectives as specified in the initial SEP Agreement: to provide greater income and benefits from the fisheries, to increase employment, to generate economic activity in specific outlying regions, to generate benefits for native people and to develop more public awareness, knowledge and support. Unintended effects include negative impacts such as adverse biological effects on enhanced and wild stocks, over-investment in the fleet, and adverse financial impacts on government. Positive unintended effects include development of aquaculture skills aiding the development of a private aquaculture industry, greater incentive to pursue and conclude an international agreement and better information and planning for management and stock rebuilding efforts.

3.2 Issues

In the July 1986 evaluation framework report, four evaluation issues were identified: production, biological impacts, value for money and other benefits.

The production issue addresses the basic question: how successful have SEP facilities been in producing salmonids, in terms of both fish released and returning adults, and what long term trends in productivity have been observed or indicated. The biological impacts issue addresses questions related to the effects of SEP on wild fish populations, in terms of mixed stock fishery, predation and competition, genetic and marine carrying

capacity effects. The question of management impact or "manageability" of SEP is an integral part of the biological impacts issue.

Taken together, the production and biological/manageability impact issues raise the following fundamental question:

What has been the incremental contribution of SEP to salmonid escapement and catch, taking impacts on non-SEP stocks as well as SEP production into account?

This question is central to the evaluation of the program.

The value for money issue addresses the question of how large the fisheries-related benefits of SEP have been relative to its costs. The other benefits issue addresses the question of how large or significant the social and other "non-fisheries-specific" benefits of SEP have been.

In terms of the logic chart, whereas the production and biological/manageability impacts issues focus on the direct output of SEP, the value for money and other benefits issues focus on the intended economic and social effects of the program. More specifically, the fundamental evaluation question they raise is:

To what extent have the intended economic and social objectives of SEP been realized -- to what extent has SEP increased net benefits from the fisheries, provided employment, generated economic activity in outlying regions and generated economic opportunities and benefits for native people?

In sum, while there are many underlying issues, there are two basic questions that the evaluation of SEP must address. With respect to the direct output of SEP, the question is what has been SEP's incremental contribution to catch and escapement.

With respect to the intended effects of SEP, the question is to what extent have the economic and social objectives of the program been realized.

These two questions must be addressed at several levels. Firstly, they must be addressed for the program as a whole. SEP was developed as a package with different components employing different techniques and addressing different objectives. On an overall basis, however, the program was intended to achieve certain incremental production targets and serve all of its objectives. What must be addressed is, how well or to what extent has this been done.

Secondly, the evaluation questions must be addressed at the program component level. It is important to determine if different components have been more successful in terms of incremental production and the achievement of SEP objectives, and what factors underlie any differences in performance. This may be particularly important given the limited funding now available to SEP and given possible changes in priority among SEP objectives.

Finally, within each program component, the evaluation questions must be addressed at a project-specific level. It is important to identify which projects have been particularly successful and those which were not, and then to try to identify the factors contributing to success or failure. Different project rationale and backgrounds could be responsible for differing performance. Differing species mix, technologies, management regimes, or cost levels could also be responsible. What one can learn from past projects about these factors and their effect on performance could be very valuable in future program design.

4.0 METHODOLOGY AND INDICATORS

The basic evaluation task is to determine the performance of SEP in terms of the two basic issues discussed in the previous section: firstly, SEP's incremental contribution to salmonid production, and secondly, SEP's economic and social effects. The methodology and indicators recommended to evaluate these issues are described below.

4.1 Incremental Contribution to Catch and Escapement

The incremental contribution of SEP refers to the difference in total salmonid catch and escapement with and without the project. It depends upon the productivity of enhancement facilities or projects and on the impact of the production and catch of enhanced fish on wild stocks, i.e. the biological/ manageability effects.

4.1.1 Productivity of Enhancement Facilities or Projects

Productivity of enhancement facilities can be measured in terms of fish released, production of adults and production trends. In carrying out such measurements, it must be recognized that many fish released from hatcheries are experimental groups. These fish may not be representative of survival trends or future expected production. This must be recognized in the analysis.

Fish Released:- While it is the adult production and production trends which are most directly relevant to the evaluation, the number and relative size of fish released should be measured as an indicator of the productivity of enhancement facilities. Factors contributing to greater or lower numbers of releases (e.g. time of release, quality of water supply, risk of flooding, ability to control disease, ability to control

predation) should be identified for purposes of inter-project or program component comparisons. Also, since either wild or enhanced brood stock must be sacrificed (not allowed to spawn in the natural system), the releases should be compared with the number of brood stock used to obtain the production (fish released per spawner sacrificed). This can be an important indicator of the production efficiency of SEP. It is possible, for example, that for some situations, brood stock may have been utilized more efficiently in the natural system than in the facility. The evaluation should identify to what extent and for what reasons this may have occurred.

