

FRED Reports

**FRED 1988 ANNUAL REPORT
TO THE ALASKA STATE LEGISLATURE**

Edited by
J. S. Holland, Ph.D.

Number 89



**Alaska Department of Fish & Game
Division of Fisheries Rehabilitation,
Enhancement and Development**

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Alaska Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement and Development

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ABSTRACT (100 words maximum) FRED's major objectives are the rehabilitation, enhancement, development, protection, and maintenance of the salmon, trout, sheefish, and grayling resources of the state for the use of all Alaskans. To accomplish these, FRED utilizes hatcheries, stream rehabilitation, lake stocking, and fishways as its basic tools. Hatcheries are about eight times more efficient in converting eggs to fish than the natural environment, and fishways open new spawning areas to anadromous fishes. FRED's Limnology, Coded-Wire Tag Recovery, and Pathology Laboratories continue to provide important information about the state's fishery resources. FRED encourages rehabilitation efforts by private nonprofit aquaculture corporations and provides technical services to them. Over 1.3 billion salmon eggs were collected for hatcheries in the State of Alaska during 1988 through the combined efforts of FRED Division and the private nonprofit hatchery operators. During 1988 FRED released more than 412 million juvenile fish. About 290 million eggs were taken for incubation during the year, and over 5.6 million salmon and trout returned in 1988 as a result of FRED projects. Private nonprofit hatcheries throughout the state released over 819 million salmon, and collected over a billion salmon eggs in 1988. An estimated 19.9 million adult salmon returned in 1988 as a result of PNP hatchery operations.		SUBJECT CATEGORY <hr/> <input checked="" type="checkbox"/> NATURAL RESOURCES <input type="checkbox"/> EDUCATION <input type="checkbox"/> SOCIAL SERVICES <input type="checkbox"/> HEALTH <input type="checkbox"/> TRANSPORTATION <input type="checkbox"/> LAW ENFORCEMENT <input type="checkbox"/> COMMERCE & INDUSTRY <input type="checkbox"/> GENERAL GOVERNMENT <input type="checkbox"/> LOCAL GOVERNMENT <input type="checkbox"/> OTHER
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PREFACE

The stated purpose of the Alaska Department of Fish and Game (ADF&G) Fisheries Rehabilitation, Enhancement and Development (FRED) Division is to sustain and enhance Alaskan fisheries through the development and application of technologies in supplemental production and natural stock rehabilitation. FRED Division has undergone a series of major changes, including a new director in 1987, a change in operational strategies and organization, and contracting of the operation of three hatcheries in 1988 to private-sector operation; a fourth hatchery is operated cooperatively. Operational changes resulted primarily in response to decreasing levels of funding for the program. The program, however, as shown by returns and importance of catches in 1988, is singularly successful. In many parts of Alaska, 1988 was the year of the enhanced fish!

During 1988 FRED Division operated 16 hatcheries, several ancillary hatchery facilities, pathology, limnology, and coded-wire tag recovery laboratories, and other programs, including lake stocking, lake fertilization, comprehensive salmon planning, private nonprofit (PNP) hatchery permitting, and stream rehabilitation projects.

In July there was a successful contracting of operations of the Hidden Falls, Cannery Creek, and Trail Lakes Hatcheries to the private sector. Kitoi Bay Hatchery is being operated by the FRED Division in cooperation with the Kodiak Regional Aquaculture Association. For reporting purposes, all activities in the former three hatcheries occurring before transition will be considered FRED activities, and those activities occurring after, i.e., fish returns and egg takes, will be reported as private-sector activities.

As previously stated, 1988 was indeed the year of the enhancement-produced fish. Extremely low returns of many natural stocks across the state would have resulted in very poor harvests for many area fishermen and subsequent impacts on local economies; however, in many cases, fish produced by enhancement activities were available for harvest. This is, of course, one of the primary benefits that enhancement proponents have been expounding; i.e., production of fish to protect against economic and societal losses in times of natural run failure. In lower Cook Inlet, a natural run failure in 1988 was attributed to floods during the fall of 1986 which scoured out the natural spawning areas in most streams. The salmon season would have been an economic disaster for local economies had it not been for the success of fisheries enhancement projects. The eggs in the local state hatchery were protected from the flood. As a result, there was an excellent return of hatchery-produced salmon. In addition, record numbers of salmon returned to lake enhancement projects. In 1988 lower Cook Inlet fishermen netted approximately \$4.3 million worth of enhancement-produced salmon. In the final analysis, 91% of the entire lower Cook Inlet pink salmon catch and 79% of the sockeye salmon catch came from fishery enhancement projects. A similar story occurred in the Prince William Sound area but on a much larger numerical scale. In 1988 fisheries enhancement saved the Prince William Sound local fleet and communities from what would have been an economic disaster. Wild-stock returns were so poor that virtually no commercial fishing was allowed on the natural pink salmon stocks. Essentially 90% of the 9.6 million pink salmon caught in Prince William Sound were taken at the doorsteps of the hatcheries. It is important to note that the hatchery fish were harvested without negatively impacting the natural stocks. Sizeable runs of enhanced sockeye and chum salmon also contributed to the Prince William Sound fishery. Production from two state hatcheries and four private-sector hatcheries saved the day in Prince William Sound during 1988.

FRED DIVISION BACKGROUND

The ADF&G, FRED Division plays a major role in the state's salmon management program. Its purpose is to sustain and enhance Alaskan fisheries through the development and application of technologies in supplemental production and natural stock rehabilitation. The division's roles are redefined as: development of new enhancement technology; hatchery production for sport, subsistence, and non-cost-recovery commercial fisheries; technical services; habitat restoration and fisheries rehabilitation; regulation and management of the PNP Program; and statewide program coordination, including production, planning, and technology transfer. As such, it **contributes knowledge** gained from tagged-fish studies and technological research; it **mitigates fish losses** from foreign interceptions and environmental disruptions; it **contributes fish** to existing but depressed fisheries; it **creates new opportunities** for commercial, sport, and subsistence fisheries; and it **aids other aspects** of the statewide enhancement program through technical services and PNP Program coordination.

Statutory Authorities

The mission of FRED is to plan and implement a program that ensures the perpetual and increasing production and use of Alaska's fishery resources (AS 16.05.092). In addition, members of the FRED Division, with approval of the Commissioner's Office, coordinate the rehabilitation and enhancement activities of the department and regional aquaculture associations (AS 16.10.380), and process fish transport permits and applications for PNP hatcheries (AS 16.10.440). The division also technically assists the PNP hatcheries to the extent possible (AS 16.10.443) and cooperates in the development of regional salmon plans (AS 16.10.375).

FRED Division's duties (AS 16.05.092) include the annual presentation of a comprehensive report to the Legislature. This report, along with a detailed budget request, satisfies the division's reporting requirements.

Functions and Services

The FRED Division operates 16 hatcheries to produce salmonid fishes for subsistence, commercial, and sport fisheries. Fishpasses located throughout the state provide spawning and rearing habitat that would otherwise be unattainable to salmon stocks. Many of these fishpasses are maintained cooperatively with the U.S. Forest Service (USFS). The strategies of lake fertilization, habitat improvement, and fish-stock introduction are used to provide improved freshwater survival and new production opportunities for salmon stocks.

FRED Division operates four laboratories that serve ADF&G and other agencies. The Fish Pathology Section has two labs, in Anchorage and Juneau, to provide diagnostic services and broodstock evaluation for state and PNP fisheries programs. The Limnology Laboratory provides supervision of all lake-enrichment projects and analyses of water, plankton, and aquatic insect populations sampled for lake productivity studies. The Coded-Wire Tag Recovery Laboratory decodes metal tags implanted in fish and

supplies resultant information for hatchery and natural stock evaluation, as well as for the evaluation of United States/Canada salmon interceptions.

The PNP Hatchery Program is administered by the FRED Division. One of the responsibilities of administering this program is to organize the regional salmon planning teams, which are comprised of ADF&G and regional aquaculture association members. The PNP Program Office coordinates the review of PNP hatchery applications and the permitting process, which includes hatchery and fish transport permits.

FRED Division is involved in the organization, permitting, and coordination of shellfish mariculture projects. The program continued in 1988 with 16 active or potential private mariculturists working on scallop, mussel, and oyster projects. A cooperative project involving ADF&G and the Japanese Overseas Fishery Cooperation Foundation, to study the feasibility of scallop spat collection in the Kodiak area was completed in 1988.

FRED PRODUCTION SUMMARY

Total production for the FRED Division decreased from 7.4 million fish in 1987 to 5.6 million fish in 1988 (Figure 1). This reduction is primarily one of reporting; the production of the contracted hatcheries is still ongoing but will be reported by the private sector. The contracted hatcheries contributed 2.9 million pink and chum salmon to the 1987 total. Since the decrease from 1987 to 1988 is 1.8 million fish, this indicates that production from existing FRED facilities has increased by 1,100,000 fish, or approximately 20% if production of contracted hatcheries is not considered.

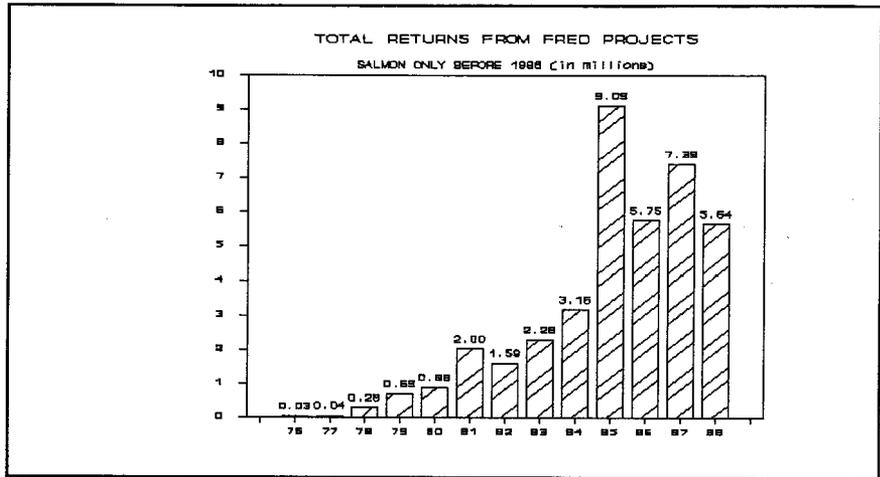


Figure 1

Releases of fish from FRED facilities increased from 388.4 million in 1987 to 412.7 million in 1988 (Figure 2). Chum salmon releases decreased by about 42 million fish while all other salmon species increased. It should be noted that release activities occurred before the contracting of operations of hatcheries and that much of the increase in releases in 1988 will not

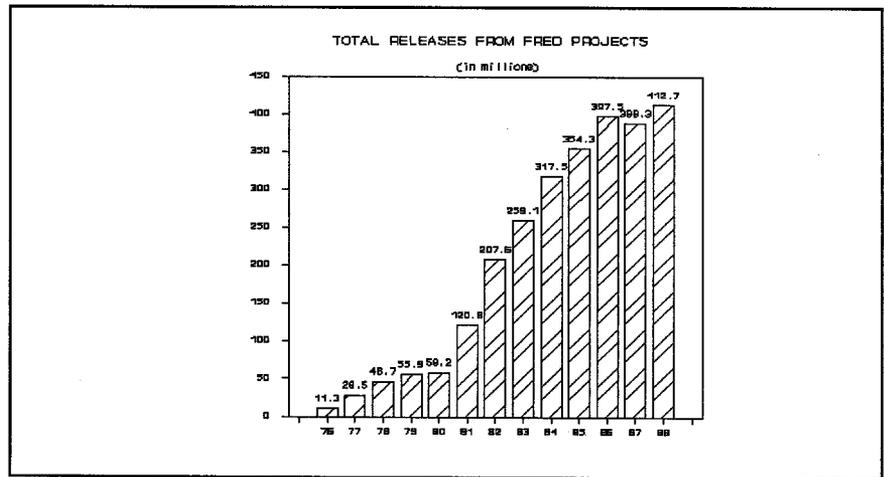


Figure 2

be reflected in future state facility production but will be reported by the private sector. Release information reflects some of the changing FRED emphasis. There is for chum salmon, and will definitely be for pink salmon in 1989, a dramatic decrease in the numbers released by FRED facilities, which reflects the move toward turning the production of proven technology, commercially oriented species over to the private-sector producers. There is an increase in the release numbers of chinook, coho and sockeye salmon reflecting a greater emphasis on sport fish production, increasing production of species important to international treaties, and the continuing development of production technology for species that have proven to be more difficult to culture successfully.

Egg-take information provided in Figure 3 again shows the dramatic impact of the contracting of operations of three major production facilities to the private sector. Numbers of eggs taken by FRED facilities decreased from 505 million in 1987 to nearly 290 million in 1988. Again, it should be noted that the decrease in egg takes is a function of reporting. Eggs were taken after contracting of operation and will be reported by the private sector. Contracted hatcheries contributed more than 201 million eggs to the 1987 total. Major decreases occurred with chum and pink salmon and less pronounced decreases in sockeye salmon eggs. Numbers of chinook and coho salmon eggs taken increased in 1988, reaching all-time highs. Again, number of eggs of various species taken in 1988 reflects the changing FRED Division program.

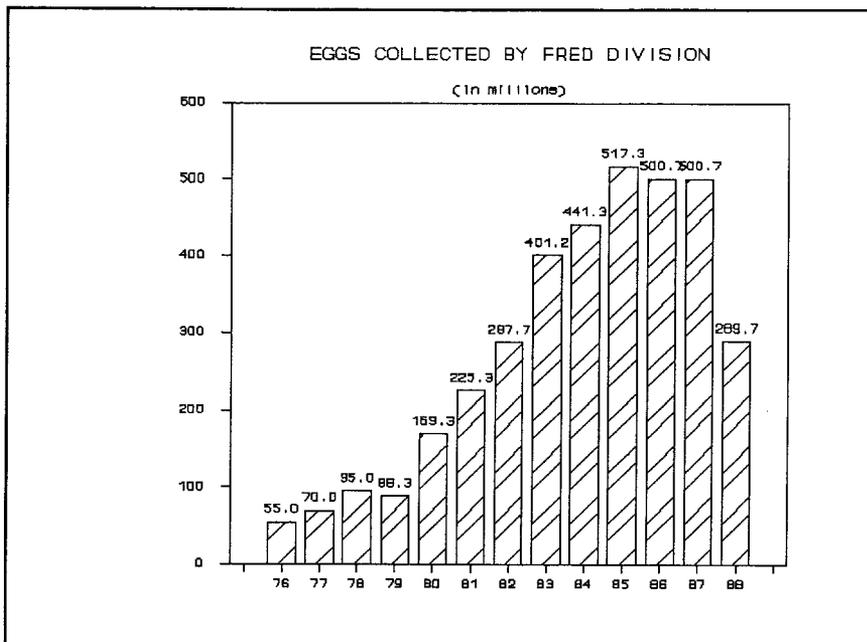


Figure 3

SOUTHEAST

Summary of FRED Projects

The FRED Division maintains three area offices and five hatcheries in southeast Alaska. This reflects the closing of the Sitka area office when the operation of Hidden Falls Hatchery was contracted to the Northern Southeast Regional Aquaculture Association (NSRAA) in July 1988. Area offices are found in Juneau, Petersburg, and Ketchikan. Hatcheries in this region include Snettisham, approximately 40 miles south of Juneau, Crystal Lake, on the road system outside of Petersburg, Deer Mountain and Beaver Falls in Ketchikan, and Klawock on Prince of Wales Island near the community of Klawock (Figure 4). In Southeast, as well as in other regions of the state, FRED Division uses hatcheries as primary tools of enhancement but employs many other strategies as well.

In Southeast, the commercial fishery includes three primary gear groups: gill net, seine, and troll, with the latter divided into power and hand-troll components. Gillnet fisheries are aimed at pink, chum, and sockeye salmon, as are the seine fisheries. Trolling primarily targets chinook and coho salmon. There is a fair amount of incidental catch, the harvest of species not specifically targeted for, among all gear groups.

Subsistence and personal-use fisheries in Southeast are of lesser magnitude than in other areas of the state. There are subsistence and personal-use fisheries for chinook, sockeye, and coho salmon across the region, but their total catch is considered negligible.

Extensive marine sport fisheries exist in the populated areas of the region, including Juneau, Sitka, Petersburg, and Ketchikan. Each of these fisheries are benefited by enhancement. In Ketchikan, the 1988 winning fish of the Ketchikan Salmon Derby was a chinook salmon from Deer Mountain Hatchery. Charter operations in the southern end of the region continue to increase with 99 operators serving the Ketchikan/Prince of Wales Island area in 1988. Twenty-one percent of the chinook salmon harvested in the Juneau area sport fishery in the past two years were hatchery fish. Sport fishermen across the region took 1,570 chinook salmon in 1988 which originated from Crystal Lake Hatchery. Freshwater sport fisheries for steelhead trout in the Klawock and Petersburg area benefited from production by the Klawock and Crystal Lake Hatcheries. Catchable coho salmon were stocked in Juneau area lakes from the Snettisham Hatchery.

In 1988 the Snettisham Hatchery crew took 8.0 million chum salmon eggs. This was far below the objective of 50 million eggs and is a consequence of an unanticipated increase in fishing effort targeting on Snettisham returns. Chinook salmon egg takes at the hatchery were 1.6 million with an additional 3 million obtained from Crystal Lake, which brings the hatchery to its production objective for that species.

There were no coho salmon eggs collected at Snettisham Hatchery during 1988. The FRED management staff elected to discontinue coho salmon culture at this hatchery. In ten years of work with coho salmon at Snettisham, their performance has consistently been below standard. Apparently, they are not well adapted to this site.

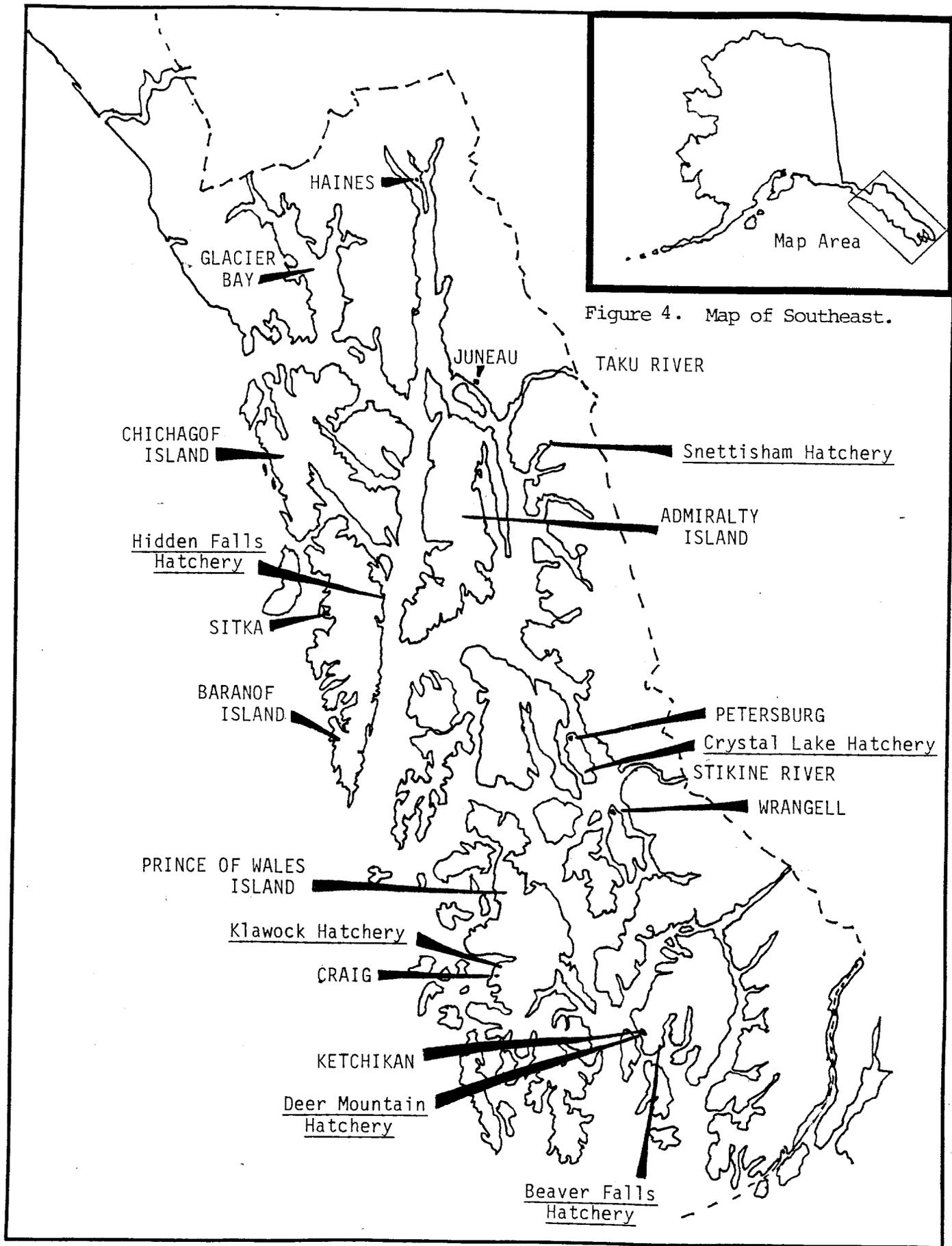


Figure 4. Map of Southeast.

Chum salmon survivals have also been less than desired. In 1988 a saltwater-rearing project at Limestone Inlet, designed to boost chum salmon survivals, was implemented. It is expected that the warmer, more productive waters at Limestone Inlet will increase the survival rate of chum salmon released there to twice that of the hatchery release rate.

The sockeye salmon production phase of Snettisham became operational in 1988. A small number of eggs were collected at Speel Lake to both help rehabilitate that stock and also to assess several techniques to be employed in the central incubation facility (CIF). One of these techniques is the chilling of incubation water to delay emergence of the fry until ice has melted off the designated stocking lake. The other technique is the thermal marking of the otoliths of developing embryos. It has been shown that an identifying mark can be placed on the otoliths by sharply changing the water temperature during the incubation period. If this technique can be successfully used on sockeye salmon and a working methodology for recoveries of marked fish can be developed, it will give managers a means to mark 100% of a hatchery release. It should be noted here that this technique is strictly experimental and should not be considered proven technology.

The sockeye salmon CIF was in its pilot phase in 1988. It is designed to work with rehabilitation of a number of depressed sockeye salmon stocks as well as the enhancement of this species in northern Southeast.

Crystal Lake Hatchery is located 17.5 miles south of Petersburg on the Mitkof Highway. The hatchery began operation in 1972 and is designed for long-term rearing of salmon and trout. Currently, the capacity of the hatchery is 1.3 million chinook salmon smolts, 100,000 coho salmon smolts, and 43,000 steelhead trout smolts. This results in an expected return of 60,000 adult chinook salmon, 8,100 adult coho salmon, and 2,000 adult steelhead trout. An isolation incubation and rearing facility was added in 1983. Each of the three isolation modules is capable of incubating 200,000 eggs, rearing 60,000 fry to 2 grams (g) or 12,000 to 10 g. The isolation modules produce fish to stock under-utilized habitats in cooperative projects with NSRAA, the Southern Southeast Regional Aquaculture Association (SSRAA), and the USFS. Annually, 500,000 chinook salmon smolts from Crystal Lake Hatchery are taken to the Earl West Cove remote-release site in a cooperative project with the NSRAA, SSRAA, and USFS.

Bacterial kidney disease (BKD) has caused chronic difficulties at this facility. Adult spawners are screened for the disease and gametes from each positive spawner are discarded. Originally, this hatchery operated using heated recirculated water, but now operates utilizing a single-pass water system. Investment is needed to replace or repair equipment and modify designs at Crystal Lake Hatchery to improve efficiency.

Predicted releases for 1989 are 500,000 chinook salmon smolts into Crystal Creek, 500,000 chinook salmon smolts into Earl West Cove, 300,000 chinook salmon smolts into Ohmer Creek, 100,000 coho salmon smolts into Crystal Creek, 8,500 coho salmon smolts into four creeks in Petersburg, 350,000 coho salmon fry into Slippery Creek, and 75,000 coho salmon fry into St. John's Creek.

Deer Mountain Hatchery in Ketchikan produces chinook and coho salmon primarily aimed at area sport fisheries. The majority of the fish reared at Deer Mountain are released at remote sites. In 1988 Reflection Lake was stocked for the first time with approximately 108,000, 4-g fingerling coho salmon of Reflection Lake origin. Ward

Lake was stocked for the second time with 60,000, 15- to 20-g summer-run coho salmon in December 1988. Both sites had representative numbers of fish coded-wire-tagged for future evaluation needs. Some 43,498 fish were tagged from the Reflection Lake release group and 20,000 were tagged from the Ward Lake group. Bold Island Lake received some 60,000, 15- to 20-g summer-run coho salmon during a December 1988 plant. Approximately 20,000 were coded-wire-tagged. The remainder of the 1987 brood year summer coho salmon (16,000) will be tagged and stocked into Ketchikan Creek in the spring of 1989 as smolts. These will be approximately 25 g in size. Expected adult summer-run coho salmon from all these programs is 9,720 fish.

The first release of one-check or normal-aged chinook salmon smolts from net pens located at the Big Salt Lake estuary system occurred in 1988. Some 51,230 chinook salmon smolts with an average weight of 25.8 g and 250-mm length were moved from Deer Mountain Hatchery to Big Salt Lake on 25 May 1988. These fish were imprinted to the Big Salt Lake system for a period of 5 days and were released. A total of 44,139 fish were coded-wire-tagged for evaluation purposes. Blood-sodium testing prior to planting and prior to release from the net pen was made to define the degree of smoltification. Adult production from the Big Salt Lake releases should exceed 2,000 fish. Future remote releases are planned for this area because returning adults will contribute to the Craig and Klawock area sport fisheries.

Deer Mountain Hatchery is currently culturing 207,000 chinook salmon fingerlings. These fish will be released in the spring of 1989 as smolts. The 1987 brood year is divided into three treatments, including a remote-release group for Prince of Wales Island.

Insufficient adult returns to Deer Mountain Hatchery in 1988 required the securing of 231,000 eggs from the Little Port Walter facility. These are the same genetic stocks (Unuk River) that the Deer Mountain Hatchery has been using. Poor returns are thought to be linked to the poor survival of "zero-check" releases; the hatchery is now producing only one-check smolts.

Results from the 1986-brood chinook salmon feeding frequency project indicated that alternate feed-and-starve periods of 5 or 10 days produced a healthier smolt than feeding on an every-other-day schedule. Investigation is continuing with the 1987 brood to further define the optimal interval for feed/starve periods and the best time to begin this schedule.

The Beaver Falls Hatchery, an isolation incubation facility near Ketchikan, provided culture support for 1987-brood sockeye salmon eggs from Karta, Naha, and Hugh Smith watersheds. Over 6.1 million of the resultant sockeye salmon fry were planted in eight area lakes in the spring of 1988. Assuming survivals of 20% from fry to smolt and 12% from smolt to adult, these plants should return approximately 160,000 adult sockeye salmon.

A pilot project has been implemented at Beaver Falls Hatchery to determine the efficacy of using salt water to treat fungus on sockeye salmon eggs during incubation. The experimental design includes two saltwater treatment regimens: a comparison with formalin treatment and a control group receiving no treatment. Two stocks of sockeye salmon eggs are being tested. Favorable results will allow treatment of all 1989-brood sockeye salmon eggs with salt water rather than with formalin.

Klawock Hatchery, near Klawock on Prince of Wales Island, maintained its coho salmon and steelhead trout production and continued its entry into sockeye salmon production. Its major production effort, approximately 1,373,000 coho salmon presmolts from Klawock Hatchery stocked into Klawock Lake in 1988, will produce a return of 92,750 adults in 1990.

Ward Creek received 19,648 steelhead trout smolts while another group of 19,959 smolts were planted into the Klawock River in 1988. These fish plants potentially will make 1,980 fish available to the recreational fisheries at Klawock and Ketchikan. Some 105,000 eggs (1988 brood year) were taken for the coming year's production; plantings will be made at the same sites, except Montana Creek. Pending approval of the fish transport permit, planting of the Klawock steelhead trout into Ketchikan Creek may become an annual event.

Limited broodstock availability and poor survivals due to poor egg quality and unproven egg-take procedures resulted in only 592,465 sockeye salmon fry (1987 brood year) planted into Klawock Lake. These are expected to add 14,000 adults to seine fisheries and escapement in Districts 103 and 104. In 1988 sockeye salmon egg takes were again restricted by brood availability, but an estimated 3.9 million eggs were taken.

Southeast Highlights

- Over 450,000 chinook and coho salmon smolts were stocked in the Juneau area in a continuing enhancement program, which contributed more than 21% of the sport-caught chinook salmon in the Juneau area in 1987 and 1988.
- Problems in Ophir Creek were assessed and a partial solution will be implemented in 1989. Work continues with other agencies to implement a comprehensive hydrological study and to replace a culvert on the creek.
- Estimated returns of over 79,000 chum salmon to Snettisham Hatchery were the highest ever.
- Construction of a 20 million-egg sockeye salmon CIF at Snettisham Hatchery was begun in 1988 with the construction of an interim temporary incubation facility.
- At Deer Mountain Hatchery, a study group of chinook salmon that had been heat-shocked to induce triploidy were shown to have 85% triploids.
- The sockeye salmon initiative in southeast Alaska was bolstered by the release of over 6.1 million sockeye salmon fry from Beaver Falls Hatchery into eight area lakes.
- Chum salmon broodstock development continued at the Marx Creek spawning channel with an overwinter survival from egg to migrant fry of 46% and fry production of 2.3 million in 1988.
- Two stream rehabilitation projects consisting of silt and overburden removal in Fish Creek and sediment removal to access upwelling flows in Marx Creek were initiated and completed in 1988.

- Crystal Lake Hatchery continued to produce the lion's share of enhanced chinook salmon in southeast Alaska.
- An estimated 34% of the chinook salmon harvest in the Petersburg marine sport fishery was attributed to Crystal Lake Hatchery stocks in 1988.
- Port Camden chum salmon egg-to-fry survival rates for the 1987 brood was 98%. This is the second consecutive year of 98%-99% fry survival in this project.

Southeast Returns and Fishery Contributions

FRED projects produced a return of over 521,000 fish to southeast Alaska in 1988 (Table 1). This is an apparent reduction of over one-half million fish. This reduction is primarily one of reporting; the production of the contracted hatcheries is still ongoing but will be reported by the private sector. As in the past, the dominant state project-produced fish was the chum salmon, accounting for 297,000 fish in Southeast in 1988. Major producers of chum salmon in Southeast are the Fish Creek spawning channel project at Hyder, Snettisham Hatchery, and Klawock Hatchery. This year's production of chum salmon at Snettisham set a new record for that facility. Chum salmon production at Klawock is being phased out and replaced by sockeye salmon. Sockeye salmon had the second-highest number of returns to FRED projects in Southeast this year. This is a portent of the future when sockeye salmon will comprise the major returns to FRED projects in Southeast. The sockeye salmon initiative, begun in 1987, will utilize hatchery, lake stocking, and lake enrichment to produce sockeye salmon in record numbers in Southeast. This is an indication of programmatic changes within the FRED Division in which pink and chum salmon production is being given over to the private sector while FRED develops new cultural technology for other species, such as sockeye salmon, etc. FRED Division's Southeast projects contributed over 17,000 chinook salmon in 1988. This is less than the number of chinook salmon returns in 1987, partially due to Hidden Falls Hatchery's returns not being counted, but also due to a lesser return to Crystal Lake and Snettisham Hatcheries this year. This lowered return was expected due to low numbers of smolts released in two prior release years. However, Alaskan hatchery chinook salmon contributions to the troll and sport fisheries in Frederick Sound are growing steadily, approaching 30% in the 1987-1988 winter troll catch and in the sport catches. Production from existing Alaskan chinook salmon enhancement programs is not expected to peak until the mid-1990s. Enhancement, in addition to much improved escapements observed in the local wild chinook salmon stocks, indicate better days ahead.

Early harvest estimates of Alaskan hatchery chinook salmon contributions indicate Crystal Lake Hatchery stocks provided approximately 10,600 of this prized species to southeast Alaskan fisheries in 1988. The commercial troll fleet harvested over 6,000 Crystal Lake Hatchery chinook salmon; nearly 70% of this catch occurred in the winter fishery. The gillnet fisheries landed approximately 2,800 Crystal Lake chinook salmon primarily in terminal fisheries. Although there was no documented seine catch of Crystal Lake Hatchery chinook salmon stocks in 1988, an unknown number of them were harvested by this gear group. Sport fishermen throughout southeast Alaska received the benefit of an additional 1,660 Crystal Lake Hatchery chinook salmon, of which 950 were landed in a special fishery downstream of the hatchery. This sport harvest includes 300 chinook salmon reportedly caught by a lodge located near Blind Slough that does not get surveyed. An estimated 34% of the Petersburg marine chinook

Table 1. Estimated contribution of fish by FRED hatcheries and projects in 1988.

Hatchery or Project	Species	Commercial Catch	Sport Catch	Brood Stock/ Escapement	Total	Comments
SOUTHEAST REGION						
Bakewell	Coho	700	87	175	962	Fishpass near Ketchikan. See footnote.
	Sockeye	400	0	100	500	
Beaver Falls	Chum	0	0	0	0	Hatchery near Ketchikan.
Chilkat Ponds	Coho	1,000	--	250	1,250	Habitat improvement project near Haines. See footnote.
Crystal Lake	Chinook	7,400	1,570	4,400	13,370	Hatchery near Petersburg.
	Coho	2,300	400	3,861	6,561	Coho sport harvest based on historical data.
	Steelhead	--	--	39	39	
Earl West Cove	Chinook	300	2	--	302	Joint remote release with SSRAA near Wrangell
Ohmer Creek	Chinook	1,140	85	220	1,445	Release site near Petersburg. See footnote.
Farragut	Chinook	110	8	--	118	Release site near Petersburg. See footnote.
Irish Creek	Coho	500	--	1,000	1,500	Fishpass near Petersburg. See footnote.
Deer Mountain	Chinook	165	27	328	520	Hatchery in Ketchikan.
Fish Creek-Hyder	Chum	120,000	0	40,000	160,000	Cooperative spawning channel with USFS. Catch based on escapement.
Hidden Falls	Chinook	NA	NA	NA		Production reported in PNP section
	Chum	NA	NA	NA		Production reported in PNP section
Ketchikan Creek	Pink	60,000	1,000	10,000	71,000	Fishpass in Ketchikan.
Klawock	Chum	38,700	0	20,000	58,700	Hatchery on Prince of Wales. See footnote.
	Coho	10,600	2,500	3,653	16,753	
	Steelhead	0	800	50	850	See footnote.
McDonald Lake	Sockeye	20,000	2,200	70,000	92,200	See footnote.
Snettisham	Chinook	461	200	486	1,147	Hatchery 40 miles SE of Juneau.
	Coho	121	204	20	345	
	Chum	70,311	NA	8,979	79,290	
Indian Lake	Coho	845	58	860	1,763	
Juneau/DJ	Chinook	112	166	76	354	
	Coho	46	NA	NA	46	
Tunga Lake	Coho	2,660	--	665	3,325	
Sunny Creek	Pink	8,000	0	2,000	10,000	Fishpass on Prince of Wales. See footnote.
Ward Creek	Steelhead	--	450	450	900	
Southeast Totals:		345,871	9,757	167,612	523,240	

-Continued-

Table 1. Continued.

Hatchery or Project	Species	Commercial Catch	Sport Catch	Brood Stock/ Escapement	Total	Comments
ARCTIC-YUKON-KUSKOKWIM						

Clear	Coho	1,000	50	800	1,850	Hatchery located south of Fairbanks.
	Chum	15,000	100	5,000	20,100	
	Chinook	370	--	90	460	
Interior lakes	Coho	--	32,000	--	32,000	See footnote.
	Rainbow	--	50,000	--	50,000	See footnote.
	Grayling	--	26,000	--	26,000	See footnote.
	Sheefish	--	200	--	200	See footnote.
	A char	--	1,000	--	1,000	
	Chinook	--	9,500	--	9,500	
Fort Richardson Interior lakes	Rainbow	--	44,400	--	44,400	See footnote.
Sikusuilag	Chum	12,000	0	1,500	13,500	Hatchery on the Noatak River.
AYK TOTALS:		28,370	163,250	7,390	199,010	

COOK INLET						

Big Lake						
Big Lake	Sockeye	126,250	0	60,860	187,110	Hatchery near Wasilla.
	Coho	4,750	1,200	3,550	9,500	
Little Susitna R.	Coho	650	325	325	1,300	
Landlocked Lakes	Coho	--	0	--	0	
Crooked Creek						
Crooked Creek	Chinook	0	1,300	650	1,950	Hatchery located on Crooked Creek.
	Coho	0	1,000	2,200	3,200	
	Steelhead	0	150	120	270	
Tustumena Lake	Sockeye	506,000	6,800	78,400	591,200	Stocking location on Kenai Peninsula.
Leisure Lake	Sockeye	91,445	2,000	470	93,915	30% of entire LCI sockeye harvest.
Chenik Lake	Sockeye	164,200	50	9,000	173,250	50% of entire LCI sockeye harvest.
Elmendorf						
Crooked Creek	Chinook	0	5,790	2,860	8,650	In addition to Crooked Creek Hatchery.
Halibut Cove	Chinook	1,350	2,050	0	3,400	Remote release location in Kachemak Bay.
Homer Spit	Chinook	0	3,300	0	3,300	
Seldovia	Chinook	0	800	0	800	First year of returns.

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Table 1. Continued.

Hatchery or Project	Species	Commercial Catch	Sport Catch	Brood Stock/ Escapement	Total	Comments
Ship Creek	Chinook	0	300	500	800	
Resurrection Bay	Coho	0	6,000	1,150	7,150	Release location near Seward.
	Chinook	0	1,300	250	1,550	Release location near Seward.
Fort Richardson						
Willow Creek	Chinook	100	450	420	970	
Little Susitna	Coho	13,400	6,300	6,000	25,700	Release location north of Anchorage.
Cook Inlet lakes	Rainbow	--	488,400	--	488,400	See footnote.
	Coho	--	0	--	0	
Trail Lakes						
Hidden Lake	Sockeye	NA	NA	NA		Production reported in PNP section.
Grant Lake	Coho	NA	NA	NA		Production reported in PNP section.
Caribou Lake	Coho	NA	NA	NA		Production reported in PNP section.
Seldovia Lake	Coho	NA	NA	NA		Production reported in PNP section.
Six Mile	Coho	NA	NA	NA		Production reported in PNP section.
	Chinook	NA	NA	NA		Production reported in PNP section.
Resurrection Bay	Coho	NA	NA	NA		Production reported in PNP section.
Cook Inlet lakes	Coho	NA	NA	NA		Production reported in PNP section.
Tutka Bay Lagoon						
Kachemak Bay	Pink	724,000	8,500	76,200	808,700	91% (with HCL) of LCI pink salmon harvest.
	Chum	2,000	0	200	2,200	
Halibut Cove	Pink	111,000	530	0	111,530	First year of returns.
Ingram Creek	Pink	1,000	500	500	2,000	First year of returns.
Homer Spit	Pink	0	4,500	0	4,500	
Clear						
Landlocked lakes	Grayling	--	68,000	--	68,000	See footnote.
COOK INLET TOTALS:		1,746,145	609,545	243,655	2,599,345	
KODIAK/ALASKA PENINSULA						

Kitoi Bay	Pink	306,922	0	439,000	745,922	Broodstock includes 298,439 cost-recovery.
	Chum	967	0	4,022	4,989	
	Coho	1,200	1,000	1,000	3,200	Anadromous returns only.
Kodiak Lakes	Coho	1,200	3,000	1,000	5,200	See footnote.
Landlocked lakes	Coho	--	10,000	--	10,000	See footnote
	Rainbow	--	14,000	--	14,000	
Karluk	Sockeye	32,200	--	49,900	82,100	Streamside incubation on Thumb River.
Frazer fishpass	Sockeye	211,800	--	246,700	458,500	Fishpass operated by Commercial Fish.
	Chinook	0	--	--	0	

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Table 1. Continued.

Hatchery or Project	Species	Commercial Catch	Sport Catch	Brood Stock/ Escapement	Total	Comments
Afognak Fishpasses (combined)	Coho	23,000	--	7,900	30,900	See footnote. Operated by Commercial Fish.
	Pink	368,400	--	86,900	455,300	See footnote. Operated by Commercial Fish.
	Sockeye	3,400	--	22,800	26,200	See footnote. Operated by Commercial Fish.
Lake Rose Tead	Chinook	70	70	30	170	See footnote.
Russell Creek	Chum	150,000	--	88,000	238,000	See footnote.
KODIAK/AK PEN TOTALS:		1,099,159	28,070	947,252	2,074,481	
PRINCE WILLIAM SOUND						
Cannery Creek	Pink	NA	NA	NA		Production reported in PNP section.
	Chum	NA	NA	NA		Production reported in PNP section.
Hobo Creek	Pink	--	--	400	400	Fishpass 20 miles NE of Whittier.
Elmendorf						
Whittier	Coho	--	1,000	--	1,000	See footnote.
	Chinook	--	500	--	500	
Fort Richardson						
Cordova	Coho	--	5,000	--	5,000	
Valdez	Chinook	--	100	--	100	
PWS Lakes	Rainbow	--	23,500	--	23,500	See footnote.
Gulkana	Sockeye	70,000	--	50,000	120,000	Streamside incubation facility near Paxson.
Main Bay	Pink	100,000	--	--	100,000	Hatchery SE of Whittier.
	Chum	200,000	--	--	200,000	
Clear	Grayling	--	500	--	500	
PWS TOTALS:		370,000	30,600	50,400	451,000	
STATE TOTALS:		3,589,545	841,222	1,416,309	5,847,076	
BY SPECIES:		Chinook	49,406	Steelhead	2,059	
	Coho	168,505		Rainbow	620,300	
	Chum	776,779		Sheefish	200	
	Sockeye	1,824,975		Grayling	94,500	
	Pink	2,309,352		Char	1,000	
			-----		-----	
			5,129,017		718,059	

Footnote: Most estimates are based upon a combination of historical data, standard survival assumptions, and minimal or no sampling.

salmon harvest came from Crystal Lake Hatchery stocks in 1988. Crystal Lake Hatchery again provided the bulk of Alaskan hatchery contributions to southeast Alaskan fisheries from three release sites: Crystal Creek at the hatchery, Ohmer Creek just south of the hatchery, and Earl West Cove near Wrangell. Earl West Cove is a cooperative remote-release site managed by SSRAA with support from FRED, NSRAA, and the USFS.

In 1988 the coho salmon return to Southeast was extremely low for natural stocks and lower than anticipated for FRED projects. Coho salmon returns to both Snettisham Hatchery and the Juneau release sites were very poor in 1988. This is attributed to the small size of smolts released in 1987. Indian Lake coho salmon continued to do well as expected by contributing an estimated 903 fish to the gillnet, troll, and sport fisheries, as did coho salmon released in Twin Lakes for a directed freshwater sport fishery. Klawock Hatchery was responsible for a terminal harvest of 32,923 chum salmon and 597 coho salmon. Klawock Hatchery coho salmon returned at extremely poor rates; preliminary Coded-Wire Tag Recovery Lab reports indicate that only 10,600 coho salmon adults were harvested in the commercial fisheries. Some 2,194 coho salmon were passed through the weir to spawn naturally in Klawock Lake. Another 1,459 (683 female and 776 male) were held and used for broodstock at the hatchery. The sport fishery took an estimated 1,000 fish in the Klawock River and 1,500 fish in marine waters. The ADF&G, Sport Fish Division did not have a formal evaluation of marine or freshwater recreational salmon fisheries on Prince of Wales Island. Tunga Lake, a Klawock Hatchery remote-release project, contributed 2,660 coho salmon adults to the commercial fisheries; these were caught in seven southeast Alaska districts. An estimated 665 fish escaped to Tunga Lake.

Southeast Releases

Southeast FRED facilities released over 108 million fish in 1988 (Table 2). This is an increase of more than 33 million over 1987. Major increases in chum and sockeye salmon releases occurred. About 6.7 million sockeye salmon were released from the Beaver Falls and Klawock Hatcheries in 1988 compared to about a quarter of a million in 1987. This increase demonstrates FRED Division's commitment to its sockeye salmon initiative. This release number is expected to continue to grow rapidly as the Klawock sockeye salmon program comes on-line. Over 95 million chum salmon were released in 1988, which is an increase of about 25 million over the 69.6 million released in 1987. Major contributors to this increase include Snettisham Hatchery with a release of over 40 million chum salmon fry; this beats the hatchery's 1987 record release by over 15 million fry. Hidden Falls Hatchery released 52 million chum salmon fry in 1988, an increase of about 12 million above its 1987 release. Hidden Falls Hatchery releases will be reported by the private sector in future years, so an immediate decrease in Southeast FRED project releases will be seen in 1989. Increasing sockeye salmon production and chum salmon production from Snettisham and other projects such as Marx Creek will slowly bring the release numbers up through time. Chinook salmon releases decreased slightly in 1988 with just over 2.0 million smolts released, as compared to about 2.2 million released in 1987. Crystal Lake Hatchery released over 1.0 million chinook salmon smolts in 1988; a milestone in chinook salmon releases. As with chum salmon, some decrease in immediate future chinook salmon releases from Southeast FRED facilities can be anticipated, as those released from Hidden Falls Hatchery will be reported by the private sector. Coho salmon releases from Southeast FRED projects increased significantly in 1988 with a release of about 3.8 million smolts

Table 2. Number of fish released during 1988 by FRED facilities.

Facility	Brood year, Stock	Species	Released
SOUTHEAST			

Beaver Falls	1987 Hugh Smith	Sockeye	2,497,000
	1987 Karta	Sockeye	315,000
	1987 Naha	Sockeye	3,325,000
Crystal Lake	1986 Crystal Cr	Chinook	1,033,000
	1986 Crystal Cr	Coho	89,800
	1987 Crystal Cr	Coho	649,000
	1987 Crystal Cr	Steelhead	90,400
Deer Mountain	1986 Reflection	Coho	7,710
	1987 Reflection	Coho	108,000
	1986 Deer Mtn	Chinook	121,000
Hidden Falls	1986 Tahini R	Chinook	57,500
	1986 Crystal Cr	Chinook	101,500
	1987 Hidden Falls	Chum	52,186,000
Klawock	1987 Klawock L	Coho	1,373,000
	1986 Klawock L	Coho	1,005,000
	1987 Cable Cr	Coho	20,000
	1987 Klawock L	Steelhead	39,600
	1987 Klawock L	Sockeye	592,000
Marx Cr Spawning Channel	1987 Fish Cr	Chum	2,270,000
Port Camden	1987 Port Camden	Chum	593,000
Snettisham	1986 Crystal Cr	Chinook	360,000
	1987 Crystal Cr	Chinook	269,000
	1986 King Salmon R	Chinook	70,400
	1987 Snettisham	Chum	35,160,000
	1987 Hidden Falls	Chum	5,170,000
	1984 Snettisham	Coho	8,180
	1985 Snettisham	Coho	72,000
	1986 Snettisham	Coho	322,000

SOUTHEAST REGION TOTAL:			107,905,090
ARCTIC-YUKON-KUSKOKWIM			

Clear	1987 Aleknagik L	A char	68,000
	1987 Wood Cr	Coho	581,000
	1988 Moose L	Grayling	2,148,000
	1988 Moose L/ Clear H	Grayling	7,000

-Continued-

Table 2. Continued.

Facility	Brood year, Stock	Species	Released
	1987 Paxon L	L trout	53,800
	1987 Swanson R	Rainbow	120,000
	1988 Swanson R	Rainbow	573,000
	1987 Clear Hatchery	Sheefish	60,000
Sikusuilag	1987 Noatak R	Chum	3,003,000
	ARCTIC-YUKON-KUSKOKWIM TOTAL		6,613,800
COOK INLET			

Big Lake	1986 Big L	Coho	40,800
	1987 Big L	Coho	2,625,000
	1986 Little Susitna R	Coho	15,700
	1987 Little Susitna R	Coho	3,943,000
	1987 Meadow Cr	Sockeye	14,492,000
Elmendorf	1987 Crooked Cr	Chinook	1,175,000
	1987 Ship Cr	Chinook	116,000
	1986 Bear L	Coho	290,000
	1987 Bear L	Coho	255,000
	1986 Crooked Cr	Coho	62,300
	1986 Ship Cr	Coho	58,800
Crooked Creek	1986 Crooked Cr	Coho	62,000
	1987 Crooked Cr	Coho	206,000
	1987 Bear Cr	Sockeye	3,047,000
	1987 Glacier Flats	Sockeye	11,659,000
	1986 Crooked Cr	Steelhead	107,000
Tutka	1987 Westside Cr	Chum	3,211,000
	1987 Tutka Bay	Pink	15,589,000
Ft. Richardson	1987 Montana Cr	Chinook	132,000
	1987 Ninilchik R	Chinook	247,000
	1987 Sheep/Willow Cr	Chinook	132,000
	1987 Willow Cr	Chinook	201,000
	1987 Caswell Cr	Coho	9,000
	1986 Eyak L	Coho	62,000
	1986 Little Susitna R	Coho	446,000
	1987 Little Susitna R	Coho	209,000
	1984 Big L/Swanson R	Rainbow	173
	1987 Big L	Rainbow	221,000
	1988 Big L	Rainbow	1,282,000
	1987 Swanson R	Rainbow	41,500
	1988 Swanson R	Rainbow	928,000
	1987 Anchor R	Steelhead	33,600

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Table 2. Continued.

Facility	Brood year, Stock	Species	Released
Trail Lakes	1986 Crooked Cr	Chinook	98,400
	1987 Bear L	Coho	348,000
	1987 Crooked Cr	Coho	721,000
	1987 Hidden L	Sockeye	6,085,000
	1987 Packers L	Sockeye	2,989,000
COOK INLET TOTAL:			71,140,273
KODIAK & AK. PENINSULA			
Kitoi Bay	1987 Big Kitoi Cr	Chum	4,738,000
	1987 Little Kitoi Cr	Coho	527,000
	1987 Big Kitoi Cr	Pink	94,172,000
	1988 Kitoi L	Rainbow	18,100
Russell Creek	1987 Mortenson Cr	Coho	325,000
	1987 Kitoi Bay	Pink	9,000,000
KODIAK & AK. PENINSULA TOTAL:			108,780,100
PRINCE WILLIAM SOUND			
Cannery Creek	1987 Cannery Cr	Pink	94,819,000
	1987 Cannery Cr	Chum	200,000
Gulkana	1987 Gulkana R	Chinook	1,390
	1987 Gulkana R	Sockeye	21,220,000
	1987 Lower Gulkana R	Sockeye	186,000
Main Bay	1986 Coghill L	Sockeye	330,000
	1987 Coghill L	Sockeye	1,405,000
PRINCE WILLIAM SOUND TOTAL:			118,161,390
SPECIES TOTALS			
	Chinook:		4,115,190
	Coho:		14,441,290
	Sockeye:		68,142,000
	Chum:		106,531,000
	Pink:		213,580,000
	Steelhead:		270,600
	Rainbow Trout:		3,183,773
	Grayling:		2,155,000
	Sheefish:		60,000
	Lake Trout:		53,800
	Arctic Char:		68,000
TOTAL RELEASE:			412,600,653

and fry; 2.9 million coho salmon were released in 1987. Klawock Hatchery was the major contributor to this increase with a release of more than 2.3 million smolts and fry in 1988.

Some significant releases primarily aimed at sport fisheries occurred in 1988. From Snettisham Hatchery, 200,000 coho salmon smolts, 250,000 chinook salmon smolts, and 14,633 catchable coho salmon were stocked in the Juneau area. Other remote-site releases are designed to rebuild natural runs and contribute to all user groups. A joint effort by FRED, NSRAA, and the USFS distributed 57,000 fed and 261,000 unfed coho salmon fry from Crystal Lake Hatchery throughout the upper watershed of Slippery Creek in 1988. Coho salmon were stocked in Reflection Lake, Ward Lake, and Bold Island Lakes from Deer Mountain Hatchery. Approximately 51,000 chinook salmon were moved to the Big Salt estuarine complex from Deer Mountain Hatchery, held in net pens for acclimation and imprinting, and released. Over 6 million sockeye salmon from Beaver Falls Hatchery were released in eight lakes in the southern Southeast region. Klawock Hatchery planted 221,000 coho salmon fingerlings in Tunga Lake. Returning adults will contribute to the troll harvest, provide an excellent roadside fishery, and spawn upstream of the fish ladder installed by the USFS.

Southeast Egg Takes

Eggs taken by Southeast FRED projects are much lower in 1988 because chum salmon egg takes at Hidden Falls Hatchery are reported by the private sector (NSRAA) for this year. In 1987 Hidden Falls Hatchery took approximately 80 million eggs out of a total for Southeast of 147 million. In 1988 The Southeast FRED project egg-take total was just over 36 million (Table 3). Also contributing to this dramatic decline was the lack of chum salmon eggs taken at Snettisham Hatchery in 1988. Plans to take 50 million chum salmon eggs at that facility failed when fishermen harvested the majority (90%) of the spawners returning to Snettisham, allowing for a chum salmon egg take of only slightly over 8 million eggs. Sockeye salmon eggs taken in 1988 by FRED projects in 1988 increased by over 3 million to a total of about 11.5 million. This is reflective of FRED's burgeoning sockeye salmon program across the state. Chinook salmon eggs increased from just over 9 million in 1987 to 11.8 million in 1988. This increase is despite the fact that chinook salmon eggs taken at Hidden Falls are not reported herein. Coho salmon egg takes in Southeast also increased from about 2.5 million in 1987 to 3.3 million in 1988.

PRINCE WILLIAM SOUND

Summary of FRED Projects

The Prince William Sound Area encompasses ADF&G Commercial Fisheries Management Area E and includes the marine waters and freshwater drainages between Cape Suckling and Cape Fairfield. The three distinct geographic subareas present are: Prince William Sound drainages and estuary, the Copper River drainage and estuary, and the Bering River drainage and estuary (Figure 5).

Table 3. Estimated number of eggs taken by FRED division during 1988.