Production of Adults:- The production of adults (catch plus escapement) is the ultimate test of productivity and as such is clearly an important indicator in the evaluation.

For planning purposes, the expected levels of adult production from enhancement programs have been estimated on the basis of "bio-standard" parameters which trace the lifecycle of the fish from egg deposition through catch. As shown in Figure 3, key biostandard parameters include juvenile survival, adult survival, age specific exploitation rates and catch distribution.⁵

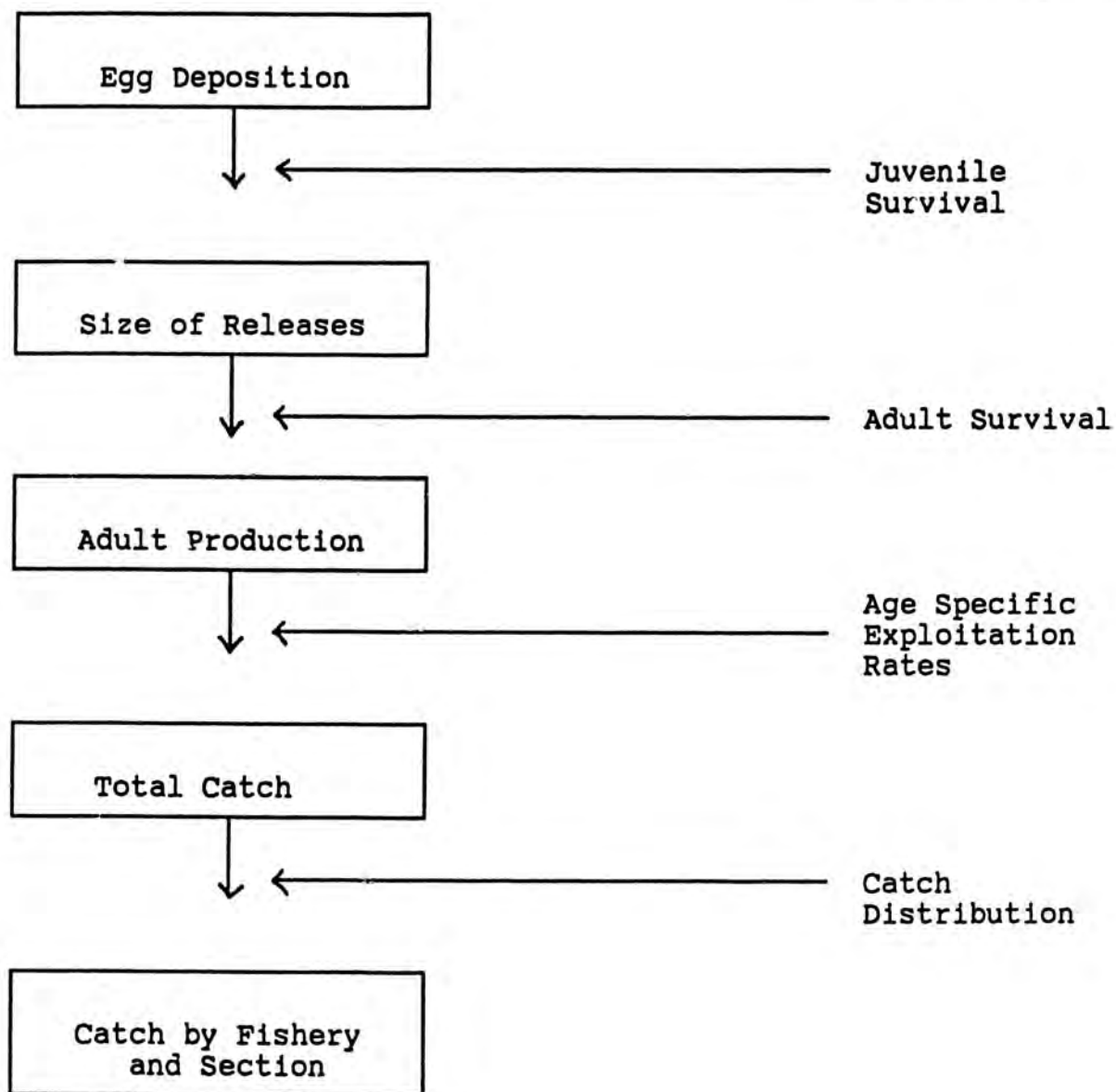
Biostandards can also be used to develop estimates of actual historic production from enhancement facilities. The number of fish released is usually known and the biostandard parameters, adjusted from synoptical and anecdotal data, could be applied to estimate production. A function of the Enhancement Planning

(5) Figure 3 shows the sequence of calculations, but a great deal more sophistication than shown can be introduced to any one step (e.g. many more life stages and risk analysis through the inclusion of stochastic functions as applied to the SEP risk analysis model, Anon. 1987a)

FIGURE 3

Sequence of Calculations to Obtain
Expected Catch Contribution

BIOSTANDARD
PARAMETERS:



Information Control (EPIC) data base is to make the "biostandard" parameters pertinent to the facility, geographical region and species accessible for amendment and use. However, as other studies have pointed out (e.g. Pearse 1982), the use of expected biostandard parameters to estimate the historical record is not an impartial evaluation procedure. Obviously, a better approach is to measure the catch contribution directly. Certainly, the reliability of the biostandard parameters has been brought into question. Further, it is overly simplistic to treat such dynamic quantities as age specific exploitation rates and catch distribution rates as fixed values.