Facility	Broodstock	Species	Eggs Taken
SOUTHEAST			
Beaver Falls	Hugh Smith	Sockeye	612,000
	McDonald	Sockeye	6,705,000
Crystal Lake	Crystal Cr	Steelhead	62,000
	Crystal Cr	Chinook	6,765,000
	Crystal Cr	Coho	988,000
	Crystal L	Coho	102,000
Deer Mountain	Reflection L	Coho	248,000
	Unuk	Chinook	399,000
Klawock	Klawock	Sockeye	3,910,000
	Klawock	Coho	1,876,000
	Thorne R	Coho	23,000
	Cable Cr	Coho	60,800
	Klawock	Steelhead	105,000
Port Camden	Port Camden	Chum	1,350,000
Snettisham	Crystal Cr	Chinook	2,995,000
	Snettisham	Chinook	1,443,000
	Snett X KSR	Chinook	54,000
	King Salmon R	Chinook	119,000
	Snettisham	Chum	8,013,000
	Speel L	Sockeye	311,000
SOUTHEAST TOTAL			36,140,800
ARCTIC-YUKON-KUSKOKWIM			
Clear	Alegnagik	Arctic char	315,000
	Clear Hatchery	Arctic char	92,000
	Wood Cr	Coho	775,000
	Moose L	Grayling	2,820,000
	Clear Hatchery	Grayling	181,000
	Paxon L	Lake Trout	116,000
	Clear Hatchery	Sheefish	945,000
Sikusuilag	Noatak R	Chum	6,639,000
ARCTIC-YUKON-KUSKOKWIM TOTAL			11,883,000

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Table 3. Continued.

Facility	Broodstock	Species	Eggs Taken
COOK INLET			

Big Lake	Big Lake	Coho	3,091,000
	Little Susitna	Coho	3,060,000
	Meadow Cr	Sockeye	20,500,000
Brood Dev Center	Swanson select	Rainbow	121,000
	Big L/Swanson	Rainbow	5,960,000
Crooked Creek	Kasilof R	Chinook	138,000
	Ninilchik R	Chinook	252,000
	Crooked Cr	Coho	652,000
	Tustumena L	Sockeye	19,868,000
	Crooked Cr	Steelhead	123,000
Elmendorf	Crooked Cr	Chinook	1,386,000
	Ship Cr	Chinook	134,000
	Bear Cr	Coho	454,000
	Ship Cr	Coho	87,000
Ft Richardson	Deshka R	Chinook	167,000
	Willow Cr	Chinook	795,000
	Caswell Cr	Coho	255,000
	Fleming Spit	Coho	189,000
	Little Susitna	Coho	462,000
Tutka Bay	Westside Cr	Chum	2,280,000
	Tutka Cr	Pink	40,239,000

COOK INLET TOTAL			100,213,000
KODIAK & AK PENINSULA			

Kitoi	Kitoi Bay	Chum	4,502,000
	Little Kitoi L	Coho	1,108,000
	Kitoi Bay	Pink	90,758,000
	Big Kitoi L	Rainbow	87,000
	Upper Station L	Sockeye	225,000
Pillar Creek	Afognak L	Sockeye	1,080,000

-Continued-

Table 3. Continued.

Facility	Broodstock	Species	Eggs Taken
Russell Creek	Russell Cr	Pink	2,000,000
	Mortensen L	Sockeye	1,600,000
KODIAK & AK PENINSULA TOTAL			101,360,000
PRINCE WILLIAM SOUND			
Gulkana	E Fk Gulkana R	Chinook	22,000
	E Fk Gulkana R	Sockeye	1,073,000
	Gulkana R	Sockeye	35,120,000
Main Bay	Coghill L	Sockeye	7,280,000
PRINCE WILLIAM SOUND TOTAL			43,495,000
Egg totals by species:			
	Chinook:		14,669,000
	Chum:		22,784,000
	Coho:		13,430,800
	Pink:		132,997,000
	Sockeye:		98,284,000
	Grayling:		3,001,000
	Rainbow:		6,168,000
	Sheefish:		945,000
	Steelhead:		290,000
	Lake Trout:		116,000
	Arctic Char:		407,000
STATE TOTAL:			293,091,800

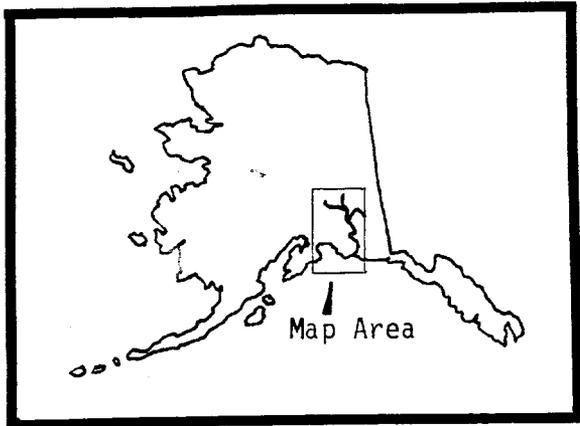
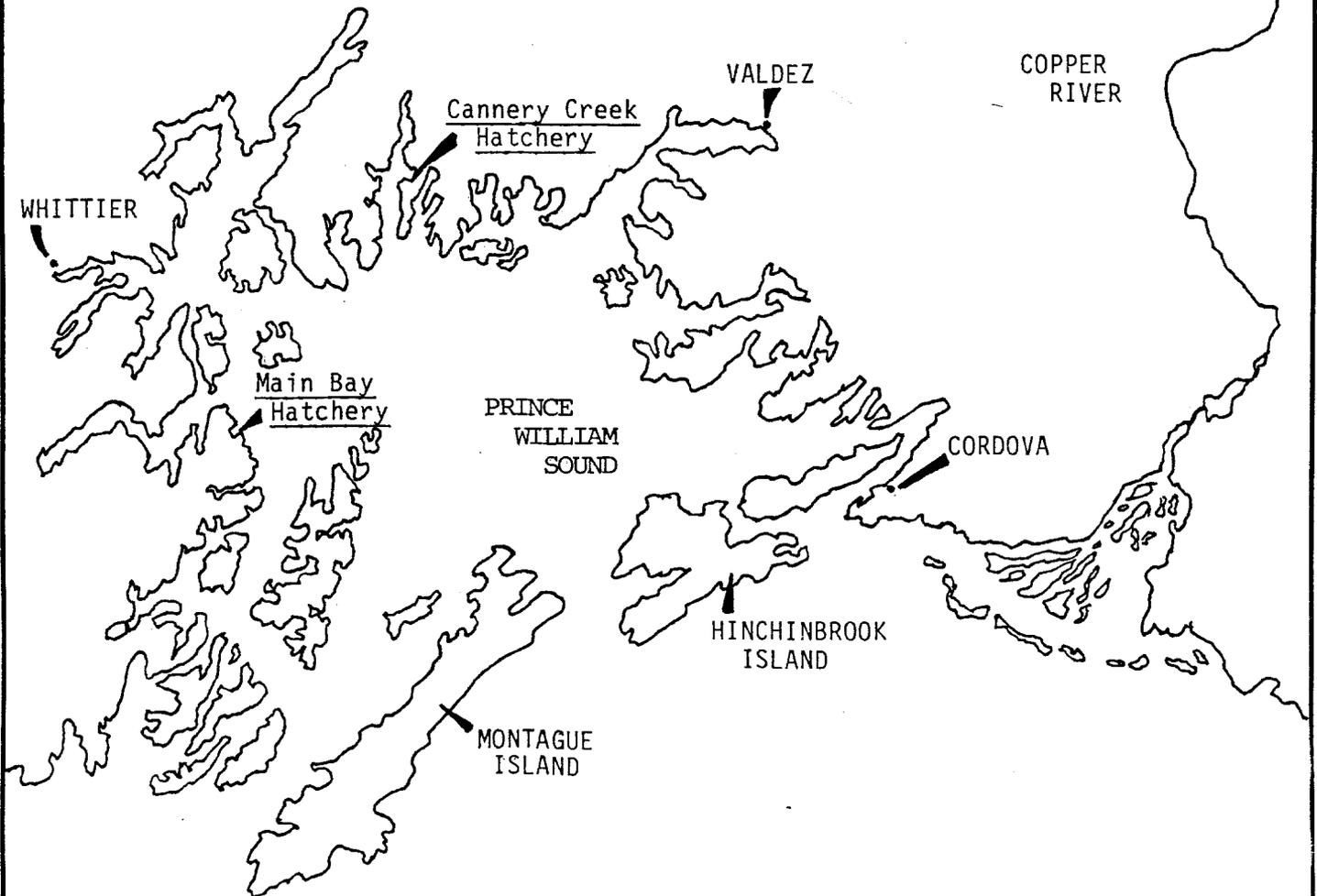
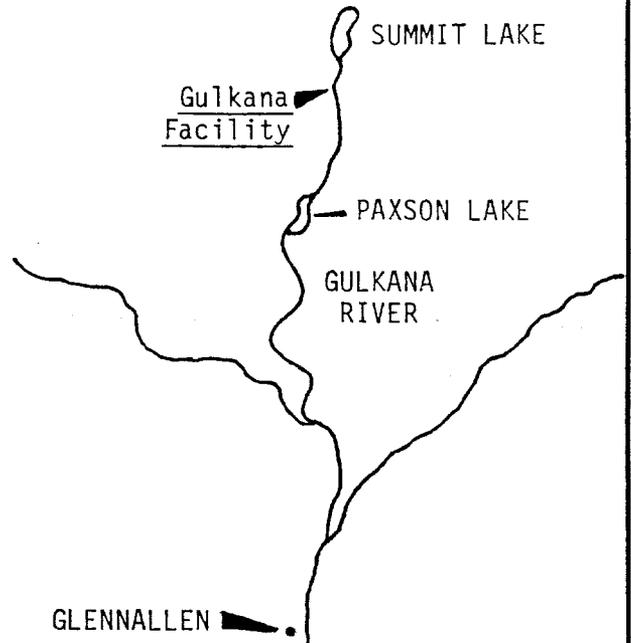


Figure 5. Map of Prince William Sound.



The commercial fishery includes three gear groups: purse seine, drift gill net, and set gill net. The purse seine fishery is, by regulation, restricted to the following districts in Prince William Sound: Eastern, Northern, Unakwik, Coghill, Northwestern, Southwestern, Montague, and Southeastern. The bulk of the catch is pink and chum salmon. The drift gillnet fishery has, by regulation, been conducted in the following districts: Copper River, Bering River, Coghill, Unakwik, and Eshamy. The catch is composed mostly of sockeye, chinook, and coho salmon. The set gillnet fishery is conducted solely in the Eshamy District. The catch is composed mainly of sockeye, pink, and chum salmon.

Substantial subsistence and personal-use fisheries occur in the Copper River where sockeye salmon are harvested along with fewer numbers of chinook and coho salmon. Some subsistence fishing does occur on the Copper River Delta and in Prince William Sound, but catches are considered negligible.

Extensive sport fisheries exist on the upper Copper River, Valdez Bay (Valdez), Passage Canal (Whittier), and Orca Inlet/Copper River Delta (Cordova). The upper Copper River fishery is aimed primarily at native chinook and sockeye salmon. The Valdez Bay fishery harvests pink, coho, and hatchery chinook salmon. The Passage Canal fishery is aimed primarily at hatchery-produced coho and chinook salmon. The Orca Inlet/Copper River Delta fishery is aimed primarily at coho and sockeye salmon.

Main Bay Hatchery, located in western Prince William Sound, is the only hatchery in Alaska raising full-term, one-check (reared in the hatchery over winter) sockeye salmon smolts. The first year of smolt production was a resounding success with the release of 330,000 sockeye salmon smolts weighing 12 g each. The hatchery is currently rearing 4,000,000 fry for release as smolts in the spring of 1989. Smolt rearing and release experiments are being conducted to determine ways of optimizing adult production. In 1988 approximately 1,400,000 sockeye salmon fry were stocked in three barren lakes.

Cannery Creek Hatchery, located in northern Prince William Sound, was jointly operated under a cooperative agreement between the FRED Division and the Prince William Sound Aquaculture Corporation (PWSAC) until July 1, 1988, at which time the hatchery was contracted-out for operation by PWSAC. Over 94.8 million pink salmon fry were released from Cannery Creek in 1988.

The Gulkana I streamside sockeye salmon incubation facility, located on the upper East Fork of the Gulkana River, released 21,200,000 sockeye salmon fry in 1988. The hatchery staff broke the facility and state egg-take record by successfully taking 35,100,000 sockeye salmon eggs. An estimated 70,000 adult sockeye salmon were produced from Gulkana I. Gulkana I is the original facility. Gulkana II is a new facility, also located on the Gulkana River, that began operations in 1987. Gulkana II is incubating over 1 million sockeye salmon eggs and 22,000 chinook salmon eggs. The Prince William Sound coho salmon smolt-stocking program was continued in 1988. Adult coho salmon returns to Cordova in 1988 were excellent with an estimated sport fish harvest of over 5,000 fish. Returns of coho salmon to Whittier in 1988 were below expectations with an estimated sport fish harvest of only 1,000. Returns of chinook salmon to Whittier in 1988 were estimated to be only 500 fish. Chinook salmon returns to Valdez were estimated to be only 100 fish.

Two road-accessible Copper River Delta ponds were each stocked with 10,000 grayling fry in 1988. Good catches from previous stockings have been reported and this fishery is increasing in popularity as the public becomes more aware of this opportunity.

The large amount of hatchery activity in Prince William Sound has necessitated the increased involvement of the FRED Division in hatchery monitoring and evaluation activities. The FRED area biologist is now charged with monitoring hatchery fish sales, monitoring broodstock collection, and overseeing tagging activities at all area hatcheries. In addition, the area biologist is heavily involved in regional planning team activities and serves as chairman of that organization.

FRED Division is involved in several cooperative projects in Prince William Sound. The Montague Island chum salmon reintroduction program is a joint project with the FRED Division, PWSAC, and the USFS. FRED Division is also involved with the USFS to evaluate the potential of several barren lakes in the Sound for sockeye salmon production and to evaluate coho salmon fry production from a newly constructed spawning channel.

Prince William Sound Highlights

- Pink (100,000) and chum (200,000) salmon returns to Main Bay Hatchery contributed an estimated \$2 million to the Prince William Sound commercial fishery.
- Sockeye salmon returns from Gulkana Hatchery contributed an estimated \$1,300,000 to the Prince William Sound commercial fishery.
- Main Bay Hatchery released 330,000 one-year-old sockeye salmon smolts. This is the first full-term sockeye salmon smolt release in Alaskan history and marks the beginning of a new era in Alaskan sockeye salmon culture.
- The 1988 Gulkana Hatchery sockeye salmon egg take of 35.1 million eggs breaks the record established last year.
- Cordova sport fishermen harvested an estimated 5,000 coho salmon returning from a FRED coho salmon smolt release.
- The 1988 Gulkana Hatchery sockeye salmon fry release of 21,200,000 fry is one of the largest releases of sockeye salmon fry from a hatchery in modern Alaskan history.
- Over 170,000 coho salmon smolts were released in Whittier and Cordova to continue the successful sport fishing programs for local residents.
- In a highly successful cooperative program with the Alaska Department of Corrections, two workers were on-site for most of 1988 and helped complete major projects.
- The role of the FRED Division has expanded in Prince William Sound to include monitoring and evaluating all facilities in a cooperative effort with the private-sector programs, including what may be the largest fish tagging and recovery effort in the world.

Prince William Sound Returns and Fishery Contributions

The apparent decrease of over 2 million fish harvested in this area in 1988 is primarily one of reporting (*See* Table 1). Again, with the contracting of operations of Cannery Creek Hatchery this year, the pink salmon produced by that facility will be reported by the PNP contractor.

A minimum estimate of 200,000 chum and 100,000 pink salmon produced at Main Bay Hatchery were harvested by commercial fishermen in 1988. Since no broodstock was needed, all were harvested. At 1988 prices, this catch was worth more than \$2 million to the fishermen. Tags collected from the chum salmon indicated that a 1.0-g smolt had about a three-times greater chance of surviving to adult than a 0.5-g smolt.

The chum salmon return to Main Bay Hatchery in 1989 should be approximately 200,000 fish and will provide an excellent fishery for set and drift gillnet fishermen in the Eshamy and Coghill Districts. The release of an estimated 3,750,000 sockeye salmon smolts in May 1989 will mark the first production-level release of sockeye salmon smolts from a hatchery in modern history. The 1989 egg-take goal will once again be 10 million eggs.

An estimated 70,000 sockeye salmon from the Gulkana Hatchery were harvested in the commercial gillnet fishery on the Copper River flats as a result of fry releases in 1983 and 1984. We again saw outbreaks of infectious hematopoietic necrosis (IHN) virus at Gulkana I, which were successfully contained and with less fry loss than in previous years. Limnological and hydroacoustic sampling of Paxson and Summit Lakes continue in order to assess the biological impact of FRED's enhancement efforts. Collection of disease samples for the Fish Pathology Section continues, allowing us to monitor the trend of the IHN virus in broodstock populations.

Prince William Sound Releases

Prince William Sound releases are tabulated in Table 2.

Returns resulting from Gulkana Hatchery sockeye salmon fry releases should number at 210,000 fish with an estimated 125,000 intercepted in the commercial fishery. The 1989 fry release should break the facility record.

Juvenile sockeye salmon (331,000) were moved from the Trail Lakes Hatchery to Main Bay Hatchery in the fall of 1987. These fish were sent to Trail Lakes Hatchery from the Esther Island Hatchery as fry in the spring of 1987. The fish were fed two different feeds while at Main Bay: Oregon Moist Pellet (OMP) and Alaska Dry Pellet (ADP). Smolts were tagged to compare the survival of fish fed each feed type to adult. Each feed group had two subgroups: one freshwater-reared and the other reared in net pens for a month before release. In the spring of 1988, 330,000 sockeye salmon smolts were released at Main Bay.

In the spring of 1988, 1,405,000 fed sockeye salmon were moved from Main Bay Hatchery and released in Prince William Sound lakes.

A joint FRED/Bureau of Land Management effort allowed the transport of 2.5 million sockeye salmon fry to Crosswind Lake via an "ag-wagon" aerial transport.

Prince William Sound Egg Takes

Prince William Sound egg-take data indicate a decrease of over 100 million eggs between 1987 and 1988 but, again, this is a factor of reporting only (See Table 3). The contracting of hatchery operations for Cannery Creek Hatchery causes an apparent loss of eggs reported by the FRED Division, but these eggs were taken and will be reported by the PNP contractor.

An egg-take camp at Coghill Lake was established in the summer of 1988, when 7.3 million sockeye salmon eggs were collected. Preliminary evaluation indicated that modified techniques have increased survival to greater than 90% from the 67% levels in 1987.

The second chinook salmon egg take for Gulkana II was successfully conducted, collecting 22,000 eggs from the East Fork Gulkana chinook salmon stock.

At Gulkana I, the egg-take crew again set a new modern record for sockeye salmon eggs taken in one season: 34,200,000. Not only are many eggs taken, but by following the special sockeye salmon egg-take procedures and special handling, IHN disease outbreaks are controlled and minimized.

COOK INLET

Summary of FRED Projects

There are four hatcheries within northern Cook Inlet. Big Lake Hatchery is located on Meadow Creek in the Big Lake drainage. Elmendorf, Fort Richardson, and the Broodstock Development Center (BDC) are located near or on military bases to take advantage of warm-water effluent from power plants to accelerate fish developmental rates (Figure 6).

Big Lake Hatchery was built in 1976 as a 16 million-egg sockeye salmon incubation facility with no rearing capabilities. In 1988 the hatchery was able to produce 17 million short-termed-reared sockeye salmon fry, up to 8.5 million 1- to 8-g coho salmon fingerlings, and 80,000 coho salmon smolts. The rearing raceways are also used to hold the sockeye and coho salmon broodstock for the egg takes.

At Elmendorf Hatchery, a feeding trial was carried out with the Crooked Creek chinook salmon. One lot of fish was fed ADP and the rest were fed the standard diet of OMP (OMP IV and OMP II). Fish in both lots grew well and converted food to body weight better than average. Final evaluation of the feeds, however, is contingent on the adult returns.

The objective of the BDC is to maintain and develop broodstock for rainbow trout enhancement programs in southcentral and interior Alaska. In addition to the three primary projects (broodstock maintenance, random-lot spawning, and broodstock selection) which satisfy the main objective of the BDC, nine other research projects were supported by the BDC staff during the past year.

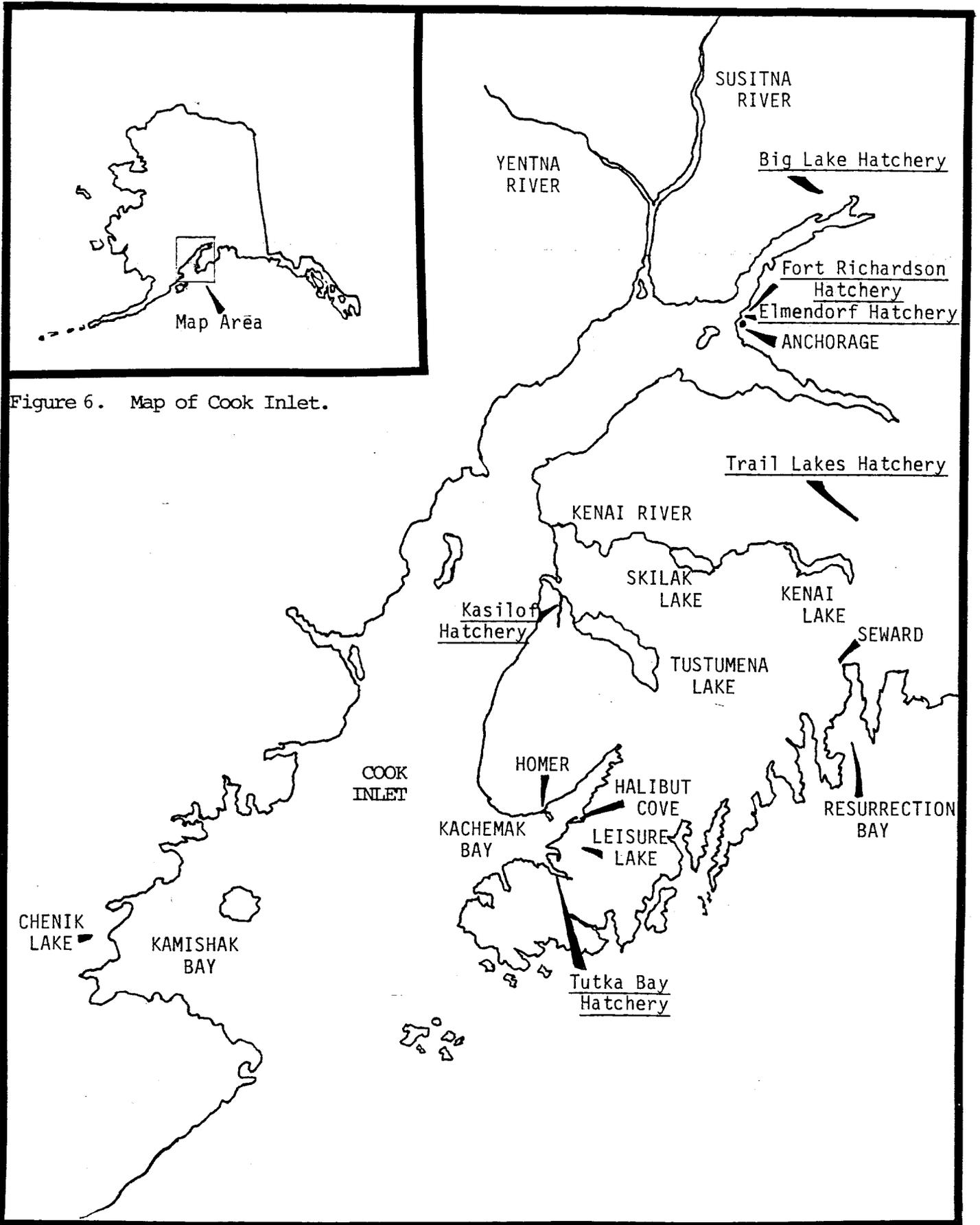


Figure 6. Map of Cook Inlet.

The goal of the selection project at the BDC is to develop a strain of rainbow trout that has high survival and fast growth in both hatchery and wild environments. Eventually, this strain is expected to be selected as the choice domestic broodstock for rainbow trout hatcheries in southcentral Alaska.

The all-female rainbow trout project at the BDC began during the egg take in April 1988. Eggs were fertilized with sperm that was irradiated with ultraviolet light, then heat-shocked to produce fish with only maternal inheritance (gynogens). At emergence, these "gynogens" and two groups of normal fry were fed 17-alpha-methyltestosterone to produce an all-male population. Three treatment levels were used, two being totally successful in sex reversal and the third producing fish that were in a transitional phase between female and male. Some of the fish in this transitional phase had both testicular and ovarian tissue present in a single gonad.

All fish produced at the Fort Richardson Hatchery are primarily targeted for sport fisheries. Fish are released throughout southcentral Alaska and the Fairbanks area. Over 300 lakes, streams, and estuaries receive fish from Fort Richardson Hatchery requiring approximately 20,000 miles of fish transport-related travel. Additional water capacity, however, would permit the full use of the hatchery's raceways and production could easily be doubled. Since this facility targets sport fisheries, opportunities are almost unlimited.

Rainbow trout production from the Fort Richardson Hatchery has three components: eyed eggs are transferred to the Clear Hatchery, fingerlings are released throughout southcentral Alaska, and catchable-sized fish are released in the Anchorage Bowl, Matanuska-Susitna, and Fairbanks area lakes.

Sport fisheries enhancement projects in northern Cook Inlet, developed with the ADF&G, Sport Fish Division, began to demonstrate their benefits in 1988. The Willow Creek chinook salmon weekend-only fishery was extended an extra week to harvest hatchery-produced fish. The harvest in the Little Susitna River was doubled, thanks to hatchery contribution, and returns to Caswell Creek were also taken in the Susitna River. Coho and sockeye salmon runs in the Big Lake drainage are comprised of approximately 90% hatchery contribution.

The FRED Division central Cook Inlet area office is located on the Kenai Peninsula in Soldotna. Projects in the central Cook Inlet area include those bound by the area north of Ninilchik, south of Turnagain Arm, east of the Chigmit Mountains, and west of Prince William Sound. Two hatcheries are located in this area. One located near Kasilof (Crooked Creek Hatchery) is operated by the state, and the other hatchery near Moose Pass (Trail Lakes Hatchery) was contracted to the Cook Inlet Aquaculture Association (CIAA) in July 1988 under a 20-year contract.

The Crooked Creek Hatchery has an egg capacity of approximately 20 million sockeye salmon eggs and supports stocking programs at Tustumena Lake and at several lakes in lower Cook Inlet. An average stocking level of 17 million sockeye salmon fingerlings has occurred since 1982. The Crooked Creek Hatchery also supports chinook and coho salmon and steelhead trout enhancement programs.

The chinook salmon fishery at Crooked Creek has developed into one of the largest on the Kenai Peninsula. The harvest in 1988 rivaled that of the early run in the Kenai

River. It is the most successful shore-based chinook salmon fishery on the Kenai Peninsula.

The Tustumena Lake (Kasilof River) sockeye salmon enhancement project was highly successful again this year. The hatchery contribution rate of over 50% was a new record that comprised an estimated extra 400,000 fish.

Fishery enhancement projects in lower Cook Inlet involve all five species of Pacific salmon and steelhead trout. Adult fish returning to these projects contribute to the commercial, sport, and personal-use fisheries. The ex-vessel value of the 1988 commercial salmon harvest of all species was \$8.25 million, a new record. The 30-year average annual commercial harvest is 795,000 pink salmon, 130,000 chum salmon, 94,120 sockeye salmon, 8,380 coho salmon, and 470 chinook salmon.

The pink salmon return to the Halibut Cove Lagoon rearing and release site was 111,000 fish. This success resulted from a cooperative project with the Cook Inlet Seiner's Association (CISA), the City of Homer, and CIAA utilizing Tutka Lagoon Hatchery pink salmon fry. Over 3 million fry were fed and released in 1988.

Approximately 11.1 million pink salmon fry and 2.4 million chum salmon fry were short-termed-reared at Tutka Lagoon for approximately 35 days before release in the spring of 1988. Both OMP and ADP feeds were used. The program yielded a 138% overall weight gain for all feed types. This was the highest overall weight gain to date.

This year Tutka Lagoon Hatchery was able to generate program receipts from the sale of broodstock carcasses. Feasibility plans are being developed to include sockeye salmon production at Tutka Lagoon Hatchery and a cooperative work program was initiated between the Tutka Lagoon Hatchery and the Pacific Rim Corporation, a firm representing Alaskan Natives. A two-month position to train a village person in fish culture was funded by the Pacific Rim Corporation.

Cook Inlet Highlights

- An estimated 50% of the 13,000 coho salmon sport-harvested from the Little Susitna River were of hatchery origin.
- The first releases of coho salmon smolts by Big Lake Hatchery was made into three selected Knik Arm tributaries.
- Hatchery-produced coho salmon produced by Big Lake Hatchery comprised an estimated 90% of the smolts emigrating and 90% of the adults entering the Big Lake drainage in 1988.
- The Willow Creek chinook salmon sport fishery was extended by emergency order for an additional weekend during 1988 due largely to hatchery contribution from the Fort Richardson Hatchery.
- An estimated 90% of the approximately 600,000 sockeye salmon smolts emigrating from the Big Lake drainage are hatchery-produced from Big Lake Hatchery.

- A terminal commercial fishery was opened by emergency order to harvest surplus sockeye salmon bound for Big Lake. Approximately 30,000 sockeye salmon were caught at a value of \$2.25 per pound, making each fish worth more than a barrel of oil.
- An estimated 90% of the 71,600 sockeye salmon entering the Big Lake drainage were of hatchery origin.
- Over 790,000 chinook salmon, 6.5 million coho salmon, and 20 million sockeye salmon eggs were taken for northern Cook Inlet enhancement projects.
- Chemical use was reduced at the Big Lake Hatchery, the quality of sockeye salmon production was maintained, and a chemical safety manual was produced.
- A total of 48,000 visitors came to Elmendorf Hatchery, mostly to view the returning Ship Creek chinook salmon.
- An Alaskan-made fish-transport tank was designed and tested at Elmendorf Hatchery. In the past all fish-transport tanks were manufactured in the Lower 48. Hatchery personnel worked with an Anchorage fiberglass firm to build a lighter, stronger, and competitively priced tank.
- Approximately 6.1 million rainbow trout eggs were taken by the BDC in April 1988, exceeding the original goal by more than 20%.
- The first phase of the all-female project was successful at the BDC when the sex of rainbow trout was reversed, turning genotypic females into males.
- Fort Richardson Hatchery production in 1988 was over 6.4 million fish and eggs, 41,400 kg, an approximate five-fold increase in biomass as compared with 1987. These include 2.2 million rainbow trout fingerlings, which enabled the hatchery to meet all of its requests; over 180,000 catchable-sized rainbow trout by 30 June and another 78,000 in July and August, a new record for one season.
- Over 65,900 angler-days were generated by Fort Richardson Hatchery's rainbow trout projects in the Anchorage Bowl and over 8,500 angler-days were spent fishing in the Kepler Lakes complex near Palmer.
- Operation of the Trail Lakes Hatchery was contracted to CIAA and will be operated under a state contract. State projects involving sport fisheries will continue for a short term at this hatchery.
- An estimated 400,000 hatchery-produced fish returned in 1988 from the Tustumena Lake sockeye salmon enhancement project and represented a record-high hatchery contribution rate of 52% for this project.
- The release of 247,000 chinook salmon smolts in the Ninilchik River marked the beginning of a new chinook salmon enhancement project on the lower Kenai Peninsula.

- A cooperative project between FRED and Sport Fish Divisions provided for the beginning of two new chinook salmon projects utilizing the late-run Kasilof River chinook salmon broodstock.
- Approximately 140,000 eggs were taken this year from late-run Kasilof River chinook salmon. The resulting smolts produced at the Crooked Creek Hatchery will be released in Kachemak Bay (Homer) and Resurrection Bay (Seward) to complement the earlier-run timing of the Crooked Creek chinook salmon broodstock currently being released at these sites.
- A record sport catch of 11,383 Crooked Creek chinook salmon occurred this year of which 7,057 (62%) were the result of smolt releases from the Crooked Creek and Elmendorf Hatcheries.
- In 1988, for the second consecutive year, the hatchery contribution to the total sport catch of coho salmon in Resurrection Bay exceeded 50%.
- Nearly 75% of the total return of coho salmon to Crooked Creek was hatchery-produced, and an estimated 1,000 sport-caught coho salmon were hatchery fish.
- The number of hatchery-produced sockeye salmon for both the Tustumena and Hidden Lake projects totaled 714,000. At an average value of \$2.50 per pound for sockeye salmon in Cook Inlet during the 1988 commercial fishery, the ex-vessel value of hatchery-produced sockeye salmon in central Cook Inlet during 1988 totaled nearly \$7.0 million.
- Initial field work was begun on rehabilitating the extremely depressed early sockeye salmon run at English Bay. This return has been steadily decreasing and is important to the communities of English Bay and Port Graham. The cooperative project includes the FRED Division, the Commercial Fisheries Division, CIAA, the Pacific Rim Corporation and the local Native corporation.
- The Homer Chamber of Commerce has nominated ADF&G for an award in the category of outstanding government organization, for creating the chinook salmon fishery on the Homer Spit.
- The FRED staff in Homer received a special commendation letter from the Governor for "Outstanding service to the people of Alaska," related to the effectiveness of the local fisheries enhancement program.
- Tutka Lagoon Hatchery had the second-highest return in the facility's 12-year history at 927,000 pink salmon. This yielded an overall ocean survival of 3.9%, which is the highest since 1982.
- Tutka Lagoon Hatchery production along with the cooperative Halibut Cove Lagoon rearing project with CISA accounted for 91% (833,730 pink salmon) of the entire 1988 lower Cook Inlet commercial pink salmon harvest.
- The Homer Spit pink salmon rearing project had a return of approximately 4,500 fish from last year's release. This provided a significant extension of the sport fishery on the Homer Spit after the chinook salmon run ended in early July.

- The Ingram Creek pink salmon fry remote transport and release had a return of approximately 2,000 fish from a release of 250,000 fry in 1987.
- The ex-vessel value from Tutka Lagoon Hatchery projects was estimated at over \$1.6 million in 1988.
- This year's egg take at Tutka set a new record for the facility with over 46 million pink and 2.6 million chum salmon eggs.
- Since 1978 over 54,000 pink salmon have been harvested by sport fishermen in and around Tutka Lagoon. Tutka Lagoon has become a very popular pink salmon sport fishery with the number of campers and charter-boat operators increasing annually.

Cook Inlet Returns and Fishery Contributions

When compared to 1987 production, the Cook Inlet harvest of hatchery-produced fish increased by over 800,000 fish (*See Table 1*). The majority of this increase was due to the near-normal catch of pink salmon in 1988 compared to the extremely poor catch in 1987 when pink salmon runs did not do well. Chinook and sockeye salmon catches were down slightly, while coho and pink salmon and rainbow trout showed increases.

Recovery of marked adult coho salmon from the Little Susitna River in 1988 indicated that 50% of a 13,000 sport harvest of the instream return and the total estimated spawning escapement was 21,000. At Big Lake, an estimated 90% of the drainage's 2,200 escapement were of hatchery origin.

The first chinook salmon releases into the Willow Creek drainage at Deception Creek occurred in 1985 with returns expected from 1986-1989. The bulk of the fish, approximately 59%, are expected in 1989. However, first-year returns as jacks in 1986 indicated 72% of the jacks in Deception Creek were of hatchery origin and in 1987 an estimated 200 age-0.2 fish were of hatchery origin. The forecasted higher contribution in 1988 transpired and an extra weekend of fishing was allowed. Preliminary figures indicate a 20%-25% hatchery contribution rate.

Mark-recovery results from the Fish Creek smolt weir in 1988 indicated a 90% hatchery representation in the 600,000 sockeye salmon emigration. These fish will be monitored at the adult weir in 1990. A preliminary assessment of adult returns in 1988 indicate 80%-90% hatchery representation.

A record number of 11,400 chinook salmon (7,090 hatchery-produced) was harvested by shore and drift-boat anglers during the 1988 Kasilof River sport fishery. The estimated annual angler expenditure for this fishery is approximately \$1.5 million. Estimated personal income derived from the Crooked Creek chinook salmon enhancement project ranges from \$818,000 to \$1.2 million, an amount equivalent to 28-40 full-time jobs. Finally, the estimated expenditure for each Kasilof River sport-caught chinook salmon ranges from \$170 to \$225, and the expenditure per angler-day ranges between \$47 and \$63.

FRED Division enhancement projects provided 71% (1.1 million) of the total 1988 lower Cook Inlet commercial harvest of 1.5 million salmon. FRED's contribution was

over 56% of the \$8.25 million ex-vessel value of the harvest. The value of the FRED production in 1988 (\$4.63 million) exceeds every previous year, except 1981.

Over 22,200 salmon were harvested in lower Cook Inlet by anglers as a result of FRED Division enhancement projects. This accounts for more than 90% of the sport-caught salmon in the Kachemak Bay area. Over 4,500 pink salmon returning to the Homer Spit release site were harvested by sport fishermen.

An additional 8,500 pink salmon were harvested by anglers in Tutka Lagoon. Dip netters harvested 2,000 sockeye salmon from China Poot Creek.

The results of fertilization were seen in the return of nearly 94,000 sockeye salmon to the Leisure Lake project. Chenik Lake had a record sockeye salmon return of 173,200 fish as a result of salmon enhancement begun in the early 1980s. These two projects accounted for 80% (255,200) of the total lower Cook Inlet sockeye salmon harvest of 319,008 fish. The ex-vessel value of the harvest from returns to these projects was at least \$2.8 million.

The Tutka Lagoon Hatchery had a major impact on the 1988 pink salmon returns to lower Cook Inlet, a bright spot in a grim year for returns of wild-stock pink salmon. The total accountability from hatchery production was 926,700 fish. Tutka production accounted for 91% (836,000 pink salmon) of the entire 1988 lower Cook Inlet commercial pink salmon harvest. This was the second-highest return to the facility in its 12-year history, and the highest ex-vessel value (\$1.6+ million) to date. Of the commercial catch of 836,000 fish, 111,000 were from a pink salmon rearing project at Halibut Cove Lagoon utilizing Tutka Lagoon Hatchery fry. This was a joint cooperative project between FRED and CISA. Additional project contributions were the Homer Spit sport fishery. Approximately 4,500 pink salmon returned to the Homer Spit from a 1987 release. Approximately 1,000 adult pink salmon returned to Ingram Creek in the Portage Glacier area from a release of 250,000 fry in 1987.

Cook Inlet Releases

Cook Inlet releases are tabulated in Table 2.

An "ag-truck" aerial transport was used for the first time ever to stock coho salmon fingerlings in previously inaccessible lakes that are tributaries to the Little Susitna River to enhance that important run even more. Sport fisheries at vehicle-accessible locations should become more popular in the future with first-time releases of chinook salmon smolts at Sheep and Montana Creeks.

Coho salmon fingerlings were reared at the Elmendorf Hatchery at 7°C to 8°C and released as 22.5-g smolts in Resurrection Bay in late May and early June.

Chinook salmon for the post-smolt program were held through the summer at Elmendorf Hatchery then released into Anchorage lakes in the fall of 1988.

In 1988 Elmendorf Hatchery produced 1.5 million chinook and coho salmon smolts that were released into southcentral Alaskan waters. Other production included 255,000 coho salmon fingerlings released into Matanuska Valley lakes, 72,000 chinook salmon

fingerlings released into Interior lakes, and 67,000 (73-g) chinook salmon released into Anchorage lakes. There was no major disease incidence throughout the year.

A total of 6.4 million fish, 41,885 kg, was released from the Fort Richardson Hatchery during the period 1 July 1987 to 15 July 1988. These included 1.8 million rainbow trout eggs, 878,000 rainbow trout fry, 1.85 million rainbow trout fingerlings, 180,200 catchable-sized rainbow trout, 33,550 steelhead trout, 218,300 coho salmon fingerlings, 61,700 coho salmon fall presmolts, 508,000 coho salmon age-1 smolts, and 713,000 chinook salmon age-0 smolts.

In July 1987 it became apparent that the chinook salmon egg-take goals would not be achieved. In order to offset this otherwise lost production additional rainbow trout fingerlings were held to increase the catchable release from 180,000 to 250,000. Over 180,000 of these fish were released by 30 June 1988 and another 75,000 were on-hand for release during July and August.

Over 30 million salmon fry, fingerlings, and smolts were released in lower Cook Inlet (a new record) to enhance the area commercial and sport fisheries. The 1989 returns could approach 1 million salmon.

At Tutka Lagoon Hatchery, approximately 12 million pink salmon were reared and released in 1988 along with 3.2 million Kamishak Bay chum salmon into Tutka Bay.

Approximately 3 million pink salmon were transported to Halibut Cove Lagoon, 300,000 to the Homer Spit, and approximately 250,000 pink salmon fry were transported to Ingram Creek.

Cook Inlet Egg Takes

In Cook Inlet there was an increase of about 0.8 million eggs in 1988 with most species' egg takes remaining similar to those in 1987, with the exception of pink and sockeye salmon. Pink salmon eggs taken increased by about 20 million eggs primarily due to the very low numbers of eggs taken in 1987, a year in which the pink salmon runs were very poor. Reported numbers of sockeye salmon eggs decreased by about 20 million with the contracting of operations of the Trail Lakes Hatchery during this operational year. Again, those eggs were taken and will show as an increase in the private-sector report.

An estimated 790,000 chinook salmon eggs were collected from Willow Creek. Adults will enter the sport fishery from 1990 through 1994. This release should also help offset the decimating effect of a "100-year flood" which occurred in 1987.

Approximately 460,000 fertilized coho salmon eggs from the Little Susitna River and 250,000 from Caswell Creek were transported for incubation at Fort Richardson Hatchery to the smolt stage. Another 3 million eggs were taken from the Little Susitna drainage for incubation and rearing for release as fingerlings. From the Big Lake drainage, 3 million coho salmon eggs were taken at the hatchery brood-capture area on Meadow Creek. Scheduled coho salmon stocking in the spring of 1989 includes fingerling releases in the Big Lake and Cottonwood Creek drainages, presmolt releases into the Big Lake drainage, and smolt stocking for Wasilla Creek, Rabbit Slough, and Jim Creek.

The sockeye salmon egg take in the Big Lake drainage yielded 20.5 million eggs. Fingerlings from this egg take are to be released into the drainage in 1989.

Brood collection of coho salmon at Caswell Creek and the Little Susitna River is being facilitated by adults homing to locations where hatchery-produced juveniles had previously been released.

A total of 6.1 million eggs were taken at the BDC during the spring of 1988 from the Swanson River and Big Lake broodstocks. These eggs were the result of random matings within each strain. The only artificial selection in this process is for the earliest spawning time for the catchable and replacement broodstock programs.

A total of 6.0 million fertilized eggs (2.2 million Big Lake and 3.8 million Swanson River) were received by Fort Richardson Hatchery from the BDC between 31 March and 27 April. At the eyed stage, 1.4 million eggs were transferred to the Clear Hatchery.

The Tutka Lagoon Hatchery provides the bulk of the pink salmon in lower Cook Inlet. All eggs are incubated at the hatchery with the majority of fry being reared and released into Tutka Bay. This summer's egg take was the largest to date with over 45 million eggs collected. Approximately 3.6 million chum salmon eggs were taken in 1987 using a donor stock from the Kamishak Bay area of Cook Inlet. This year approximately 2.2 million eggs were collected for incubation and release into Tutka Bay.

KODIAK AND ALASKA PENINSULA

Summary of FRED Projects

The FRED Division maintains an area office in Kodiak and operates two hatcheries in the Kodiak and Alaska Peninsula areas (Figures 7 and 8). The FRED Division Kodiak Area Office is located in Kodiak. The area includes the Kodiak Island Archipelago and the southern and eastern slopes of the Alaska Peninsula from Cape Douglas to the southern entrance of Imuya Bay. In 1988, 523 permit holders harvested 14,259,000 pink, 2,695,000 sockeye, 1,426,000 chum, 300,000 coho, and 22,000 chinook salmon. The total salmon catch of 18,702,000 fish has an ex-vessel value of approximately \$94.016 million (an average of \$179,763 per permit holder). The 1988 year was the highest year ever for the ex-vessel value at twice the 20-year average.

FRED Division operates projects and facilities that contribute salmon to the annual production of the Kodiak area. Projects such as the Karluk and Frazer Lakes fertilization rehabilitate areas that were historically productive; others, such as Kitoi Bay Hatchery, enhance natural production. The salmon produced by the FRED Division benefit commercial, sport, personal-use, and subsistence fisheries.

In 1988 mariculture feasibility studies were continued in the Kodiak area. Seven active culturists with scallops, mussel, and oyster projects are coordinated through the FRED Kodiak Area Office.

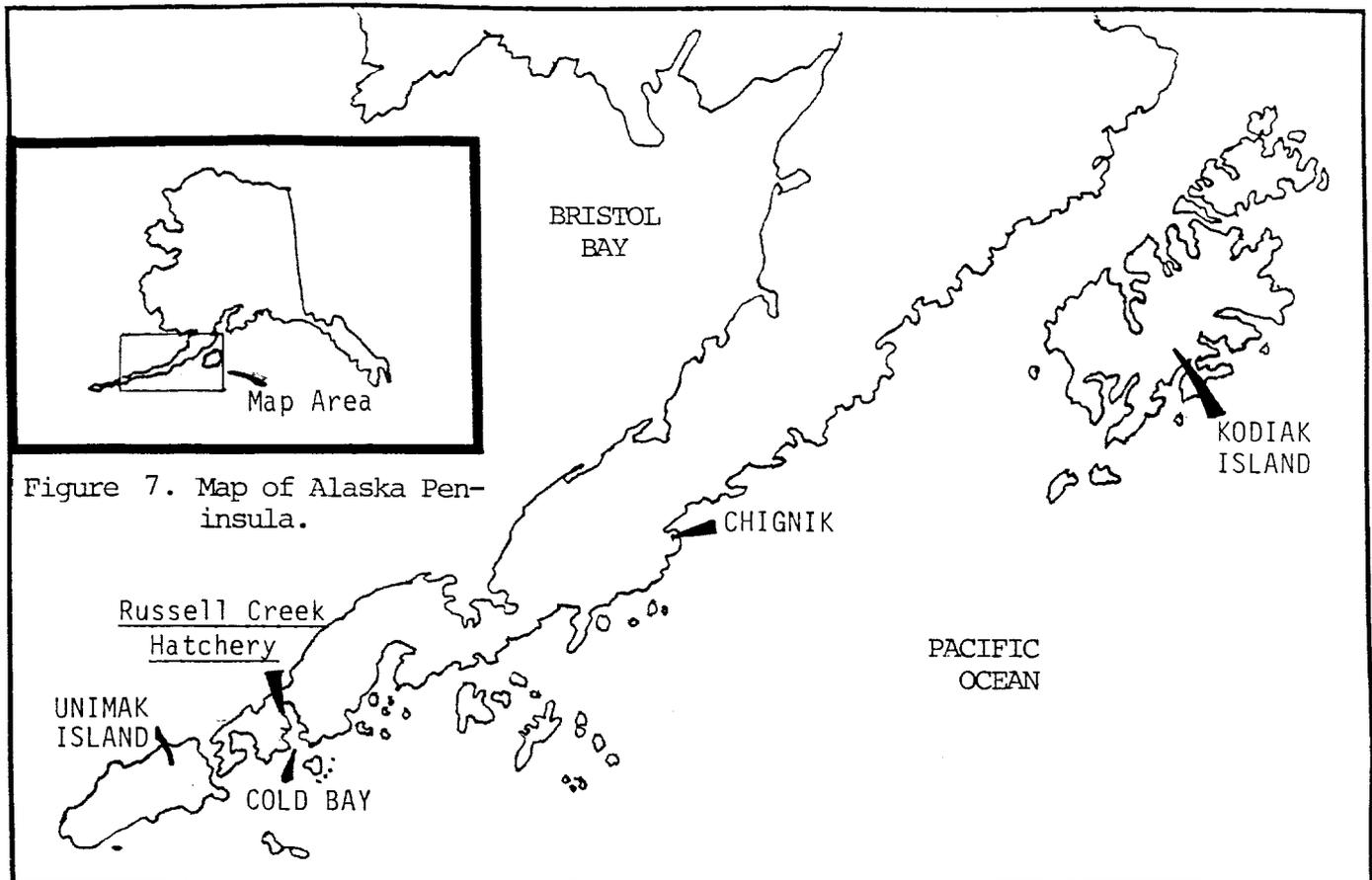


Figure 7. Map of Alaska Peninsula.

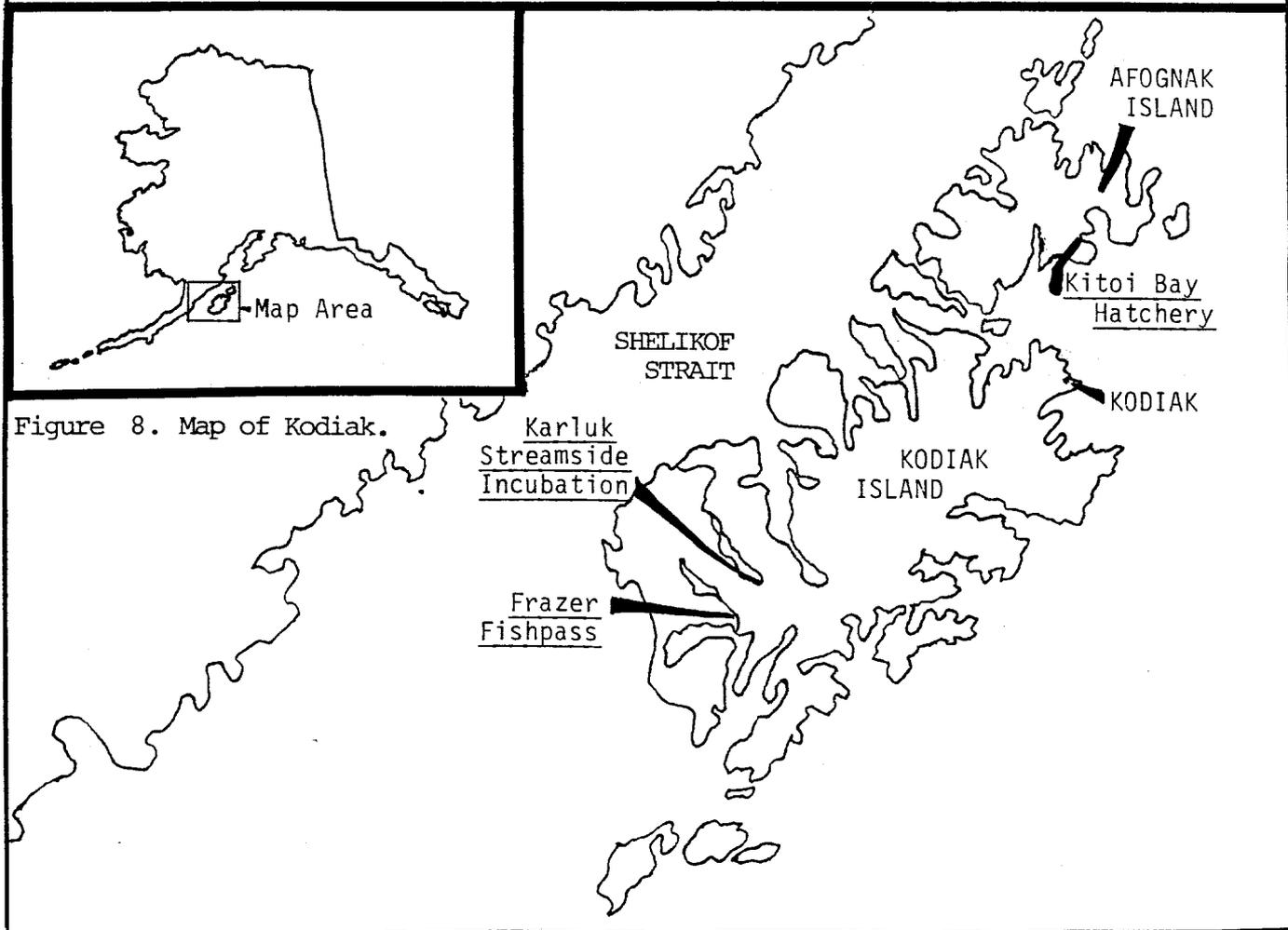


Figure 8. Map of Kodiak.

In 1988 community and fisherman support for more salmon enhancement and rehabilitation projects was apparent in several significant areas. The major breakthrough was the fisherman approval of a 2% assessment for support of salmon projects. Also, the agreement of the Kodiak Regional Aquaculture Association (KRAA) to operate the Kitoi Bay Hatchery on a cooperative basis for cost sharing was a major undertaking.

The Kodiak Island Borough agreed to contribute funds along with KRAA to purchase net pens at Kitoi Bay to allow all fish at the hatchery to be pen-reared. This simple improvement will probably more than double the returns to the hatchery. The borough further helped KRAA by paying for all of the lake fertilization cost at Karluk Lake, while KRAA picked up all the cost of fertilizing Frazer Lake. Further, the borough gave a 25-year lease to the FRED Division for \$1 per year for the Pillar Creek Hatchery, and the City of Kodiak agreed to allow the state to draw water for the hatchery without charge.

Two pilot sockeye salmon feasibility studies were initiated at Pillar Creek and Kitoi Bay. At Pillar Creek, an 8-inch pipeline was installed and a small hatchery module was constructed and is currently incubating 1,080,000 eggs and fry. At Kitoi Bay Hatchery, staff are currently incubating 225,000 Upper Station zero-check sockeye salmon eggs and fry for a pilot test of rearing and survival of these unusual fish whose life history is more like a chum salmon than a sockeye salmon.

The cost-recovery program at Kitoi Bay Hatchery was an important cooperative program that was successfully implemented. More than \$700,000 will be generated from this program.

Lake fertilization at Frazer Lake was begun in 1988. This project, coupled with the lake fertilization project at Karluk, are the largest lake fertilization programs in the state. This is a cooperative venture with KRAA handling the contract, FRED Division is evaluating the results and coordinating the effort, the Kodiak Island Borough financing the program, and the U.S. Fish and Wildlife Service (USF&WS) issuing the permits.

The Japanese Overseas Fishery Cooperation Foundation/Alaska cooperative project begun in 1987 was continued. Results of this project were not successful in capturing Weathervane scallop. Although the target species was not captured, many other species were captured and are currently being cultured to test their market potential.

The Russell Creek Hatchery is located at the tip of the Alaska Peninsula about three miles southeast of the town of Cold Bay and about 1.5 miles upstream from salt water on Russell Creek. Constructed in 1977-1978, it has the potential to be one of the largest hatcheries in the world, with a capacity of 250 million pink salmon eggs. Recent construction by the hatchery staff corrected several severe design problems and added some necessary hatchery components, such as a large complex of aluminum raceways for broodstock collection and spawning. The result is a very large, modern hatchery that will enhance tremendously the local commercial fisheries.