To measure the catch contribution directly, three different methods can be used: mark for stock identification, stock reconstruction estimates, and stock interception estimates. It is recommended that these methods, which are described below, be used in the evaluation, where feasible and appropriate.

The mark for stock identification method relies on artificial or natural marks (e.g. scales, parasites) with which the proportion of total catches accounted for by specific enhancement facility production can be estimated. By far the most prevalent marks are the coded wire tags (CWT) implanted in the fishes' nose and fin-clips applied to chum and pink salmon before release from the facility. Chinook and coho salmon released from all major facilities and many small projects are marked with the CWT, with recovery and other related data held in the mark recovery program (MRP) database. The fin-clip information is held by the Biological Program Coordination Unit (BPCU).

The primary objectives for CWT tagging have been to estimate actual catch contribution, distribution and survival to catch rates for each tagged group using observed and estimated recoveries along with the number of tagged fish released. These terms are defined as follows:

Observed Recoveries = tags removed from heads of marked fish
and successfully decoded

Estimated Recoveries = $\frac{\text{Observed Recoveries} * \text{Total Catch}}{\text{Sampled Catch}}$

Survival to Catch = $\frac{\text{Estimated Recoveries}}{\text{Tagged Fish Released}}$

The above quantities are compiled by the Sports Creel Survey Program and the Head Recovery Program for sports catch and the Commercial Sampling Program for commercial catch.

Since the above statistics have not been expanded to represent unmarked fish, they are termed unexpanded estimates.

Expansion for unmarked fish in the population is obtained through the use of an expansion factor, i.e.:

Catch Contribution = Expansion Factor * Estimated Recoveries

where, the expansion factor, in turn is calculated through one of two models:

The Standard Model:

Expansion Factor = $\frac{\text{Total Fish Released}}{\text{Total Tags Released}}$

The Alternative Model:

Expansion Factor = $\frac{\text{Total Fish Returned}}{\text{Total Tag Returned}}$

The standard model is preferred and used except when tag loss rates are considered too high. Then the alternative model is used. Problems associated with unexpanded and expanded estimates are detailed in the September 1982 Pacific Marine Fisheries Commission Workshop (PMFC 1983) and the March/April 1982 PMFC workshop on coded wire tagging experimental design (PMFC 1982). The standard and alternative models are evaluated for selected hatcheries by English et. al. (1987a).

Estimation of the catch contribution with the use of fin-clipped chum and pink (primarily chum) salmon employs the same procedure as CWT. There are only four distinguishable marks in common usage. For chum salmon, the major fisheries are terminal and the methodology is appropriate. In some cases, such as the Johnson Strait and Fraser River fisheries, run reconstruction analysis is required to supplement the mark recovery analysis.

The utility of other marks, for example, the electrophoresis data (primarily for chum) and the scale discrimination data (primarily for Fraser River sockeye) for estimating SEP contribution to catch is presently unclear. It is possible that such data used in conjunction with stock reconstruction techniques will provide better estimates in mixed stock situations than with a single approach.

Stock reconstruction involves a backward tracking of different stocks from their final escapement back to the outer-most fishery along their migration routes. Estimates of migration routes, timing and diversion rates (proportions of a given stock following different migration routes) are required as well as weekly catch and escapement data. The actual reconstruction works backward through time. In each time period, the catch in each fishery is allocated to the different stocks present in the fishery in proportion to the amount of each stock known to have escaped the fishery at the end of the period. As

the process works backward through time (and backward through the migration routes of any given stock), the catch of a given stock in each previous fishery is estimated on this basis and added on to the estimated run. Eventually, the reconstruction works its way to the outer-most fisheries in which the stock is caught, at which point the total run entering the west coast fishery is determined.

The technique, which is described in Starr and Hilborn (1987), is applied mainly to the "net species" (sockeye, pink and chum salmon) when catch is taken in mixed stock fisheries. It is assumed that the simple migration route of fish through the fisheries and the passive net gear produces largely density independent harvest rates.

The precision and accuracy of the actual catch contribution estimates produced by the stock reconstruction method are uncertain. The reliability of some of the data is poor. On the other hand, stock reconstruction offers the only available method to estimate contribution, adult survival and catch distribution for unmarked stocks.