The original plan was to produce chum salmon; however, political and management problems created by the False Pass June fishery controversy resulted in a decision by FRED not to pursue the culture of chum salmon at this hatchery. Consequently, the emphasis is now on the production of very large numbers of pink salmon and the beginning of a program for sockeye salmon culture to enhance local production by 500,000 to 1,000,000 fish annually.

An excellent sockeye salmon incubation module was designed and constructed by the hatchery staff. The design of the building and the layout incorporates the most up-to-date information on sockeye salmon culture methods, with emphasis on isolation and disinfection. The capacity will be 2 million eyed eggs. They will be incubated in 10 separate incubators, each with its own water supply, drain pipes, and start tank.

Limnology studies were begun on Mortensen Lake in the fall of 1988, and planning is underway to begin a sockeye salmon enhancement program for Thin Point Lagoon in the future.

Kodiak and Alaska Peninsula Highlights

- Sockeye salmon spawner returns (49,884) increased for the sixth consecutive year to upper Thumb River.
- Hatchery broodstock development at the Village of Ouzinkie continued with stocking 20,000 coho salmon fry for the second year.
- Four thousand adult coho salmon returned for Kodiak sport fisheries enhancement.
- A pilot test of the Pillar Creek Hatchery site commenced with the incubation of 1,080,000 sockeye salmon eggs.
- Sockeye salmon eggs (225,000) at upper Station Lake were collected to develop the feasibility of zero-check sockeye salmon fish culture at Kitoi Bay Hatchery.
- The application of 96 and 75 tons of fertilizer was applied to Karluk and Frazer Lakes (within the National Wildlife Refuge), respectively, to increase survival of sockeye salmon was completed in cooperation with the USF&WS, KRAA, and additional funding support from the Kodiak Island Borough.
- A hatchery pipeline was installed and the pilot Pillar Creek Hatchery was constructed.
- A stream rehabilitation project at Horse Marine Lake was initiated. Survey results indicate a recommendation for a fish ladder to improve fish passage to the lake.
- A patent application for the Kitoi Incubator was completed. The patent issued in the public domain is one of the first patents issued to the state for an employee invention.
- The Kitoi Bay Hatchery once again led the state-owned and operated hatcheries in the number of eggs taken and incubated with approximately 97 million. The return of 745,000 hatchery-produced pink salmon adults was below expected levels but, with the expanded rearing program in place, higher returns can be expected in the future.
- A modern, state-of-the-art sockeye salmon incubation module with a capacity of 2 million eyed eggs and initial rearing has been designed and constructed at the Russell Creek Hatchery. An initial egg take of 1.6 million sockeye salmon eggs from Mortensen Creek has been accomplished, with very high survival rates.

- Ten million eyed pink salmon eggs were transported by air from the Kitoi Bay Hatchery to the Russell Creek Hatchery in the fall of 1987 to begin the buildup of broodstock for an odd-year run. More than 9 million fry were released in the spring of 1988.
- Two million pink salmon eggs were taken from Russell Creek fish in the summer of 1988 to begin the broodstock buildup for the even-year run. Survival has been excellent.
- An estimated 150,000 chum salmon were taken in Cold Bay by the commercial fishery, contributing a more than \$1 million ex-vessel revenue to the local economy and confirming the hatchery's importance.

Kodiak and Alaska Peninsula Returns and Fishery Contributions

Chum and sockeye salmon harvest levels in 1988 led to an overall increase in the FRED-produced harvest in this area of about one-half million fish (*See Table 1*). Chum salmon production from the Russell Creek Hatchery played an important part in the observed increase.

The total return of 746,000 pink salmon to Kitoi Bay Hatchery included: a commercial catch of 306,900; a cost-recovery harvest of 298,400; broodstock and escapement of 140,700; and 5,000 adult chum salmon returning to Kitoi Bay Hatchery.

Hatchery-produced chum salmon returned to Russell Creek Hatchery in excellent numbers this year and an estimated 150,000 were taken by the commercial fishermen in Cold Bay, providing ex-vessel revenues of about \$1 million to the local fishermen. This revenue was badly needed by many of the fishermen because of revenue lost when the chum salmon cap was reached during the June fishery before the local allocation of sockeye salmon was taken.

The 6-year trend of build-up of sockeye salmon spawners in the upper Thumb River of Karluk Lake demonstrates the success of the strategy of sockeye salmon egg plants in that system and the lake fertilization program. The Karluk Lake sockeye salmon population and commercial fishery continues to rebuild after 50 years of depression.

Kodiak and Alaska Peninsula Releases

During 1988 Kitoi Bay Hatchery was again a leading producer of fish (*See Table 2*). Nearly 100 million young salmon were released, including 5 million fed chum salmon and 94 million pink salmon (11 million direct-release and 83 million fed). Nearly 40,000 rainbow trout and 483,585 coho salmon fingerlings were stocked into Kodiak area lakes from Kitoi Bay Hatchery.

Of 500,000 coho salmon eggs from Mortensen Creek, 300,000 fingerlings were planted in the tributaries of Russell Creek in 1988 and another 35,000 are being held and reared to the smolt stage and will be released in the spring of 1989. The scientific-educational hatchery project at the Village of Ouzinkie continued with the release of 20,000 coho salmon fry.

Kodiak and Alaska Peninsula Egg Takes

A total of 91 million pink salmon, 4.5 million chum salmon, and 1.1 million coho salmon eggs were taken for continuation of salmon enhancement at Kitoi Bay (See Table 3).

Two million pink salmon eggs were taken from the natural run in Russell Creek in the summer of 1988, and their survival to the eyed-egg stage has been excellent.

The sockeye salmon enhancement program in Kodiak expanded with egg takes for two new projects: 1,080,000 eggs for the new Pillar Creek Hatchery and 225,000 eggs from the Karluk Lake "Upper Station zero-check stock" for Little Kitoi Bay.

The sockeye salmon egg take for Russell Creek Hatchery was completed in September 1988 at a remote location on Mortensen Creek. This was also a pioneering egg take that had to conform to the strictest sockeye salmon guidelines under very primitive conditions in harsh weather. A total of 1.6 million sockeye salmon eggs were taken and transported to the hatchery for incubation. Despite the rigors of transport, it appears that the survival to the eyed-egg stage will be about 85%, with some lots in the 90% range.

ARCTIC-YUKON-KUSKOKWIM

Summary of FRED Projects

The Arctic-Yukon-Kuskokwim (AYK) region is that part of Alaska lying north of the Alaska Range. The major commercial salmon fisheries in this region are located in the lower Yukon River, lower Kuskokwim River, Norton Sound, and Kotzebue Sound. In the Yukon River, summer and fall chum salmon are the largest fishery. The catches of coho and chinook salmon are smaller but these fish are valued as subsistence fish. Subsistence fisheries are more important in upriver locations. In Norton Sound, the pink salmon fishery is the largest with chum, coho, and chinook salmon fisheries being of secondary importance. In Kotzebue Sound, the fall chum salmon fishery is the only significant commercial fishery, although subsistence fisheries on sheefish and Arctic char are also important. Sport fisheries are located throughout the AYK region, but most effort is expended in the Fairbanks vicinity.

Two FRED Division hatcheries are located in the AYK region. Clear Hatchery at the Clear Air Force Station produces coho salmon for the commercial and subsistence fisheries, and coho salmon, sheefish, rainbow trout, grayling, and Arctic char for the local sport fisheries. Fall chum and chinook salmon are still returning from past releases, but these programs have been discontinued due to lack of funding. Sikusuilaq Springs Hatchery on the Noatak River near Kotzebue produces fall chum salmon for the Kotzebue commercial fishery (Figure 9).

The harvest rate on upper Yukon River chinook salmon has been as high as 90%. Negotiations between Canada and the U.S. are still in progress on the allocation of the Yukon chinook salmon. Catches and escapements of fall chum salmon have continued to be weak, forcing a reduction in commercial openings. In the Kotzebue area, the fall

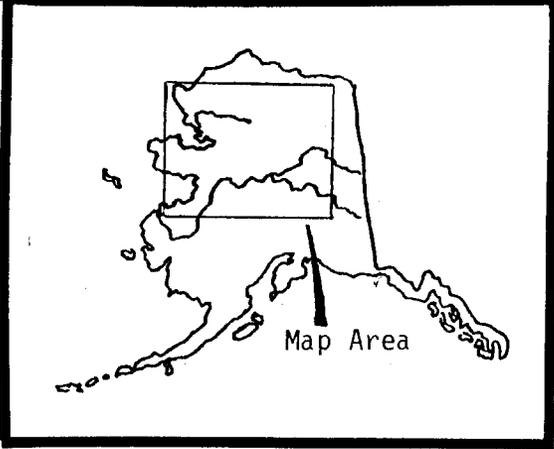
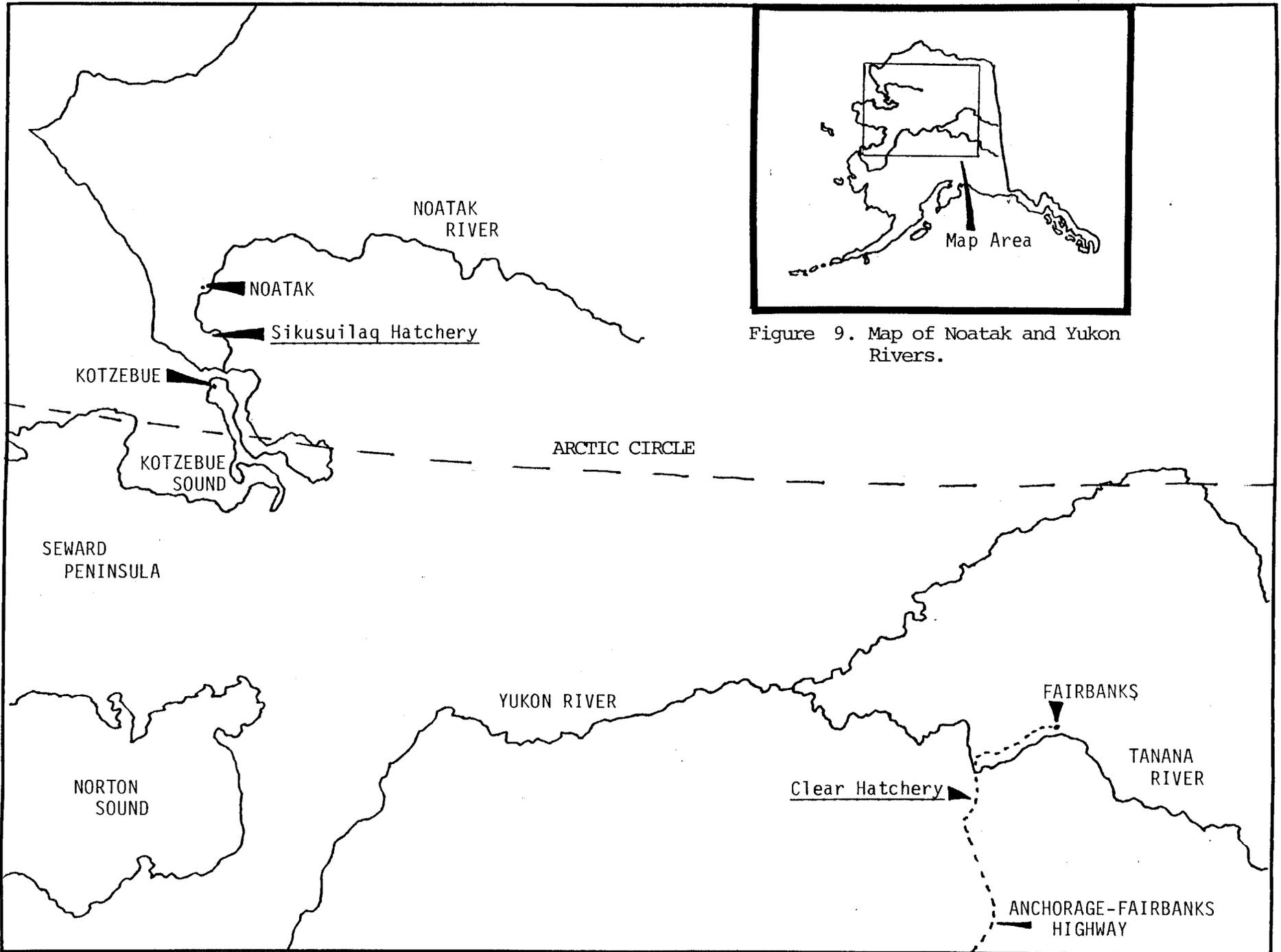


Figure 9. Map of Noatak and Yukon Rivers.

chum salmon fishery improved this year; however, the average catch in recent years has been below the historical average.

Returns of Sikusuilaq Springs Hatchery fish have been sufficiently good in the last three years to justify expansion beyond the current pilot-project scale. Recently, bids have been requested for design changes that will bring the capacity from its current 4 million eggs to 60 million. Also, in an effort to build up hatchery broodstock, new incubation and rearing facilities have been put on-line this year to increase the capacity to 10 million eggs. This year 6.6 million eggs were taken.

FRED Division assisted the Tok School in planting 50,000 fall chum salmon eggs in a spring-fed stream near Tok. This is the projects's second year. Students at the school will monitor the eggs through the winter.

Several anadromous streams in the Nome area that had been damaged by road building and mining were examined for their potential for rehabilitation. Rehabilitation plans for the Pilgrim, Nome, and Solomon Rivers have been drawn up with the ADF&G, Habitat Division and the Bureau of Land Management. Additional plans to study the feasibility of improving the production of Salmon and Glacial Lakes through fertilization were also made.

FRED Division continued to assist a local couple in setting up a landlocked, freshwater fish farm in Fairbanks.

A joint study of overwintering Arctic and Least ciscoes in the Colville River Delta was initiated with the North Slope Borough.

The final work is being done in a 3-year National Oceanic and Atmospheric Association-funded project on the fisheries of the Chukchi Sea. This study has provided new information of the migration of juvenile salmon out of the Kotzebue area into the Bering Sea.

Clear Hatchery was completed at Clear Air Force Station near Nenana in January 1980. Since Clear Hatchery is interior Alaska's only hatchery, it is a center for developing rearing programs for Interior fishes. The site was selected partly because of the availability of heated waste water which allows a flexible rearing program.

The Arctic char project is to develop, maintain, and expand domestic broodstock to supplement and eventually replace the wild-stock egg take and to continue to provide fingerlings, subcatchables, and catchables for Interior and Southcentral sport fish programs.

The Arctic grayling project is to maintain and expand the domestic brood source to replace wild egg take and to continue to provide fry and fingerlings for statewide sport fisheries projects. Additional emphasis is placed on developing techniques to increase survival levels at all stages of fish culture.

Lake trout, a new program, presently consists of a wild egg take to ultimately provide a unique fishery in a limited number of lakes.

The rainbow trout program consists of hatching and rearing trout to fingerlings and subcatchables from eyed eggs received from the Fort Richardson Hatchery domestic stock in order to enhance Interior sport fisheries opportunities.

The anadromous coho salmon project provides a minimal number of adults for sport, subsistence, and commercial fisheries in the Yukon River drainage and maintains the broodstock to support the landlocked stocking program for Interior sport fisheries.

Clear Hatchery has one of the best aquifers in the state with an unlimited amount of clean water at two temperatures: 3.5°C and 7.0°C, as well as from 4,000 to 6,000 liters per minute of 13.5°C water. Close at hand are steam and warm-water sources to heat incubation and rearing water to any desired temperature. There is an inexpensive option of doubling production capacity by the installation of a double-pass system. Performance can be judged by Clear's progressive history of culturing up to seven species. Our success in culturing Alaska's exotic species, Arctic grayling, Arctic char, and sheefish continues with considerable success.

Arctic-Yukon-Kuskokwim Highlights

- Fall chum salmon returned to Clear Hatchery in record numbers this year. It is expected that the total return will be over 20,000 fish with about three-fourths of these being harvested by the commercial and subsistence fisheries.
- With the implementation and increase of domestic stock and the expansion of future goals, the Arctic char project is soundly expanding.
- A record number of wild Arctic grayling eggs were taken as well as a significant number from the domestic brood source. The unfed fry-release goal of 1.0 million was surpassed by 86%.
- A domestic sheefish egg take of .94 million was achieved. Subsequent incubation and rearing techniques are still being refined.
- Rainbow trout fingerling and subcatchable goals of .57 million and .12 million, respectively, were surpassed.
- Coho salmon goals, both anadromous and landlocked, were far surpassed.
- Sikusuilaq Springs Hatchery had the highest return to date of 13,500 adult chum salmon. Over 80% of these were harvested in the commercial and subsistence fisheries.

Arctic-Yukon-Kuskokwim Returns and Fishery Contributions

Chum salmon production from Sikusuilaq Springs Hatchery showed a dramatic increase in 1988, but the area catch in general was down primarily due to estimated lower catches of sport-caught rainbow trout and coho salmon (*See Table 1*).

The coho salmon return to Clear was better than in past years. The total return will be about 1,800 fish with a little more than half going to the commercial and subsistence

fisheries. The sport fishery on the coho salmon and fall chum salmon returning to Clear Creek has also been increasing. Clear Creek probably offers the best fall salmon fishing in the Fairbanks area.

Chum salmon returning to Sikusuilaq Springs Hatchery near Kotzebue contributed over 12,000 fish to the commercial fishery. Corrections due to the higher mortality of marked fish have not been completed; they may result in a doubling of the hatchery contribution. Approximately 1,000 additional hatchery fish were caught in the subsistence fishery.

Arctic-Yukon-Kuskokwim Releases

Clear Hatchery stocked approximately 79,000 Arctic char into 20 Interior lakes to initiate this program. Almost 1.9 million Arctic grayling fry were stocked into 34 lakes statewide and 180,000 fingerlings were stocked into 31 lakes statewide (*See Table 2*).

Clear Hatchery released 54,000 lake trout, 530,000 rainbow trout fingerlings, 126,000 subcatchable rainbow trout, and approximately 277,000 coho salmon fingerlings for the anadromous program. In addition, 304,000 coho salmon were planted into Interior lakes.

Sikusuilaq Springs Hatchery released 2.9 million chum salmon fry and 100,000 chum salmon fingerlings. For the first time fingerlings were reared in net pens placed in Sikusuilaq Creek.

Arctic-Yukon-Kuskokwim Egg Takes

Total egg takes in this area increased in 1988 by more than 2.5 million eggs over the 1987 levels: 11.8 million to 9.1 million (*See Table 3*). The major increase was in chum salmon eggs at Sikusuilaq Springs Hatchery which is increasing its egg capacity due to its recent successes in chum salmon production.

A record number of eggs was taken in 1988 at Sikusuilaq Springs Hatchery. Over 6.6 million chum salmon eggs were collected with less effort than was expended during previous years for fewer fish. This year more adults than ever returned from previous releases, and more broodstock than ever were caught nearby the hatchery. Some adults were even enticed to swim up a fishpass into the hatchery where their eggs were taken indoors.

At Clear Hatchery in 1988, eggs were taken from Arctic char, Arctic grayling, coho salmon, lake trout, and sheefish. The Arctic char egg take was successful with 315,000 eggs taken at the remote site and over 92,000 from the captive broodstock. As the domestic broodstock is developed, more eggs with less effort are expected. Another record number of Arctic grayling eggs was taken: 2.8 million. Most of these eggs were taken from the domestic source. The goals for the coho salmon egg take for both the anadromous and landlocked programs were exceeded with an egg take of 775,000 eggs. The remote egg take for lake trout was less difficult again this year, and over 116,000 eggs were taken.

The remote sheefish egg take was eliminated in 1988 and a record number, 945,000 eggs, was taken from the captive broodstock. In addition, over 1.6 million eyed rainbow trout eggs were received from Fort Richardson Hatchery.

PROGRAM PROJECTIONS FOR 1989

The FRED Division utilizes many strategies for rehabilitation, enhancement, and development of fisheries other than hatcheries. Several of these strategies, including operation of fish ladders to allow salmon to reach unutilized spawning areas, lake fertilization, habitat improvement, and fish-planting programs are much more difficult to evaluate than standard hatchery production. With lake fertilization and fish-planting projects, tagging and use of sonar counters allows for evaluation, often on a par with hatchery evaluation, but at a much greater cost. Fish ladders and habitat improvement projects are difficult to evaluate; i.e., estimate the increased number of fish attributable to the project. In many cases, if evaluation is biologically feasible, it is cost-prohibitive. Since hatchery production is the most quantifiable strategy, it is often used as the standard by which the effectiveness of fisheries enhancement is measured. For this reason, the forecast values shown in Table 4 are based only on hatchery production. This, however, is a gross underestimation of actual FRED production.

The numbers of salmon that returned in 1988 as a result of FRED hatchery operations met or exceeded many of the projected values. The obverse was equally true; some of the returns were lower than projected values. It should be obvious now that the reported numbers of chum and pink salmon returning to FRED-operated hatcheries in 1988 are much lower than the numbers projected in 1987. This, of course, is due to the contracting of operations of three major chum and pink salmon-producing facilities and to reporting all activities occurring after the contract date by the contracting agencies. Since the numerical majority of FRED production has historically been in pink and chum salmon and since the contracted hatcheries were the major producers of these species, the total production from FRED facilities missed the projected mark by about 1.8 million fish. The contracted hatcheries contributed 2.9 million pink and chum salmon to the 1987 total. Since the decrease from 1987 to 1988 is 1.8 million fish, this indicates that production from existing FRED facilities has increased by 1,100,000 fish, or approximately 20%, if production of contracted hatcheries is not considered.

Projected Returns for 1989

A statewide total of over 4.9 million salmon is expected to return to FRED projects in 1989 (Table 4). Pink salmon comprise the largest segment of the projected returns, primarily to Kitoi Bay, Russell Creek, and Tutka Lagoon Hatcheries and to the Halibut Cove project. The projection for 1989, in contrast to prior projections, is for sockeye salmon to be the second-largest segment of the 1989 returns. Major sockeye salmon producers for 1989 will include Tustumena, Big Lake, Gulkana, Chenik Lake, Karluk Lake, Hidden Lake, McDonald Lake, Hugh Smith Lake, and Leisure Lake. It is of interest that sockeye salmon comprised the second-largest component in the FRED 1988 return, although it was not projected in 1987. This was due to the nonreporting of contracted hatchery chum salmon production by FRED. With the exception of chum salmon, the projected returns of all species of salmon and steelhead trout to FRED facilities in 1989 are greater than the reported returns in 1988.

Table 4. A projection of the number of salmon expected to return in 1989 as a result of FRED hatcheries and projects (excluding fishways and PNP transfers).

Return site	Numbers by species					
	Chinook	Coho	Sockeye	Chum	Pink	Steelhead
SOUTHEAST						
Crystal Lake	10,600	5,200	--	--	--	50
Ohmer Creek	2,000	--	--	--	--	--
Irish Creek	--	--	--	--	--	--
Petersburg	--	--	--	--	--	--
Deer Mountain	1,775	8,798	--	--	--	--
Klawock	--	70,448	--	33,664	--	900
Snettisham	3,491	7,841	--	91,471	--	--
Indian Lake	--	1,099	--	--	--	--
Earl West Cove	3,100	--	--	--	--	--
Farragut River	850	--	--	--	--	--
Port Camden	--	--	--	100	--	--
Brennan Lake	105	--	--	--	--	--
Bold Island Lakes	7	--	--	--	--	--
Tunga Inlet	--	10,469	--	--	--	--
Ward Creek	--	849	--	--	--	900
Juneau/DJ	4,089	--	--	--	--	49
Chilkat Ponds	--	1,250	--	--	--	--
Marx Creek	--	--	--	10,356	--	--
Badger/Bakewell	--	--	17,568	--	--	--
Hugh Smith Lake	--	--	42,760	--	--	--
McDonald Lake	--	--	159,780	--	--	--
AREA TOTALS:	26,017	105,954	220,108	135,591	0	1,899
PRINCE WILLIAM SOUND						
Cordova	--	5,000	--	--	--	--
Gulkana	--	--	210,000	--	--	--
Main Bay	--	--	--	200,000	--	--
Whittier	500	5,000	--	--	--	--
Valdez	500	--	--	--	--	--
AREA TOTALS:	1,000	10,000	210,000	200,000	0	0
COOK INLET						
Big Lake	--	12,500	331,900	--	--	--
Cottonwood Drainage	--	2,200	--	--	--	--
Willow Creek	7,600	--	--	--	--	--
Little Susitna	--	44,600	--	--	--	--
Crooked Creek	9,000	3,000	--	--	--	600
Chenik Lake	--	--	90,000	--	--	--
Paint River	--	--	25,000	--	--	--
Tustumena	--	--	300,000	--	--	--

-Continued-

Table 4. Continued.

Return site	Numbers by species					
	Chinook	Coho	Sockeye	Chum	Pink	Steelhead
Tutka	--	--	--	750	350,000	--
Halibut Cove	2,880	--	--	--	112,500	--
Homer Spit	3,640	3,100	--	--	6,000	--
Seldovia Bay	750	--	--	--	--	--
Leisure Lake	--	--	100,000	--	--	--
Seldovia Lake	--	750	--	--	--	--
Caribou Lake	--	2,100	--	--	--	--
Resurrection Bay	2,000	13,000	--	--	--	--
Caswell Creek	--	0	--	--	--	--
Ingram Creek	--	700	--	--	1,000	--
Ship Creek	3000	2500	--	--	--	--
Jim Creek	--	300	--	--	--	--
Rabbit Slough	--	300	--	--	--	--
Wasilla Creek	--	300	--	--	--	--
AREA TOTALS:	28,870	85,350	846,900	750	469,500	600
KODIAK-AK. PENINSULA						
Karluk	--	--	160,000	--	--	--
Kitoi	--	3,200	--	5,000	2,350,750	--
Kodiak Lakes	--	--	--	--	--	--
Russell Creek	--	--	--	--	90,000	--
AREA TOTALS:	0	3,200	160,000	5,000	2,440,750	0
ARCTIC-YUKON-KUSKOKWIM						
Clear	650	1,850	--	15,300	--	--
Sikusuilag	--	--	--	13,500	--	--
AREA TOTALS:	650	1,850	0	28,800	0	0
STATE TOTALS:	56,537	206,354	1,437,008	370,141	2,910,250	2,499
GRAND TOTAL:			4,982,789			

Sport Fisheries Enhancement Program

The FRED Division sport fisheries enhancement program has matured and diversified considerably. The sport fisheries enhancement program is a complex program that involves all species of Pacific salmon (except chum salmon), rainbow trout, lake trout, steelhead trout, Arctic grayling, Arctic char, and sheefish. Life stages stocked include: unfed fry, fed fry, fingerlings, presmolts, smolts, postsmolts, and catchable-sized fish; these were released from 13 facilities into approximately 75 stocking locations for anadromous fisheries and approximately 300 stocking locations for landlocked fisheries. Area biologists and hatchery production have played key roles in this program along with personnel from the ADF&G, Sport Fish Division and other agencies, especially the USFS. There continues to be a solid and increasing public demand for additional sport fish production via the hatchery system.

Highlights of the 1988 sport fisheries enhancement program include:

- Over 3 million rainbow trout were released in southcentral and interior Alaska, 280,000 of which were catchable-sized.
- Six million fertilized eggs from two rainbow trout broodstocks were taken at the Broodstock Development Center.
- Over 34% of the sport-caught chinook salmon in the Petersburg area were produced by Crystal Lake Hatchery.
- Nearly 200 different lakes were stocked with rainbow trout, some more than once. The hatchery program was able to meet the ADF&G, Sport Fish Division stocking request.
- Results from the southcentral Alaska sport-fishing economic survey report estimated economic value of the Anchorage lake-stocking program to be \$1,711,000 in 1986. The "net-willingness-to-pay" for this opportunity was \$2,425,000.
- Twenty-one percent of the chinook salmon harvested in the Juneau sport fishery over the past two years were hatchery fish.
- Over 2 million Arctic grayling were produced at Clear Hatchery; one of only three successful Arctic grayling enhancement programs in the U.S.
- During 1988 approximately 68,000 Arctic char were released into 20 locations near Fairbanks; this program is the only one of its kind in the U.S. and shows tremendous potential for the future.
- The lake trout enhancement program began in 1987 at Clear Hatchery and during 1988, 54,000 fingerlings were released into 20 lakes.
- In 1988, 200,000 coho salmon smolts, 250,000 chinook salmon smolts, and 14,633 catchable coho salmon were stocked in the Juneau area.
- Hatchery-produced chinook salmon account for two-thirds or more of the annual harvest on the Kenai Peninsula outside of the Kenai River.

- In 1988 nearly 20,000 hatchery-produced chinook salmon were harvested by anglers in southcentral Alaska (almost 11,000 from Crooked Creek alone).
- More than 90% of the salmon taken by anglers in Kachemak Bay are the result of the FRED Division enhancement program.
- Over half the coho salmon caught in Resurrection Bay in 1988 were hatchery-produced--a total of over 8,000.
- The chinook salmon fishery in Willow Creek was extended for an additional weekend in 1988 because of the return of hatchery-produced salmon.
- Over half the coho salmon caught from the Little Susitna River and Fish Creek (Big Lake) were hatchery-produced.
- The Homer Spit enhancement project continues to expand and create a unique angling opportunity where none is possible without this stocking project. In 1988 more chinook salmon were harvested at this location than during previous years, and the first large return of pink salmon returned to the site. This year chinook, pink, and coho salmon were stocked to provide salmon sport fishing from May to September.
- Economic models demonstrate that the FRED Division sport fishery enhancement program is a major contributor to the economy and is currently valued at least \$10 million per year.

Commercial Fisheries Enhancement Program

Commercial fishermen benefited substantially from returns of hatchery-produced fish. In some areas, returns of wild fish were so poor that harvests depended almost completely on hatchery production.

In Prince William Sound, wild pink salmon returns were nearly absent. Commercial harvests relied on FRED Division and PNP hatchery returns, including returns to Main Bay and Cannery Creek from fry released by FRED Division in 1987. Pink and chum salmon returning to Main Bay Hatchery contributed an estimated \$2 million to the commercial fishery. Sockeye salmon returning to Gulkana Hatchery contributed an estimated \$1.3 million to the commercial fishery.

In lower Cook Inlet, returns from FRED Division production contributed 71% of the 1988 harvest and over half of the \$8.25 million ex-vessel value. Over 90% of the pink salmon caught in lower Cook Inlet had been released from Tutka Lagoon Hatchery into Tutka and Halibut Cove Lagoons. Approximately 80% of the lower Cook Inlet sockeye salmon harvest were returning to Chenik and Leisure Lakes from fry released from the Crooked Creek Hatchery. Lake fertilization is also boosting production from these systems. The total estimated ex-vessel value of FRED production in lower Cook Inlet in 1988 was \$4.6 million.

In northern Cook Inlet, an estimated 90% of the sockeye salmon returning to Big Lake were of hatchery origin. Approximately 30,000 were caught in a terminal fishery to harvest surplus fish bound for Big Lake.

Hatchery production around Kodiak Island was substantial. At Kitoi Bay Hatchery, 737,000 pink salmon returned; of these, 307,000 were harvested by commercial fishermen and 300,000 were sold for cost recovery. An estimated 50,000 sockeye salmon returned to upper Thumb River, part of the Karluk Lake system that continues to recover and contribute to commercial fisheries.

Returns to Cold Bay on the Alaska Peninsula contributed an estimated 150,000 chum salmon to the commercial fishery worth over an estimated \$1 million. This gave a substantial benefit to the local economy that would have otherwise been lost.

In interior Alaska, an estimated 75% of 20,000 chum salmon returning from Clear Hatchery releases were harvested by commercial and subsistence fishermen. Nearly 1,000 coho salmon also returning from Clear Hatchery releases were caught in commercial and subsistence fisheries.

In arctic Alaska, over 8,000 chum salmon returning to Sikusuilaq Springs Hatchery were caught in the commercial fishery. In addition, approximately 1,000 hatchery-produced chum salmon were caught in the subsistence fishery.

In southeast Alaska, over 70,000 chum salmon returning to Snettisham Hatchery were taken by fishermen for a record catch produced by this facility. Sockeye salmon produced the second-largest number of returns to FRED projects in Southeast in 1988. The commercial troll fleet harvested over 6,000 Crystal Lake Hatchery chinook salmon with almost 70% of that catch occurring in the winter fishery.

Contracting of Hatchery Operations

During fiscal year (FY) 1988 the FRED Division worked with several regional aquaculture associations in the southcentral area to develop contracts that would facilitate the operation of state fish hatcheries by the private sector. Based on legislation drafted and adopted early during the 15th Legislative Session, the FRED Division was able to negotiate directly with the regional aquaculture associations and implement the operational contracting of two state hatcheries to regional associations.

On July 1, 1988 Prince William Sound Aquaculture Corporation (PWSAC) and Cook Inlet Aquaculture Association (CIAA) assumed operational responsibility for the Cannery Creek and Trail Lakes Hatcheries, respectively. Cannery Creek Hatchery, a 100 million-egg production facility, will continue to produce pink salmon for commercial seine and gillnet fisheries in Prince William Sound. A production increase to approximately 140 million eggs was completed in the fall of 1988. Trail Lakes Hatchery, a multi-species central incubation facility near Moose Pass, will continue to be operated primarily as a sockeye and coho salmon hatchery to enhance commercial, sport, and personal-use fisheries in the Cook Inlet area. Additional salmon production will be implemented as fisheries enhancement planning for the Cook Inlet area is completed.

Under the terms of the contracts developed through negotiations with the regional associations, the hatcheries and associated equipment remain the property of the State of Alaska, and the regional aquaculture associations, as contractors, are responsible for all aspects of operation, upkeep, and long-term maintenance. Any capital improvements must be reviewed and authorized by the FRED Division and the Department of Transportation and Public Facilities regarding projects that exceed ADF&G's delegation

of authority for construction projects. The associations are issued PNP hatchery permits which enables them to harvest salmon returning to the hatcheries in order to generate operational funds, and the operation of the facilities are regulated by statutes governing the PNP Program. Production numbers and species selection are determined in accordance to the respective regional comprehensive salmon plans approved by the Commissioner of ADF&G.

In addition to the operational contracting of Cannery Creek and Trail Lakes Hatcheries, a cooperative agreement between FRED Division and the Kodiak Regional Aquaculture Association (KRAA) was developed for the joint operation of the Kitoi Bay Hatchery near Kodiak. Under terms of the agreement, the division continues to operate the facility with funding assistance from KRAA. Operational revenue is generated through the sale of salmon returning to the hatchery. Under the present agreement, KRAA provides approximately 50% of the operational funding for the hatchery. Kitoi Bay is a multi-species hatchery producing over 100 million pink, chum, and coho salmon annually.

Fish Habitat Enhancement and Improvement

FRED Division initiated a new series of projects in 1988 that are designed to enhance fish production in Alaska through the approach of rehabilitating and improving fish habitat in streams. Individual project sites were developed in Anchorage and near Nome, Kodiak, Palmer, Yakutat, and Ketchikan. The objective of this project is to manipulate the habitat so that the total long-term fish productivity of the system is improved without requiring a fish-stocking program.

Campbell Creek is a medium-sized stream that meanders through Anchorage. It supports runs of coho, chinook, and pink salmon and Dolly Varden char. Much of the riparian habitat is maintained by the Municipality of Anchorage as greenbelts or nonurbanized areas. Several reaches, however, have been modified by urban activities or degraded by overuse, so fish rearing and resting habitat has been lost. FRED Division, together with the Habitat and Sport Fish Divisions and the Municipality of Anchorage, has developed plans to restore or create fish habitat and to demonstrate how the degradation process can be minimized or reversed.

A 680-m reach of Campbell Creek was selected for this enhancement work. Physical and biological surveys have been completed. Streambank stabilization measures and fish habitat improvement devices and locations have been designed. Currently, maps are being drawn, habitat alteration permit applications are being completed, and the contract is being written so that work can be completed by July 1989.

Rainbow trout spawning habitat will be expanded and improved by installing new spawning-sized gravel in a small stream tributary to Stephan Lake near Palmer. The stream has been surveyed and the gravel will be deposited before spawning begins in the spring of 1989.

In the Nome area, FRED Division is cooperating with the Bureau of Land Management to develop a stream habitat improvement project to repair damage to salmon spawning and rearing habitat that was degraded by mining and road construction activities. Surveys have been completed and work is being scheduled.

Fish migration near Kodiak in Horse Marine Creek near Olga Bay is obstructed by a short but steep waterfall. Fish spawning and rearing habitat is abundant above the falls. It has been assumed that fish passage could be improved through blasting to create steps and pools in the rock ledge. During 1988 a survey team examined the site to develop the enhancement plan. The team concluded, however, that the rock was not appropriate for blasting. The preliminary work plan entailed designing a project that would be implemented by the local user group. After completing the feasibility survey, a conceptual design for a fishpass was completed. The project is now "on hold" until sufficient funding can be appropriated to construct and install the fishpass.

Cooperative Program with the Department of Corrections

In 1987 the FRED Division entered into an agreement with the Department of Corrections to develop an inmate work program to use minimum-security inmates for on-site, nonskilled labor at FRED Division hatcheries. The program was continued in 1988 and inmates were used at two hatcheries in the region. Approximately 23 months of inmate labor have been provided to date. Several building maintenance and upgrade projects were completed at the Kitoi Bay and Main Bay Hatcheries. Overall, the program has been very successful. The Department of Corrections established a comprehensive and effective screening process for selecting inmates for the program. The laborers have been hard-working, well-behaved and, generally, more skilled than was originally anticipated. The FRED Division plans to continue the program in 1989.

International Assistance

A request by the Chinese Government and subsequent approval by Governor Cowper and Commissioner Collinsworth initiated a trip by FRED Senior Fish Culturist Dave Gaither to China 17 August-2 September 1988. The purpose was to provide salmon culture technical support for the new salmon hatchery program in the northwest Heilongjiang Province. A previous salmon hatchery program, 1956 to 1972, failed because of noncooperation of return user groups (Russia) and poor return rates. Recently, the Soviet Union and Japan have participated in a cooperative effort with the supply of eyed eggs to these new facilities. The Suifenhe River Hatchery at 2.0 million pink salmon eggs and the larger Heilongjiang River Hatchery at 6 million chum salmon eggs are both up-river facilities, 185 km and 970 km from the sea, respectively. Many questions were asked concerning fry releases and hatchery incubation and rearing procedures.

The original understanding was that involvement would center around on-site instructions and consulting during adult salmon collection, egg fertilization, and hatchery egg seeding, but due to time frames, travel distances, and other considerations, the involvement would be to give lectures at the Heilongjiang Science Institute in Harbin. Two central lecture themes were requested: (1) life history of pink and chum salmon and hatchery construction in Alaska; and (2) hatchery culture of salmon from egg collection to returning adult. These were broken into nine parts: (1) introduction; (2) adult collection; (3) egg take and fertility; (4) incubation; (5) rearing; (6) fish food; (7) marking, tagging, and evaluation; (8) release; and (9) hatchery design.

The salmon culture program in China is now struggling to get off the ground, and their need for technical advice is apparent. The sponsorship of a few of their people to travel

to Alaska and become involved in a hatchery training program will be of great benefit to them. A request has been made to return next year for additional on-site advice and training.

TECHNOLOGY AND DEVELOPMENT

Planning for sockeye salmon enhancement in Southeast, primarily northern Southeast, has been a major project for the Chief of Technology and Development. Central to this effort was the allocation to projects of the monies received via the U.S./Canada Pacific Salmon Treaty, the central incubation facility for sockeye salmon at Snettisham, and the Turner Lake sockeye salmon stocking project. One spinoff of the latter project was a requirement for mass marking of sockeye salmon fry to be planted into Turner Lake. This has led to establishment of a modest cooperative research agreement between the FRED Division and the National Marine Fisheries Service, Auke Bay Laboratory for work on chemical markers and their detection in sockeye and pink salmon. The development of new tools for the mass marking of the "non-smolt" salmon species, sockeye, pink, and chum salmon, will prove extraordinarily useful for enhancement managers and for fishery managers.

The ecological models developed out of FRED Division's lake work that are used for predicting biological carrying capacity are now being used as a second way in which to set escapement goals for sockeye salmon-producing lakes. Hopefully, more and more commercial fishery managers will discover this new approach and factor it into their array of techniques. Once again, this example demonstrates that the field research conducted within the division is strictly applied research aimed at helping resource managers do their job.

This winter during January, the Pathology Section will conduct two consecutive, week-long workshops on fish health. The workshops are directed at fish culturists working in private and public hatcheries. Hatchery employees are the first line of defense against fish disease so it is especially important that they receive "hands-on" training regarding the maladies that can overcome finfish and shellfish.

Coded-Wire Tag Recovery Laboratory

In 1988 the Coded-Wire Tag (CWT) Recovery Laboratory processed 25,000 heads from adipose-clipped salmon and steelhead trout sent to the lab from as far away as Kotzebue Sound. The level of activity at the lab mirrored the record-setting summer chinook salmon troll fishery and the alternating open and closed periods of the coho salmon fishery in Southeast. The number of heads processed this year is 7,000 less than processed in 1987. Major differences between 1986 and 1987 tagging programs produced fewer tagged fish to be recovered in 1988 in Prince William Sound. The coho salmon run failed to materialize in southeast Alaska. The record catch of chinook salmon in last year's winter troll fishery reduced the number of chinook salmon that could be taken in the summer troll fishery. Sampling a reduced catch of both species produced fewer tagged fish for processing.

The majority of work continues to be from southeast Alaska, but samples outside of Southeast amounted to 19% of this year's work. Production figures do not include the processing of approximately 800 tags from fry and smolts recovered throughout the state. The species and sample source composition of the workload is shown in Table 5.

Table 5. Coded-Wire Tag Recovery Laboratory sample source composition by species.

	Commercial	Cost recovery	Sport	Rack and escapement	Other	Total
Chinook	8,000	850	1,300	1,550	0	11,700
Chum	1,400	350	0	850	0	2,600
Coho	4,400	600	950	2,200	50	8,200
Pink	800	350	0	250	0	1,400
Sockeye	650	0	0	350	0	1,000
Steelhead	50	0	50	0	0	100
TOTAL	15,300	2,150	2,300	5,200	50	25,000

The lab's ability to consistently meet processing objectives permits fishery managers to take in-season advantage of the hatchery add-on clause of the U.S./Canada Pacific Salmon Treaty. During the 1988 fishery accounting year (1 October 1987-30 September 1988), Alaskan hatcheries contributed 30,600 chinook salmon (11.0% of the catch) to the commercial and sport harvests in southeast Alaska. This estimate is reduced by 5,000 fish (base hatchery harvest) and by 1,700 fish (estimated error risk adjustment) resulting in a catch ceiling of 286,900 chinook salmon. For the first time this year the lab generated estimates of hatchery contribution to southeast Alaska's sport fisheries.

Data are made available to many users in a variety of formats, including 24-hour on-line access, hard-copy reports, floppy disks, and 9-track tapes. Each week a series of standard reports are generated, printed, and distributed to seventy users representing many organizations. Programs to generate reports outlining sport fishery sample and catch statistics and contribution estimates to those fisheries were written. Enhancements to existing data entry and report generation programs increased the utility of reports and guaranteed entry of more accurate data. Release and recovery records are distributed coastwide as hard-copy reports to each agency and on 9-track tape to the Pacific Marine Fisheries Commission (PMFC). The lab responded to approximately 500 requests for special purpose reports. These requests require anywhere from several minutes to several days of CWT Lab staff time to process. Each individual commercial and sport fisherman participating in the recovery program is sent a letter documenting the origin of each adipose-clipped fish sampled from his catch. This year 2,300 letters were sent to sport fishermen and 1,000 letters were sent to commercial fishermen.

The CWT Lab received U.S./Canada funds to reconstruct sampling and recovery data collected prior to 1980. Data from 1978 and 1979 have been reworked but await final editing. Currently, all data since 1980 are accessible in the same format. By the end of 1989, the CWT database will include all CWT data collected since 1975.

The final report of the Pacific Salmon Commission's Working Group on Mark Recovery Databases was accepted by the Data Sharing Committee this fall. The 150-page report defines a complete mechanism for making available to coastwide fisheries managers a standardized, consistent CWT database on their own computers. The task was a

technical challenge because the data-sharing mechanism had to accommodate about 40 agencies using nearly as many different computer systems. A paper entitled, "Coded-Wire Tag Data Coding and Organization for a Coastwide Data System," was written and presented at the International Symposium and Educational Workshop on Fish Marking Techniques. This report will be published in the meeting's proceedings. This successfully ends a two-and-one-half-year commitment to the project. Alaska's release data have been transmitted to PMFC in accordance with the new formats and protocol. Historic recovery data will be transmitted by the end of the year.

Information for all fish tagged in Alaska has been collected, edited, entered onto the computer, and forwarded to PMFC. Sample forms and instructions were rewritten prior to the 1988 season. CWT release information forms and instructions are being improved. Lab procedures are being formalized and documented.

Fishery management concerns associated with large-scale hatchery production of pink salmon in Prince William Sound has necessitated implementation of a massive evaluation program. In 1988 nearly 1 million pink salmon were tagged in Prince William Sound. After several meetings and a lot of work, an evaluation-planning process has been established to facilitate the successful implementation of future tagging and sampling programs in Prince William Sound.

Limnology/Lake Fertilization

Field Activities:

Limnology Section personnel conducted field-research activities on many Alaskan and Canadian lakes. Much of this activity centered both on rearing-capacity studies for juvenile sockeye salmon and on enhancement techniques. The enrichment project at McDonald Lake was continued. In 1988 the highest-ever biomass of rearing sockeye salmon juveniles for McDonald Lake was observed. Research projects involving sockeye salmon fry plants at Klawock Lake, Salmon Lake on the Karta River system, Neck Lake, and at Patching and Heckman Lakes in the Naha River system were continued. Sockeye salmon evaluation continued at Bakewell/Badger Lakes, and funding was obtained from the USFS and the Southern Southeast Regional Aquaculture Association for evaluating the Virginia Lake project. Funding for all these projects was coordinated as cooperative projects with the USFS or as part of the U.S./Canada Pacific Salmon Treaty. Specifically, these projects involved coded-wire tagging of wild sockeye salmon smolts at Klawock Lake, the application of nutrients to the surface of McDonald Lake, the development of hydroacoustic techniques to measure juvenile sockeye salmon densities at Bakewell/Badger, Patching, Heckman, Klawock, Salmon, McDonald, and Margaret Lakes, and the taking of limnology samples at all of the above-mentioned systems.

In northern Southeast, field research was conducted at Chilkat and Chilkoot Lakes as part of a rearing-capacity study to determine management options for the sockeye salmon populations. Similar projects were also done at Crescent Lake, Mountain/Situk Lakes (Yakutat), and at Tatsamenie Lake on the Canadian side of the Taku River. Funding for all these projects was shared between the ADF&G, Commercial Fisheries Division, the Northern Southeast Regional Aquaculture Association, and as part of the U.S./Canada Pacific Salmon Treaty. The objective of this work is to determine management options for these sockeye salmon populations. These projects included the taking of limnology samples at each of these systems over the seasonal cycle of sockeye

salmon production, and the development of hydroacoustic techniques to measure juvenile sockeye salmon densities.

In Southcentral, the section conducted field-research activities on Tustumena, Hidden, Packers, Leisure, English Bay, and Chenik Lakes in Cook Inlet, on Summit Lake near Glennallen, and on Karluk, Frazer, and Spiridon Lakes on Kodiak Island. These activities were directed toward the evaluation of sockeye salmon juvenile outplants on Hidden, Summit, and Tustumena Lakes, the nutrient enrichment of Frazer and Karluk Lakes, the assessment of both enrichment and juvenile outplants at Packers, Leisure, and Chenik Lakes, and the rearing-capacity studies at Spiridon and English Bay Lakes. In addition, sockeye salmon juvenile outplant densities were determined for Leisure, Kirschner, Port Dick, Paint River, Hazel, and Chenik Lakes which for the most part were fishless systems. The research activities included smolt enumeration at Hidden and Tustumena Lakes, a sockeye salmon fry entrance timing study at Tustumena Lake, the development of hydroacoustic techniques to measure densities of rearing juvenile sockeye salmon on each of the above-mentioned lakes, and the taking of limnology samples over the seasonal rearing cycle. The FRED area biologist in Kodiak conducted most of the limnology sampling work on Frazer, Karluk, Spiridon, Afognak, and Akalura Lakes. Funding for these projects was shared between the Cook Inlet Aquaculture Association, the Kodiak Regional Aquaculture Association, the lower Cook Inlet Seiners Association, the USF&WS, and the ADF&G, Commercial Fisheries Division.

The Limnology Section participated in the sockeye salmon enhancement work on seven lakes in Prince William Sound through development of sockeye salmon stocking densities. Also, two unnamed lakes are undergoing prestocking and enrichment studies, and a rearing capacity study was just initiated on Coghill Lake, the sound's best sockeye salmon system. Funding for these studies was shared with the USFS.

Information Transfer:

The Limnology Section also continued its unmatched record of presenting the results of its work for peer review at scientific conferences and in technical reports and international journals.

Limnology Laboratory:

The Limnology Section has centralized laboratory facilities in Soldotna. Water-quality samples are sent to this facility from projects located throughout the State of Alaska and from Canada.

During 1988 the Limnology Laboratory conducted nearly 22,000 individual analyses on water-quality and zooplankton samples collected from 50 lakes statewide. In addition to the laboratory services provided to various state and federal agencies as well as the regional PNP groups for salmon enhancement, lab staff have contracted work from both the Oregon State University (OSU) and the University of Alaska--Fairbanks (UAF). Samples analyzed for OSU were collected from Surprise Lake, situated within the Aniakchak Caldera of the Aniakchak National Monument, as part of a lake and stream inventory program. Authorization to receive funding for this work during FY 89 (\$3,050) is proceeding through a revised funding program. Samples analyzed for UAF are part of a research program concerning the metabolism of marine nitrogen. Processing these samples required developing a semiautomated method for determining urea

nitrogen. Quality assurance for laboratory analyses was maintained as evidenced by the results of the 1987 U.S. Geological Survey (USGS) Water Reference Program.

All nutrient and chlorophyll a samples collected during the 1987 field season have been processed and staff are currently in the middle of analyzing the USGS reference samples in preparation for the 1988 nutrient work. Once again, staff anticipate completing the 1988 nutrient, chlorophyll a, and particulate carbon samples by the end of the fiscal year; however, particulate nitrogen and phosphorus samples will backlog. In addition, a record number of zooplankton samples were analyzed this year and, as a result, two people working full-time analyzing samples is necessary to process the entire zooplankton sample inventory by the end of the fiscal year.

In addition, the Limnology Laboratory is now equipped with three personal computers installed with various word-processing, database, statistical, and graphics software. The lab now has on computer files complete water-quality data for over 50 lakes. This database contains detailed water quality and nutrient information on all lakes sampled by date. As such, limnological information can now be easily sent and received through modem links and soon will be available through a facsimile machine.

Finally, the Limnology Section personnel were reclassified into the newly established limnology series. This series has been designed to allow limnologists to be recognized as a distinct discipline, separate, even though closely aligned, from the fishery biologist job classes.

Pathology

During 1988 the pathology staff handled 202 cases (requests for analytical services) and conducted approximately 23,000 individual laboratory procedures in support of this case work. Inspections were conducted at 43 enhancement facilities across the state and 226 fish transport requests were reviewed. This workload is expected to increase given the interest in and recent passage of legislation allowing for shellfish and sea-vegetable mariculture and aquatic freshwater farming of finfish.

In 1988 infectious hematopoietic necrosis virus (IHNV) monitoring encompassed 4,560 tests or titrations to determine prevalences and virus titers. These data include mostly routine monitoring of stocks for hatchery use and assessment of IHNV risk management. Other of these data were generated for research to answer basic questions of IHNV biology in natural sockeye salmon stocks using a large database. Consequently, a database has been developed for ripe and postspawned sockeye salmon with IHNV titers and prevalence in both ovarian fluids and tissues of male and female anadromous sockeye salmon and kokanee from 1975 through the present with over 20,171 individual titrations encompassing 96 wild and hatchery stocks. From this database, statistics such as average virus prevalence and titer per stock or statewide are available for predictive risk management and research purposes. Two manuscripts (copies on request) regarding the IHNV experience and success of the FRED Division's farming-around approach are now in review for publication in two professional journals.

No IHNV workshop was held in 1988. It is noteworthy that IHNV is no longer a significant enough problem to merit an IHNV workshop every year, but instead was a minor topic this past year in a FRED Division workshop addressing the basic culture of sockeye salmon that is now the paramount issue.

The enzyme-linked immunoabsorbent assay (ELISA) for detection of bacterial kidney disease (BKD) was performed using FRED equipment and fish samples in the Juneau lab under the guidance of two USF&WS personnel that pioneered the technique in fish diagnostics. After repeated setbacks in procurement of the necessary biological reagents that would allow FRED to proceed with the assay on its own, a commercial vendor now has the necessary products which should permit the assay to be used in the 1989 screening of broodstock samples. Preliminary assays will be run beforehand this winter using kidney samples from the 1988-brood samples that have been read using fluorescent antibody techniques (FAT). A correlation should emerge regarding FAT values and optical density readings from ELISA.

The long sought-after CIP monies to purchase a reconditioned transmission electron microscope (TEM) for the Juneau Pathology Laboratory was awarded by the 1988 Legislature. A Philips EM 300 was purchased and is now installed. This instrument represents a powerful complement to the diagnostic capabilities of the fish health program.

Bitter crab studies continue regarding life cycle and distribution of the dinoflagellate agent in Southeast Tanner crabs. Of particular significance is the discovery of this disease in the Bering Sea opilio Tanner crab fishery. This is a new host species and extends the known distribution of this disease. The potential negative impact to the multimillion dollar opilio fishery is a sobering consideration.

The establishment of the new Juneau Pathology Laboratory is complete. This has been an immeasurable success surpassing all expectations. The Juneau lab has absorbed about one-third of the entire pathology caseload, primarily involving BKD analyses in chinook and coho salmon broodstock screening and in diagnostic requests for all Southeast hatcheries and other state or federal agencies and facilities. Now at full throttle, the Juneau lab should be able to handle one-half of the caseload next fiscal year. Additional work this past year included preliminary Bering Sea opilio Tanner crab studies and BKD and virus work for New Zealand chinook and sockeye salmon programs. Dedicated in a ceremony by the Governor, ADF&G Commissioner Collinsworth, and Juneau Senator Jim Duncan in August, the lab is absolutely state-of-the-art in its capabilities, ranging from routine investigations in bacteriology, virology, histology, parasitology, and serology to sophisticated ELISA and TEM applications. The strategic location in Southeast has been a success in overcoming past logistical problems of shipping diagnostic samples to Anchorage and receiving them in optimum condition required for processing.