The North Coast Tagging Program was conducted from 1981 to 1985 to determine the stock interception rate on adult pink and sockeye salmon found in northern B.C. and southwest Alaska. All data are accessible through the North Coast Tag Data Base held on the VAX 11/780 computer at the Pacific Biological Resource Station (Nanaimo).

A general mark-recapture analytical model to estimate the relative population mixture (i.e., catch contribution) and precision in sequential fisheries has been developed (Gazey, et. al. 1987). Therefore, reliable catch contribution estimates are available over these years for northern pink and sockeye stocks (primarily Fulton and Pinkut Creek). These estimates can be

compared to estimates derived through stock reconstruction. An understanding of the difference between the estimates will permit a comparison of assumptions that have been in estimating the catch contributions but shouldn't be used to extrapolate these estimates to years when synoptic tagging data are not available. At the very least, the tagging data provides very good information about the migration route through the fisheries and migration timing.

Productivity Trends:- The purpose of the SEP evaluation is to determine how well the program has in fact performed. It is an "ex-post" perspective. However, most SEP projects have long expected life spans and an evaluation at any point in time must take into account not only historic performance to date but also the expected future performance over the remaining life of the facilities. Two factors must be considered in this respect.

Firstly, future performance will depend in part on the management regime and policies governing facility operations and related catch. It will likely be necessary in the evaluation to postulate alternative management scenarios to capture the range of performance that might reasonably be expected.

Secondly, estimates of future production should be based on actual historic performance, including consideration of long term trends in productivity. A long term reduction in the productivity of SEP facilities has been the focus of much speculative discussion. Certainly, the productivity (survival to catch) of most U.S. hatchery stocks has declined since 1978 (English 1985). The survival trend for B.C. hatchery stocks has been fairly stable or positive for some species and declining for others, especially chinook salmon. Data are available to analyze trends and this should be done as part of the evaluation.

In order to understand or identify the factors underlying SEP production trends, productivity trends of closely related wild stocks should be investigated. If hatchery productivity has been declining relative to wild productivity, one could infer that factors related to the facility or its operations (e.g. culture conditions, genetic conditions) are responsible. However, if hatchery and wild stock productivity have been changing at the same rate, then factors related to estuarine or ocean survival are more likely to be responsible, factors which in some cases may be unrelated to the program itself. Although some data is available, studies of this nature have not yet been initiated and even with a major program, meaningful results could not be expected in the near to mid term (e.g. within ten years). It is recommended that this analysis of the factors underlying long term productivity trends be undertaken. It should however be recognized that this question cannot be fully addressed as part of an evaluation in the short term. It must rather await another evaluation carried out in the longer term.

For purposes of this evaluation, it is recommended that the future projections be based on historic average productivity. To the extent historic trends are identified suggesting that the historic averages may not be maintained, it may be necessary to estimate ranges of future production corresponding to varying assumptions about the continuation or reversal of such trends. It should be noted, however, that until the factors underlying any observed trends are well understood, it will be very difficult to state definitively which future trend assumptions are most likely to prove correct.

4.1.2 Impact of SEP on Wild Stocks

The incremental contribution of SEP depends not only on SEP production, but also on SEP's impact on wild stocks, i.e., SEP's biological and manageability effects. The introduction of large

numbers of enhanced fish can have significant impacts upon wild populations. These impacts can occur because of mixed stock fisheries, predation and competition among juveniles, genetic effects, and possibly limited marine habitat carrying capacity.

Mixed stock fishery effects generally refer to the over-harvesting of wild stocks in fisheries dominated by enhanced production. Large volumes of enhanced fish plus lower percentage escapement requirements for enhanced as opposed to wild stocks (because of the greater spawning efficiency of enhanced fish) can result in optimal harvesting rates for enhanced fish being much greater than for wild. Unless harvesting rates in mixed stock fisheries are constrained to the level appropriate for the wild stocks, or harvesting patterns are altered to separate the harvesting of the enhanced and wild stocks, then wild stocks can be overharvested, resulting in insufficient escapement and a decline in wild production. Mixed stock effects need not always be negative. In some cases enhanced production has been used to replace the harvest of wild fish, thereby allowing wild stocks to rebuild without forcing reductions in total harvest levels.

Predation and competition effects may occur because of the broad overlap in the distribution of juvenile salmon of various stocks and species. The effects may take the form of one stock feeding upon another. This interaction was suspected for chinook salmon raised in warm groundwater in the Upper Fraser River area. Another form of adverse stock interaction may come from the introduction of too many fish into the habitat such that the competition for food reduces survival rates.

It should be noted that what the evaluation must assess is the incremental impact of these effects. For example, even if one determined that coho were important predators of juvenile pink salmon, the question would still remain whether the coho simply replaced other predators or increased the amount of