The FRED Pathology Program has been striving to provide Alaskan oyster growers with a list of disease-certified broodstock sources for the Japanese oyster in the Pacific Northwest. At present, three such facilities have been certified and include: Wescott Bay Sea Farms, Friday Harbor, Washington; Pacific Mariculture, Inc., Moss Landing, California; and Innovative Aquaculture Products, Lasqueti Island, British Columbia, Canada. However, the supply of seed from these vendors has often not been adequate for Alaskan growers regarding spat numbers, too small of a size, and unavailability early in March and April. Other potential sources for certified spat are being investigated. More specifically, a proposal to export Alaskan oysters to Oregon for spawning with subsequent setting at a facility in California for sale of seed back to Alaskan growers is being evaluated. The advantages would be in the use of a cultured Alaskan stock and an unlimited supply of quality and reasonably priced spat from one source. This past

year, 20% of the fish transport requests and 13% of the caseload for both labs have involved oyster transports.

Genetics

The direction of the Genetic Program was changed during 1988. The Genetic Laboratory, which has been a major part of the Genetic Program, was closed. In addition to the existing work on the Genetic Policy, review of fish transport permits, and review of PNP hatchery permits and alteration requests, there will, in the future, be greater involvement in project development and review of existing enhancement programs for possible genetic consequences. There is also to be the development of a genetic extension service with the objective of making genetic information more accessible to managers. A high priority of this service will be production of a genetic handbook. Finally, research on Swanson River rainbow trout at the Fort Richardson Hatchery, Broodstock Development Center (BDC), will continue.

The genetic selection, initiated in 1986 on the Swanson River rainbow trout broodstock at the BDC, continued in 1988. Families are selected for characteristics related to growth and survival. Selection is also being carried out to shift spawning time from early May to early March. Egg takes in the spring of 1988 produced the third year-class of select families. In the spring of 1989, the first select-family lots will be produced from selected adults. This will provide the first opportunity to evaluate progeny of select fish. The data on these lots will provide preliminary information on the efficacy of the selection program. Plans are being developed for evaluating the performance of these fish.

Experiments have been initiated in 1988 to develop an all-female population of rainbow trout. The basic methods have been reported in the literature and will be adapted for use at the Fort Richardson Hatchery. There are two basic steps in the procedure. The first is the isolation and sex reversal of genetic females. When these sex-reversed females are mated to normal females, they produce 100% female progeny. Experiments in the development of triploidy (sterile) fish were also initiated in 1988. Sexual maturation results in increased mortality, slowing of growth, and reduction of flesh quality. This can be thought of as a necessary economic burden; however, in some limited applications, this burden could, where appropriate, be eliminated by stocking all-female triploidy fish. The stocking of triploidy all-female populations of rainbow trout is expected to be limited in scope but can be economically important in some select applications.

Tissue samples were collected in 1987 by ADF&G personnel from sockeye salmon spawning in seven Tustumena Lake tributaries. The purpose of this study was to determine if genetic differences could be detected between the spawning populations. Preliminary electrophoretic analyses of these tissues by the USF&WS, Genetics Laboratory in Anchorage, detected no genetic difference among these samples. Samples were again collected in 1988. Results are not yet available.

Fisheries Library

During 1988 the Fisheries Library continued to function with financial support from the ADF&G, FRED, Commercial Fisheries, and Sport Fish Divisions. The current funding

formula was based on respective FY 88 usage-statistic percentages multiplied by the library's total FY 89 budget. For FY 90, the three divisions have agreed to readjust funding percentages based on actual usage statistics from the previous year.

Late last year there was renewed discussion within the department concerning consolidation of the library with the fisheries collection at the University of Alaska--Southeast (UAS). It was hoped that an agreement could be reached and the move could take place upon completion of the new UAS Library Building. However, since the initial discussion, the university's fisheries cover program has been transferred to the UAF campus. Additionally, UAS has placed a library assistant position at the Auke Bay Fisheries Laboratory Library to take care of its immediate literature needs. Because of these two developments, the university believes there is no need to merge collections.

For the first ten months of the year, the Fisheries Library received a total of 2,701 requests for information. This is about average compared to previous years' totals. Percentages by division are slightly different than those used to determine funding for FY 89; while the Commercial Fisheries and FRED Divisions' usage dropped, the Sport Fish Division's usage increased. Use by other divisions within the department and outside requests have remained about the same compared to previous years.

Mariculture

For the years 1987 and 1988, FRED Division mariculture activities have focused to a large extent on the Kodiak scallop feasibility project, a cooperative effort between the Japanese Overseas Fishery Cooperation Foundation (OFCF), the Kodiak Area Native Association (KANA), and ADF&G. KANA is taking an increasingly important role in the Kodiak work, addressing the need for resource-based economic development for Kodiak's rural communities. A similar cooperative project involving the University of Alaska, ADF&G, and OFCF is now underway at Sitka, testing the feasibility of kelp culture.

One of the primary objectives of this work is technology transfer into Alaska. FRED Division's mariculture coordinator is now relaying the information and techniques from this project as well as other sources into appropriate areas of the state. Alaskan communities are interested in the potential of scallop seed collection and culture and oyster and mussel culture, as well as some new areas, such as sea vegetable and sea urchin culture. Centers of interest range from Ketchikan through Sitka and Petersburg--Wrangell to Juneau in Southeast, Yakutat, Cordova, and villages such as Chenega in Prince William Sound and the Kachemak Bay area in Cook Inlet. There is even a freshwater farm in Fairbanks.

Applied research needs directed at relieving some of the bottlenecks to responsible mariculture development in Alaska are being explored by the mariculture coordinator and others on a cooperative basis. This work involves development of cost models for farms, establishing prototype hatcheries for oysters and rock scallops, and improving technology for farming processes.

Engineering Services

Engineering services provided by FRED Division staff consisted of consulting, design, contract, and project management both within and outside FRED Division.

Within the FRED Division, the following work was accomplished during 1988:

- Fish holding raceway design and siting at Clear Hatchery.
- Fry start tank design for Clear Hatchery.
- Gunnuk Creek Hatchery review. Public Health Service construction impact on hatchery operation.
- Snettisham sockeye salmon CIF preliminary planning.
- Gastineau Hatchery plan review.
- Crystal Lake Hatchery upgrade.
- Snettisham Hatchery--Interface with the U.S. Army Corps of Engineers regarding Carter Lake tap.
- Survey and siting for:
 - a. Pillar Creek sockeye salmon module.
 - b. Main Bay sockeye salmon maturation complex.
 - c. Tutka Lagoon sockeye salmon module.
 - d. Design sewage system (holding tank) for Big Lake spawning shed.
- Roofing renovation for Tutka Lagoon Hatchery.
- Electrical renovation for:
 - a. Big Lake Hatchery.
 - b. Main Bay Hatchery turbine load banks.
- Drafting support.

Outside the FRED Division, the following projects were completed in cooperation with other divisions within ADF&G.

- Cost estimate and proposed design for the King Salmon office building roof repair.
- Design and construction for:
 - a. Chitna office module.
 - b. Susitna landing double-vaulted toilet.
 - c. Chignik sewage system renovation.
 - d. Delta storage yard--chain-link fence.

- ° Design for:
 - a. Tok office roof replacement and electrical renovation.
 - b. Fairbanks office handicap access.

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- Kyle, G. Trail Lakes Hatchery salmon production, the Bear Lake sockeye salmon proposal, and Resurrection Bay chinook and coho salmon. Seward Chamber of Commerce, Seward, Alaska.
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THE PRIVATE NONPROFIT HATCHERY PROGRAM

Background

The 1974 Alaska State Legislature authorized the Commissioner of ADF&G to issue permits to PNP corporations for the operation of salmon hatcheries for ocean ranching. The intent of the program was to allow private ownership of salmon hatcheries that would contribute to the state's salmon fisheries. The cost of constructing and operating these hatcheries was to be derived from the sale of a portion of the returning fish.

The PNP Program, administered by the ADF&G, FRED Division, in cooperation with the department's fisheries management divisions, carries out the statutory and regulatory responsibilities pertaining to public and private aquaculture in Alaska.

The PNP Program is responsible for:

- comprehensive and strategic salmon production planning;
- administration of the permitting process for PNP salmon hatcheries and scientific/educational aquaculture programs;
- administration of the permitting process for private shellfish and aquatic plant farms;
- development of annual operations management plans for all public and private salmon hatcheries;
- administration and coordination of the statewide fish and shellfish transport permit systems;
- coordination of technical assistance to PNP hatcheries;
- coordinating the development of and ADF&G relations with qualified regional aquaculture associations; and
- administration and coordination of the U.S./Canada fisheries enhancement program.

Regional Associations

Regional associations are comprised of representatives of commercial fishermen and other user groups in the region, including sport fishermen, subsistence fishermen, and members of local communities. Seven regional associations have been formed:

1. Southern Southeast Regional Aquaculture Association (SSRAA)
2. Northern Southeast Regional Aquaculture Association (NSRAA)
3. Prince William Sound Aquaculture Corporation (PWSAC)

4. Cook Inlet Aquaculture Association (CIAA)
5. Lower Yukon/Kuskokwim Regional Aquaculture Association (LY/KRAA)*
6. Bristol Bay Regional Aquaculture Association (BBRAA)
7. Kodiak Regional Aquaculture Association (KRAA)

These associations cooperate with the department in developing and maintaining regional salmon production plans and in the implementation of various salmon rehabilitation and enhancement activities.

Comprehensive and Strategic Planning

The 1976 law authorized the Commissioner to designate regions of the state for the purpose of enhancing salmon production. This same law also established the formation of regional planning teams (RPT) to develop regional salmon plans. Each RPT consists of six voting members, with three department personnel appointed by the Commissioner and three appointed by the board of directors of the appropriate regional aquaculture association. The duties and responsibilities of the RPTs have been mandated in a formal charter from the Commissioner. The responsibilities of the RPTs in developing regional comprehensive salmon plans, including provisions for public involvement in the planning process, are described in regulations. The Commissioner may also request the involvement of representatives of other federal and state agencies. The teams develop 20-year comprehensive plans, 5-year action (strategic plans), and perform annual plan update and maintenance.

The status of planning by region follows:

1. **Southern Southeast**

The southern Southeast regional plans have been approved, and the team is in the plan-maintenance process.

2. **Northern Southeast**

The northern Southeast regional plans have been approved, and the team is in the plan-maintenance process.

3. **Yakutat**

No formal salmon planning activities have occurred in Yakutat since the approval of the 20-year regional plan. The plan has been accepted by the USFS as a basis for the development of land management plans applicable to the region. Further planning by ADF&G will occur in 1989.

* Indicates inactive regional association

4. **Prince William Sound**

The Prince William Sound regional plans have been approved. The team has proceeded into the plan maintenance and updating process.

5. **Cook Inlet**

The planning team efforts in Cook Inlet are presently directed toward watershed system planning, with a goal of assessing the capacity of specific systems to sustain and maintain significant, naturally occurring salmon stocks. Watershed system planning also includes an identification of opportunities for salmon enhancement techniques designed to strengthen existing runs and create new runs. Provisions for user-group access and harvest preferences are given primary consideration in this planning process.

6. **Kodiak**

The Kodiak regional plans have been approved and the RPT has proceeded into the plan-maintenance process.

7. **Bristol Bay**

The Bristol Bay RPT has completed the comprehensive salmon plan for Bristol Bay. The plan is unique in that, unlike plans for other salmon production regions in Alaska, it does not concentrate on fisheries enhancement through such strategies as hatcheries; rather, it emphasizes maintenance and restoration of fish habitat and effective management practices.

8. **Lower Yukon/Kuskokwim**

No formal salmon planning activities are presently occurring in the lower Yukon/Kuskokwim region.

PNP Hatchery Funding

Since 1977 funding necessary for the implementation of salmon rehabilitation and enhancement activities by PNP corporations has been obtained primarily through the Fisheries Enhancement Revolving Loan Fund administered by the Alaska Department of Commerce and Economic Development (DCED). The loan program has gone through several modifications by the Legislature, the most recent occurring in 1987. The maximal loan amount available for an individual project is \$10 million, with a payback period of up to 30 years at approximately a 9.5% interest rate. Payments and accrual of interest on these loans can be deferred for 6 to 10 years. Loans for projects not endorsed by the regional aquaculture association may also have these terms, except that they are limited to a maximum of \$1 million. Loans are available for the purpose of planning, construction, and operation of salmon rehabilitation and enhancement projects, primarily salmon hatcheries. These loans are secured through collateral that may include returning hatchery fish and assessments of commercial fishermen.

A cooperative agreement between ADF&G and DCED addresses an interagency/review and coordination process regarding PNP hatchery permit applications, the alteration of

previously issued PNP hatchery permits, loans related to PNP hatchery operations, or other rehabilitation and enhancement activities.

Table 6 presents cumulative state loans secured by corporations for capital construction and operations, cumulative enhancement funds returned to the regional aquaculture associations, and revenue generated during 1988 by corporate sales of returning hatchery fish. Through December 15, 1988, \$63.6 million has been borrowed by PNP corporations. Another \$24.5 million has been generated through assessments. In 1988 PNP operators sold fish worth more than \$9.2 million to recover the cost of building and operating their hatcheries.

Program Implementation

The application procedures and standards for issuance of PNP salmon hatchery permits are defined by regulations issued in 1985.

These regulations require the completion of a management feasibility analysis by ADF&G prior to the submission of a PNP hatchery application. This analysis must be completed within 30 days after the applicant provides the information requested in 5 AAC 40.130 of the regulations. The application process takes approximately 135 days and is designed to comply with the coastal zone consistency review process established by the Governor's Office of Management and Budget.

The appropriate RPT reviews each application and makes a recommendation to the Commissioner on the application's compatibility with the regional comprehensive plan. The RPT uses review criteria that are defined in the PNP regulations.

PNP permit holders may request alterations of their permits and basic management plans, based on accumulated experience and changing conditions. The RPT may review and make a recommendation to the Commissioner on a permit alteration request. The team's review is conducted in accordance with performance standards identified in the PNP regulations.

Since the inception of the PNP Program, 29 salmon hatchery permits have been issued and three permits have been given up. Thirty-nine applications have been either denied or withdrawn from the process. The four most recent permits were issued to regional aquaculture associations for the operation of state-owned hatcheries in the Cook Inlet, Prince William Sound, Kodiak, and northern Southeast regions. The respective hatcheries involved were Trail Lakes, Cannery Creek, Kitoi Bay, and Hidden Falls.

Twenty-two of the permitted PNP hatcheries are in operation and 19 had returns of adult salmon during 1988. Currently, there are two applications for PNP hatchery permits under consideration. In addition, 36 scientific/educational permits for aquaculture research projects or school district aquaculture programs were issued in 1988 by the Commissioner. These permits are administered by the PNP Program.

Regulations and application forms for shellfish farm permits were developed in 1988. The regulations and application forms are currently undergoing modification to make them consistent with aquatic farm legislation passed in 1988. To date, seven shellfish farm permits have been issued and seven applications are under review. The number of

Table 6. Cumulative state loans and enhancement funds returned to associations (through December 15, 1988), and annual fish sales for 23 private nonprofit (PNP) hatcheries (through Dec. 31, 1988).

Region/Corporation (number of permits)	State Loans		Cumulative Enhancement Funds Generated through Assessments, Returned to Associations via Contract	Estimated Revenue From 1988 Sales of Fish Returning to Special Harvest Areas
	For Capital Construction	For Operations		
SOUTHERN SOUTHEAST				
Southern Southeast Regional Aquaculture Association-SSRAA (3)	\$9,093,000.00	\$2,848,942.00	\$9,218,123.88 (note 1)	\$1,276,554.48
Alaska Aquaculture, Inc.-AAI (1)	\$1,053,285.00	\$1,866,208.00	N/A	\$35,692.90
Meyers Chuck Aquaculture Association-MCAA (1)	\$10,000.00	\$0.00	N/A	\$4,070.16
NORTHERN SOUTHEAST				
Northern Southeast Regional Aquaculture Association-NSRAA (3)	\$2,724,265.00	\$1,638,496.00	\$5,163,557.83 (note 1)	\$1,087,051.00
Armstrong-Keta, Inc.-AKI (1)	\$1,252,145.00	\$1,451,500.00	N/A	
Burro Creek Farms, Inc.-BCF (1)	\$51,500.00	\$332,875.00	N/A	\$2,072.75
Douglas Island Pink and Chum Inc.-DIPAC (3)	\$6,879,000.00	\$1,782,000.00	N/A	\$68,688.10
Kake Nonprofit Fisheries Corp.-KNFC (1)	\$1,114,778.00	\$1,490,069.00	N/A	\$83,458.59
Sheldon Jackson College-SJC (1)	\$362,254.00	\$61,370.00	N/A	\$10,776.00
Tlingit and Haida Fisheries Development Corp.-THFDC (1)	\$1,464,000.00	\$89,860.00	N/A	
PRINCE WILLIAM SOUND				
Prince William Sound Aquaculture Corp.-PWSAC (3)	\$18,370,538.00	\$1,085,500.00	\$5,291,795.09 (note 2)	\$4,669,796.31
Valdez Fisheries Development Assoc.-VFDA (1)	\$3,193,830.00	\$3,250,543.00	N/A	\$1,547,929.74
COOK INLET				
Cook Inlet Regional Aquaculture Assoc.-CIAA (2)	\$1,438,881.00	\$683,369.00	\$4,811,251.20 (note 2)	\$5,141.54
KODIAK				
Kodiak Regional Aquaculture Assoc.-KRAA (1)	\$0.00	\$0.00	\$0.00 (note 2)	\$475,548.43
STATEWIDE TOTALS	\$47,007,476.00	\$16,580,732.00	\$24,484,728.00	\$9,266,780.00

note 1: 3% mandatory assessment tax collected collected from commercial fishermen.

note 2: 2% mandatory assessment tax collected from commercial fishermen.

applications is expected to increase dramatically with implementation of regulations by the Department of Natural Resources under the aquatic farm legislation passed in 1988.

Locations of operational PNP programs and remote release sites are illustrated in Figures 10, 11, and 12.

Hatchery Production

In 1988 PNP corporations estimated that 14.3 million adult salmon originally released as juveniles from corporate facilities were either harvested in common-property fisheries or returned to hatchery special harvest areas (Table 7). In Prince William Sound, returns to PNP hatcheries were estimated by the operators to have contributed over 8.7 million pink salmon to the commercial fishery. That contribution represents over 87% of the total harvest of pink salmon in Prince William Sound. SSRAA estimates its hatcheries at Neets Bay and Whitman Lake contributed over 544,000 chum, coho, and chinook salmon to the common-property fisheries in Southeast.

Statewide production data since 1975 for combined species, including adult returns and harvests, are presented in Table 8. Preliminary estimates by the PNP corporations indicate that common-property harvests of the 1988 return were over 10.2 million fish. This represents a decrease from 1987 in common-property harvests due primarily to a smaller return of pink salmon in Prince William Sound. Cumulative data for chum salmon produced by PNP corporations since 1975 are presented in Table 9. Similar data for sockeye, pink, coho, and chinook salmon are presented in Tables 10, 11, 12, and 13, respectively.

Egg takes and fry or smolt stocking are regulated by ADF&G through fish transport permits (FTP), which are administered by the PNP Program. During 1988 fry and smolt releases increased to 819 million juvenile fish, an increase of over 358 million (or 78%) from 1987 levels (Table 14). 1988 egg takes for PNP hatcheries totaled over 1.05 billion green eggs, up 178 million (or 20%) from 1987 levels. The largest egg take of 1988 was at Esther Lake Hatchery where over 288 million green pink, chum, coho, chinook, and sockeye salmon eggs were taken for incubation (Table 15). This was followed by the Valdez Fisheries Development Association's (VFDA) Solomon Gulch Hatchery with over 159 million pink, chum, and coho salmon eggs, and the PWSAC's Armin F. Koernig Hatchery with over 126 million pink salmon eggs. In southeast Alaska, the SSRAA took over 105 million eggs of all five species for its three hatcheries, the NSRAA took over 90 million pink, chum, coho, and chinook salmon eggs for its three hatcheries, and Douglas Island Pink and Chum, Inc. took over 67 million pink, chum, and coho salmon eggs for its three facilities.

Significant progress was made in initiating hatchery-originated sockeye salmon production from PNP hatcheries. Releases of juvenile sockeye salmon totaled 1 million in 1988. Sockeye salmon egg takes totaled 10.6 million eggs at PNP hatcheries in 1988. Significant increases in pink, chum, and coho salmon production also were made in 1988. Pink salmon egg takes increased by 27 million over 1987 levels as the facilities in Prince William Sound came up to capacity. However, pink salmon egg takes decreased by nearly 50% at Southeast hatcheries. Chum salmon egg takes increased by 35 million, or 58%, over 1987 levels; coho salmon egg takes increased by over 4.0 million, or 43%, over 1987 levels. Chinook salmon egg takes increased to an all-time high of 7.01 million eggs in 1988.

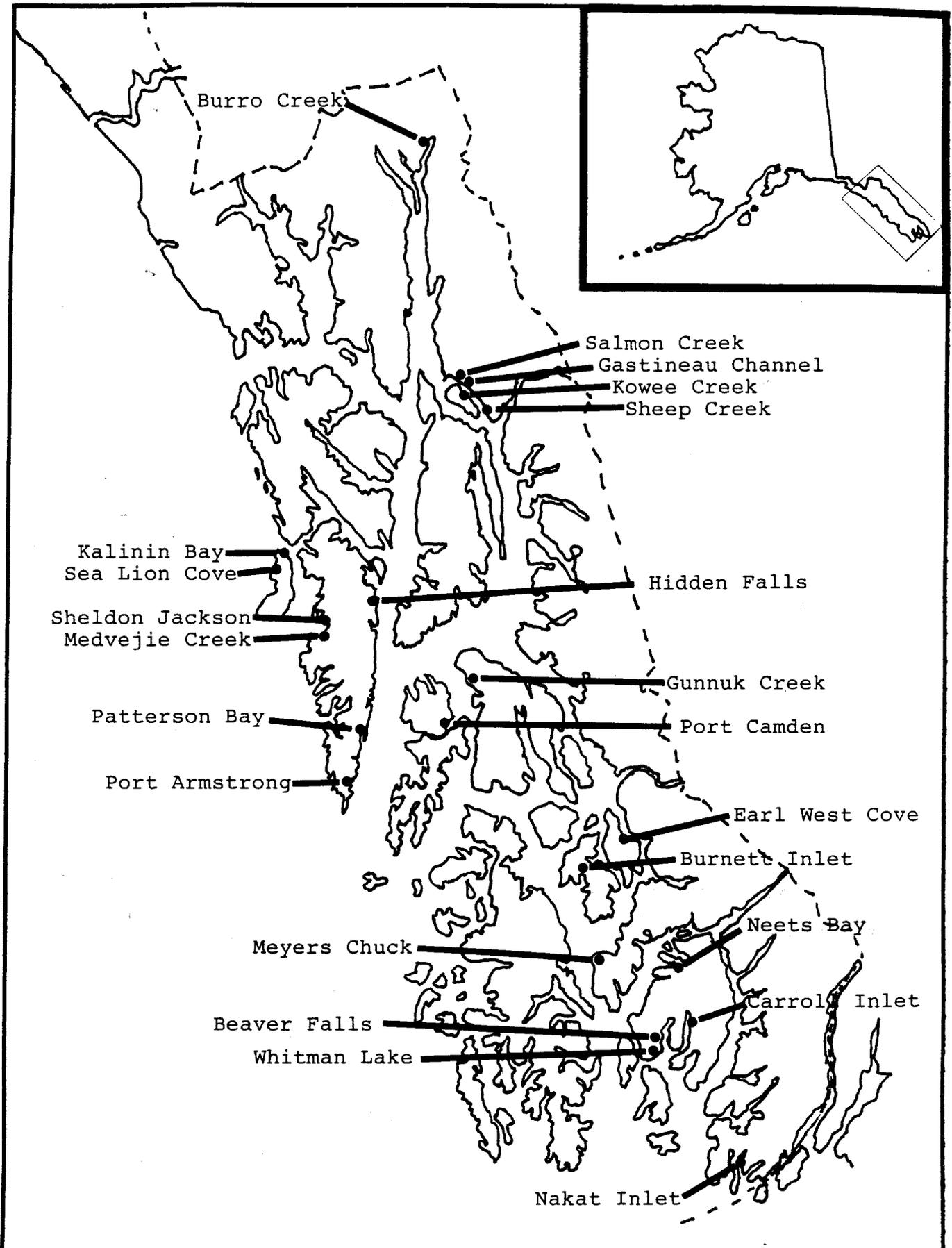


Figure 10. Locations of operational PNP hatcheries and remote release sites in southeast Alaska.

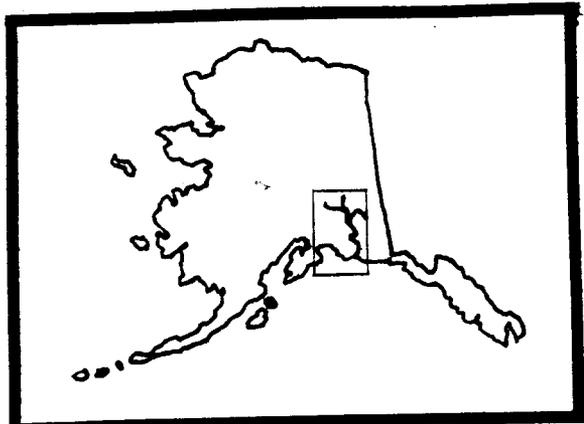
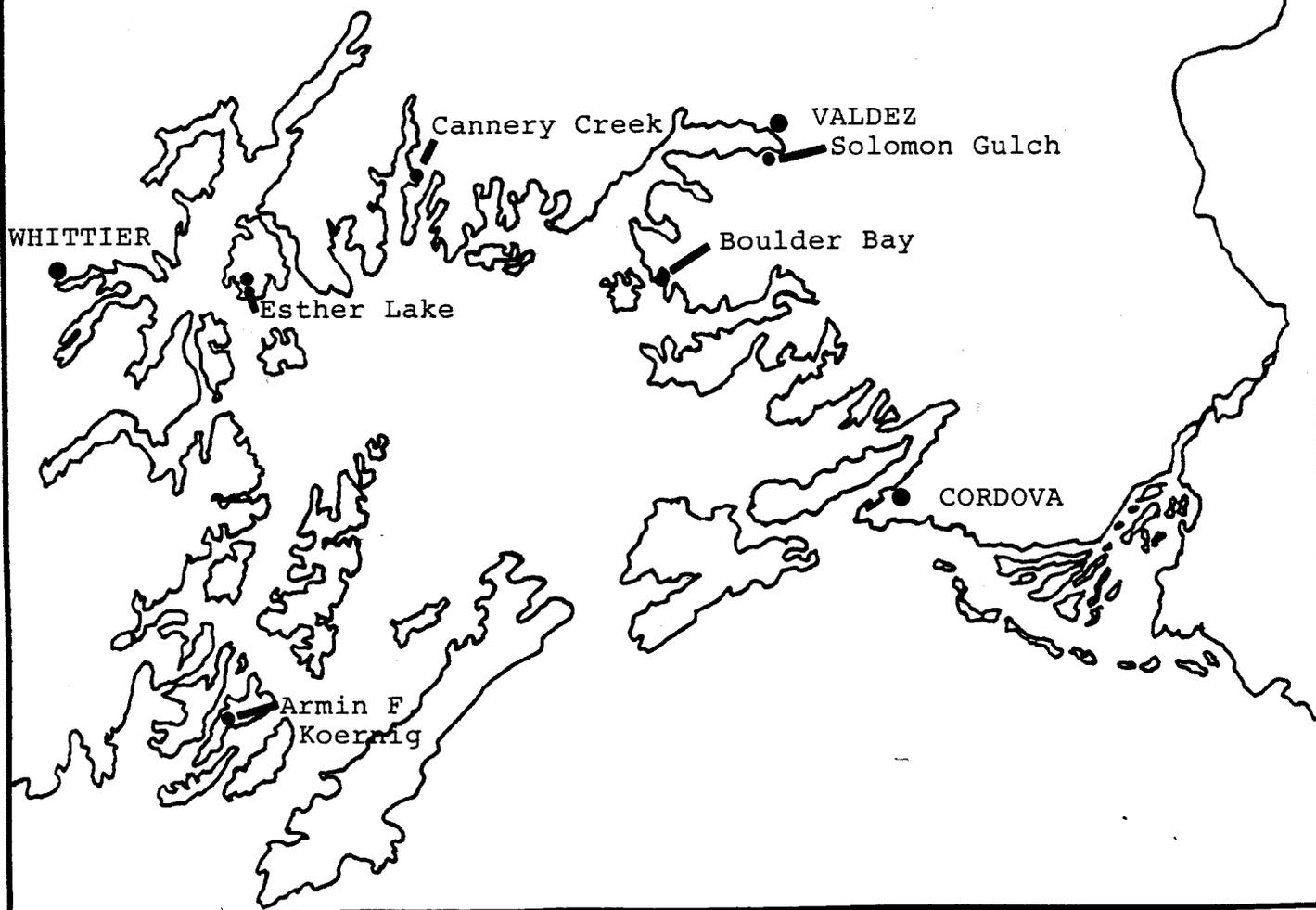


Figure 11. Locations of operational PNP hatcheries and remote release sites in Prince William Sound.



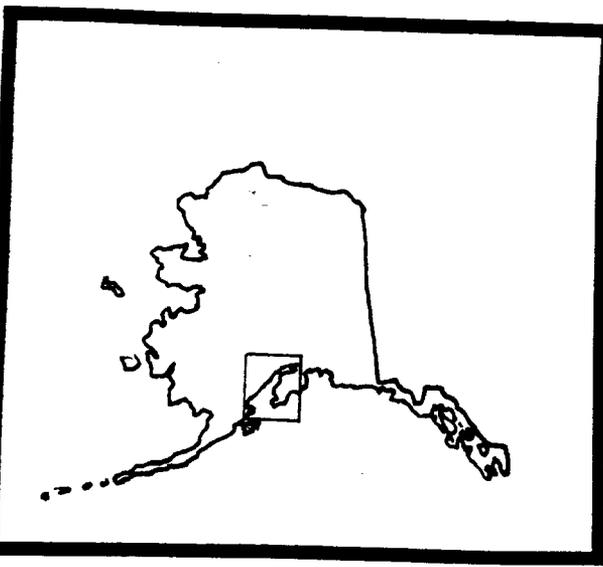


Figure 12. Locations of operational PNP hatcheries in Cook Inlet.

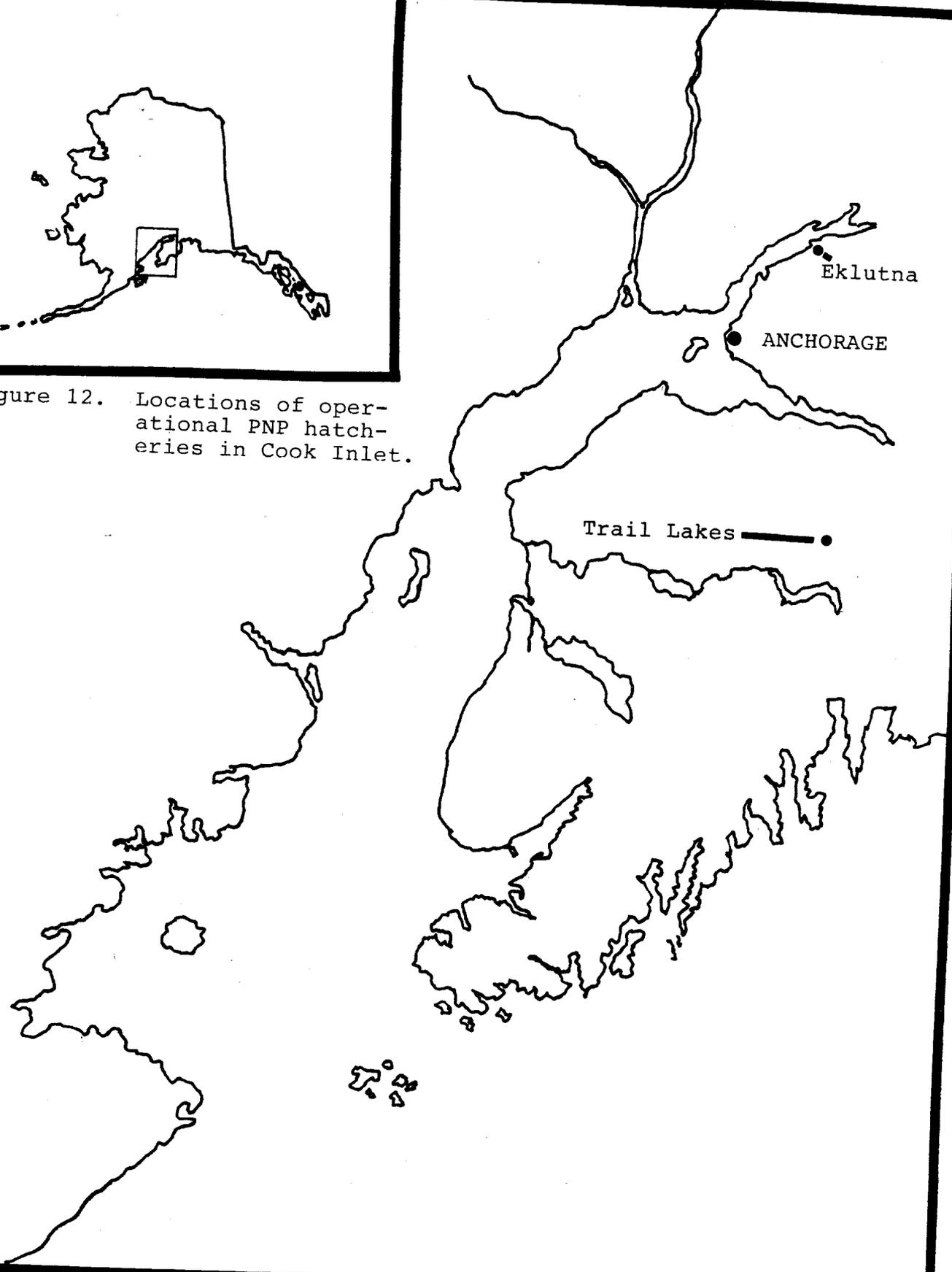


Table 7. 1988 estimated adult returns, by species, to PNP hatcheries
(including common-property harvests) as reported by operators.

REGION/LOCATION	Pink	Chum	Coho	Chinook	Sockeye	TOTAL
SOUTHEAST						
SSRAA - Whitman Lake		399,494	22,211	4,148		425,853 (note 1)
- Neets Bay		465,801	13,144	17,720		496,665 (note 1)
- Beaver Falls					0	0
NSRAA - Medvejie Creek		45,764	3,092	344		49,200 (note 1)
- Hidden Falls		421,971		418		422,389 (note 1)
AAI - Burnett Inlet	73,309	6,925	47	0		80,281 (note 1&2)
A-K - Port Armstrong	28,256	119	0	286		28,661 (note 2)
BCF - Burro Creek	14,684	656	0			15,340 (note 2)
DIPAC - Sheep Creek	28,642	66,129	1,435			96,206 (note 1,3&4)
- Kowee Creek	19,133	0				19,133 (note 3&4)
- Gastineau	0	0	0	0		0
KNFC - Gunnuk Creek	40,095	3,910				44,005 (note 2)
MCAA - Meyers Chuck	14,633	0	0			14,633 (note 2)
SJC - Indian River	8,963	1,823	2,363	22		13,171 (note 1&3)
SOUTHEAST TOTALS	227,715	1,412,592	42,292	22,938	0	1,705,537
PRINCE WILLIAM SOUND						
PWSAC - Armin F. Koernig	6,076,493	119,224				6,195,717 (note 4)
- Esther Lake	3,866,618	299,749	56,824	308	0	4,223,499 (note 4)
- Cannery Creek	227,688	5,174				232,862 (note 4)
VFDC - Solomon Gulch	1,126,998	9,018	16,200	0		1,152,216 (note 4)
PWS TOTALS	11,297,797	433,165	73,024	308	0	11,804,294
COOK INLET						
CIAA - Eklutna	0	9,418	4,696	0		14,114 (note 2)
- Trail Lakes			2,174		66,499	68,673
COOK INLET TOTALS	0	9,418	6,870	0	66,499	82,787
KODIAK						
KRAA - Kitoi	746,047	4,989				751,036 (note 4)
KODIAK TOTALS	746,047	4,989	0	0	0	751,036
STATEWIDE TOTALS	12,271,559	1,860,164	122,186	23,246	66,499	14,343,654

note 1: estimation based on expansion of coded wire tag recoveries.

note 2: estimation based on assumed common property interception rates.

note 3: estimation based on assumed marine survival rates.

note 4: estimation based on data provided by Division of Commercial Fisheries.

Table 8. Summary of statewide salmon production (all species) from PNP hatcheries as reported by operators.

Year	Egg Take	Fry or smolt release	Total return	Special harvest	Hatchery revenue
1975	8,091,395				
1976	16,622,881	3,719,741			
1977	37,008,186	12,360,354	160,147	108,718	\$130,726.00
1978	37,346,167	26,796,238	160,967	114,188	\$141,799.00
1979	54,295,879	29,131,774	356,501	244,555	\$309,612.00
1980	125,740,500	35,587,200	1,506,466	346,168	\$436,171.00
1981	223,600,000	101,600,000	2,563,913	850,293	\$1,274,640.00
1982	234,390,000	126,990,000	5,340,720	1,370,110	\$1,165,608.00
1983	261,310,000	170,375,000	4,285,989	744,767	\$669,838.00
1984	372,880,000	217,730,000	4,764,144	1,048,701	\$1,668,788.00
1985	469,960,000	302,320,000	8,106,485	1,853,483	\$1,878,348.00
1986	522,200,000	380,890,000	7,903,526	1,211,620	\$1,867,054.45
1987	868,250,000	461,170,000	19,096,871	4,172,700	\$6,557,877.16
1988	1,045,620,000	819,800,000	14,305,054	2,499,557	\$9,266,780.00
Cumulative hatchery revenue from special harvest:					\$25,367,241.61

Table 9. Summary of chum salmon production from PNP hatcheries.

Year	Egg Take	Fry release	Total return	Special harvest	Hatchery revenue
1975	77,000				
1976	347,275	66,075			
1977	1,614,574	264,068			
1978	1,684,930	1,064,000	543		
1979	6,782,864	924,400	3		
1980	26,850,000	3,340,000	1,588		
1981	32,400,000	21,900,000	20,518	6,115	\$24,640.00
1982	46,130,000	23,590,000	22,133	378	\$302.00
1983	68,790,000	41,770,000	126,783	35,099	\$37,120.00
1984	122,170,000	54,780,000	1,001,449	436,617	\$690,393.00
1985	119,450,000	97,880,000	525,088	123,215	\$209,208.00
1986	181,450,000	100,490,000	779,637	188,754	\$303,080.00
1987	234,500,000	149,790,000	955,294	487,605	\$1,162,578.50
1988	369,610,000	186,050,000	1,835,164	469,754	\$2,180,685.40

Table 10. Summary of sockeye salmon production from PNP hatcheries.

Year	Egg Take	Fry or smolt release	Total return	Special harvest	Hatchery revenue
1985	310,000	0	0	0	\$0.00
1986	1,295,700	102,000	0	0	\$0.00
1987	1,570,000	750,000	0	0	\$0.00
1988	10,590,000	1,000,000	66,499	0	\$0.00

Table 11. Summary of pink salmon production from PNP hatcheries.

Year	Egg Take	Fry release	Total return	Special harvest	Hatchery revenue
1975	8,002,395				
1976	16,251,456	3,653,666			
1977	35,383,112	12,093,184	160,147	108,718	\$130,726.00
1978	34,851,807	25,732,238	160,397	114,188	\$141,799.00
1979	46,582,015	28,204,674	356,498	244,555	\$309,612.00
1980	98,030,000	31,690,000	1,504,878	346,168	\$436,171.00
1981	188,000,000	78,800,000	2,491,345	838,037	\$1,200,000.00
1982	185,170,000	102,550,000	5,253,378	1,354,732	\$1,084,806.00
1983	185,520,000	126,890,000	4,086,552	701,399	\$613,618.00
1984	241,760,000	159,340,000	3,637,927	583,185	\$741,673.00
1985	339,910,000	199,490,000	7,404,789	1,698,732	\$1,320,320.00
1986	324,570,000	271,960,000	6,767,984	948,624	\$1,012,420.00
1987	618,350,000	299,260,000	17,963,785	3,624,586	\$4,711,068.00
1988	645,100,000	625,820,000	12,257,959	2,007,720	\$6,715,887.09

Table 12. Summary of coho salmon production from PNP hatcheries.

Year	Egg Take	Fry or smolt release	Total return	Special harvest	Hatchery revenue
1975	12,000				
1976	24,150				
1977	10,500	3,102			
1978	809,430	0	27		
1979	931,000	2,700	0		
1980	666,500	557,200	0		
1981	2,800,000	900,000	52,050	6,141	\$50,000.00
1982	2,870,000	700,000	61,709	11,500	\$80,500.00
1983	6,200,000	1,570,000	71,781	7,396	\$19,100.00
1984	6,300,000	3,230,000	121,112	27,310	\$233,466.00
1985	4,100,000	4,220,000	168,427	29,530	\$293,820.00
1986	8,300,000	4,280,000	344,749	72,960	\$535,203.00
1987	9,280,000	5,440,000	169,149	58,333	\$625,546.65
1988	13,310,000	4,720,000	122,186	13,383	\$178,771.15

Table 13. Summary of chinook salmon production from PNP hatcheries.

Year	Egg Take	Fry or smolt release	Total return	Special harvest	Hatchery revenue
1980	194,000				
1981	400,000				
1982	220,000	150,000	3,500	3,500	N/A
1983	800,000	140,000	872	872	N/A
1984	2,730,000	380,000	3,656	1,589	\$3,256.00
1985	6,180,000	720,000	8,181	2,006	\$55,000.00
1986	6,580,000	4,050,000	11,156	1,282	\$16,351.00
1987	4,550,000	5,940,000	8,643	2,176	\$58,684.00
1988	7,010,000	2,210,000	23,246	8,700	\$191,436.36

Table 14. 1988 releases from PNP hatcheries in millions.

REGION/LOCATION	Pink	Chum	Coho	Chinook	Sockeye	TOTAL
SOUTHEAST						

SSRAA - Whitman Lake		8.33	0.44	1.04	*	9.81
- Neets Bay	0.41	36.16	1.43	0.91		38.91
- Beaver Falls					0.24	0.24
NSRAA - Medvejie Creek	0.10	28.14	0.92	0.17		29.33
- Hidden Falls	Releases listed under FRED hatchery production					
- Port Camden		0.60				0.60
AAI - Burnett Inlet	9.90	8.53	0.01	*		18.43
A-K - Port Armstrong	19.37	1.29	*	*		20.66
BCF - Burro Creek	2.33	0.50	0.00			2.83
DIPAC - Kowee Creek	8.34	*				8.34
- Sheep Creek	19.70	18.35	0.07			38.12
- Gastineau	13.59	*	*	*		13.59
KNFC - Gunnuk Creek	4.16	10.75				14.91
MCAA - Meyers Chuck	1.00	*	*			1.00
SJC - Indian River	14.25	0.45	0.10	0.03		14.83
SOUTHEAST TOTALS	93.14	113.10	2.95	2.16	0.24	211.59
PRINCE WILLIAM SOUND						

PWSAC - Armin F. Koernig	110.96	*				110.96
- Esther Lake	195.32	68.39	0.87	0.05	0.76	265.40
- Cannery Creek	95.60	0.25				95.84
VFDC - Solomon Gulch	130.79	1.61	0.82			133.23
PWS TOTALS	532.68	70.25	1.69	0.05	0.76	605.43
COOK INLET						

CIAA - Eklutna	*	2.70	0.07	*		2.77
- Trail Lakes	Releases listed under FRED hatchery production					
COOK INLET TOTALS	0.00	2.70	0.07	0.00	0.00	2.77
KODIAK						

KRAA - Kitoi	Releases listed under FRED hatchery production					
STATEWIDE TOTALS	625.82	186.05	4.72	2.21	1.00	819.80

Note 1: * indicates permitted species but no releases this season.

Note 2: individual hatchery releases may not add up to the regional or statewide totals because of rounding.

Table 15. 1988 egg takes for PNP hatcheries in millions.

REGION/LOCATION	Pink	Chum	Coho	Chinook	Sockeye	TOTAL	Comments:
SOUTHEAST							

SSRAA - Whitman Lake		34.87	3.95	1.61	*	40.43	(note 1)
- Neets Bay		61.72	0.35	2.57		64.64	
- Beaver Falls					0.32	0.32	
NSRAA - Medvejie Creek	0.04	17.84	1.49	1.42		20.79	(note 1)
- Hidden Falls		67.88		0.47		68.35	
- Port Camden		1.35				1.35	
AAI - Burnett Inlet	6.67	8.60	0.05	0.37		15.69	(note 1)
A-K - Port Armstrong	17.15	0.05	0.12	0.17		17.48	
BCF - Burro Creek	4.55	0.65	0.02			5.21	(note 1)
DIPAC - Kowee Creek	*	4.90				4.90	
- Sheep Creek	*	31.91	1.06			32.97	
- Gastineau	17.11	12.21	*	*		29.32	
KNFC - Gunnuk Creek	4.49	10.22				14.70	
MCAA - Meyers Chuck	*	*	*			0.00	(note 1)
SJC - Indian River	3.26	0.94	0.14	0.13		4.47	

SOUTHEAST TOTALS	53.26	253.15	7.17	6.73	0.32	320.63	(note 2)
PRINCE WILLIAM SOUND							

PWSAC - Armin F. Koernig	126.42	*				126.42	(note 1)
- Esther Lake	180.26	101.50	2.79	0.27	3.43	288.25	
- Cannery Creek	130.55	4.76				135.31	
VFDC - Solomon Gulch	154.61	3.32	1.60	*		159.52	(note 1)

PWS TOTALS	591.84	109.58	4.38	0.27	3.43	709.50	(note 2)
COOK INLET							

CIAA - Eklutna	*	6.88	0.11	*		6.99	(note 1)
- Trail Lakes			1.65	*	6.85	8.50	

COOK INLET TOTALS	0.00	6.88	1.76	0.00	6.85	15.49	(note 2)
KODIAK							

KRAA - Kitoi	Listed under FRED hatchery production						

STATEWIDE TOTALS	645.10	369.61	13.31	7.01	10.59	1045.62	
							ALL SPECIES TOTAL: 1,045,620,000

Note 1: * indicates permitted species but no egg take this season.

Note 2: individual hatchery egg takes may not add up to the regional or statewide totals because of rounding.

Many PNP hatcheries are currently in the process of broodstock development and, consequently, have not reached their permitted capacities. Permitted capacities for PNP hatcheries now total over 1.57 billion eggs, an increase of over 314 million from 1987 levels (Table 16). This increase is due largely to the issuance of PNP permits for the four state hatcheries contracted for operation by regional aquaculture associations. Potential returns from statewide PNP hatchery-originated production at the 1.6 billion-egg level should exceed 25 million adults, assuming FRED standard assumptions of hatchery and marine survival. Exceptional marine survival, similar to that experienced during recent years, could boost adult production considerably over these estimates. Under the existing permits, approximately 52% of hatchery capacity is scheduled for pink salmon, 41% for chum salmon, and 7% for steelhead trout, sockeye, coho, and chinook salmon.

For the 1989 season, projected returns to PNP facilities in southeast Alaska are expected to include approximately 64,000 chinook salmon, 172,200 coho salmon, 1,973,400 chum salmon, and 2,029,000 pink salmon, assuming standard ocean-survival conditions. Returns to PNP facilities in Prince William Sound are projected at 27,921,600 pink salmon, 376,000 chum salmon, and 136,400 coho salmon for 1989.

Significant hatchery special harvests are expected at the Armin F. Koernig, Esther Lake, Cannery Creek, Solomon Gulch, Kitoi Bay, Sheldon Jackson College, Sheep Creek, Neets Bay, Port Armstrong, Burnett Inlet, Hidden Falls, and Medvejie Creek Hatcheries. Common-property terminal harvests by commercial gear groups are expected at the Kitoi Bay, Esther Lake, Cannery Creek, Hidden Falls, Neets Bay, and Whitman Lake (Nakat Inlet, Carroll Inlet, and Earl West Cove) Hatcheries.

Annual Management Plans

The PNP regulations require that ADF&G prepare, in conjunction with PNP permit holders, an annual management plan (AMP) to guide hatchery operations for the succeeding calendar year.

AMPs will be developed for 15 state and 22 PNP hatchery facility prior to the 1989 operating season. The AMPs will be reviewed by both the department and the RPTs before final approval by the Commissioner. The AMPs outline expected operational activities at each facility, including wild and hatchery egg takes, proposed fish and egg transports and releases, anticipated adult returns, anticipated impacts on the management of mixed-stock fisheries, and terminal-harvest management strategies. Also included are anticipated facility broodstock requirements and, in the case of PNP facilities, hatchery cost-recovery plans that identify legal gear types for hatchery harvest and the number of fish required in order to meet capital and operating expenses.

Table 16. Permitted egg capacities, in millions, of PNP hatcheries within the planning regions, 1988.

REGION	Pink	Chum	Coho	Chinook	Sockeye	Steelhead	Total
SOUTHERN SOUTHEAST							
Association Facilities	0.00	91.80	8.40	5.50	2.80		108.50
Non-Association Facilities	21.00	47.00	1.25	0.75			70.00
total	21.00	138.80	9.65	6.25	2.80		178.50
NORTHERN SOUTHEAST							
Association Facilities	0.30	139.10	3.30	5.10			147.80
Non-Association Facilities	112.50	202.00	4.17	0.38		0.09	319.14
total	112.80	341.10	7.47	5.48	0.00	0.09	466.94
YAKUTAT (no PNP facilities)							
total	0.00	0.00	0.00	0.00	0.00		0.00
PRINCE WILLIAM SOUND							
Association Facilities	508.00	129.00	4.00	4.00	31.00		676.00
Non-Association Facilities	166.00	28.00	1.00	0.30			195.30
total	674.00	157.00	5.00	4.30	31.00		871.30
COOK INLET							
Association Facilities	10.00	10.00	7.10	4.10	30.00		61.20
total	10.00	10.00	7.10	4.10	30.00		61.20
STATEWIDE TOTALS							
	817.80	646.90	29.22	20.13	63.80	0.09	1577.94

PROGRAM EXPENDITURES

Fiscal Year 1989 Operating Budget

The FRED Division, as a Budget Request Unit (BRU), requests operating funds in two components; a change from prior years when a third component, CIP, was also requested. Approximately 96% of the FY 89 authorized budget is in the FRED component, which includes all of the division's operational, technical, and administrative functions. The remaining BRU component is Special Projects. Special Projects are those that are contracted from federal agencies, such as the USFS, or when funds are received from other sources, such as interagency receipts. Much of the monies received for special projects during FY 89 were from U.S./Canada Pacific Salmon Treaty mitigation funds for projects dealing with sockeye and chum salmon in southeast Alaska. The total FY 89 budget for the FRED Division BRU is \$15.3 million. The General Fund portion of the FY 89 funding decreased by nearly 3% from the FY 88 authorized budget. Approximately \$308,400 in program receipts and other funding are not to be received in FY 89 and, as such, are not allocated to the program.

The FRED Division can be partitioned by function for the purpose of examining the BRU's involvement in the state's fisheries program. Table 17 presents such an analysis of the various services the FRED Division performs for Alaska's fisheries enhancement program. Note that the programmatic total reflects the \$308,400 that will not be received.

Fiscal Year 1990 Operating Budget

The current Governor's Budget Request for FRED Division in FY 90 is \$15.7 million, which is approximately a 2.6% increase over the FY 89 authorized budget. This includes an increase in general funds of 2.4% over the FY 89 authorized budget. It also includes \$555,400 of General Fund/program receipts revenue, some or all of which may not be received.

Table 17. FRED Division FY 89 operating budget (all funding sources).

Function	Budget ^{a/}	Percent
Management/Administration (headquarters & regional offices)	1,831.4	12
Private Nonprofit Hatchery Coordination & Regional Planning	238.7	1.6
Hatchery Production Statewide (facility operating budgets)	8,442.6	55.1
Biological Projects & Staff (planning, operations, assessments)	783.5	5.1
Lake and Stream Improvement/Stocking (fishpasses, habitat, and stocking projects)	154.8	1
Technical Supervision/Quality Control (biology, fish culture, engineering, maintenance, library, mariculture, economics)	1412.8	9.2
Fish Pathology Services (statewide fish health services)	578.1	3.7
Genetics Laboratory (statewide genetics services)	90.9	0.6
Limnology (principal scientist and project leaders)	200.8	1.3
Lake Fertilization/Stocking (field projects statewide and limnology lab support)	263.1	1.7
Tagged Fish Recovery Laboratory (CWT) (statewide and U.S./Canada concerns)	390.4	2.5
Special Projects (cooperative funding projects)	635.4	4.2
Non-receivable Revenue	<u>308.4</u>	<u>2</u>
TOTAL	15,330.9	100

^{a/} In thousands

ACKNOWLEDGMENTS

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Production Report	William J. Hauser, Ph.D. Kenneth A. Leon, Ph.D.
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Finally, a smaller group has helped with the editing and manuscript preparation. Thanks to Marianne McKean for preparation of tables and for editing much of the manuscript and to Katherine Aschaffenburg for her able assistance in manuscript preparation.

APPENDIX 1

Stocking Location by Species for Fish Released in 1988

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
28 MILE PIT	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	800	4.190
31 MILE PIT	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	800	4.190
BACKDOWN L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,200	4.220
BATHING BEAUTY	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	350	4.190
BRODE L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.220
CHENA HS #32.9	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.190
DICK'S POND	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.220
DOC L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	520	4.220
GRAYLING L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.190
HARDING L	AYK	ARCTIC CHAR	CLEAR H	SUBCATCH	ALEKNAGIK L	30,820	51.328
HIDDEN L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	3,600	4.190
KENS POND	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.220
LAST L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	500	4.220
LUKE L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	600	4.220
MANCHU L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	2,900	4.190
RANGEVIEW L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	900	4.220
STEESE HWY 30.6	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.190
STEESE HWY 36.6	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.190
WEASEL L	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,600	4.220
WEIGH STATION-1	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.190
WEIGH STATION-2	AYK	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	1,000	4.190
IRENE L	NCI	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	3,600	6.990
MIRROR L (PALM)	NCI	ARCTIC CHAR	CLEAR H	FINGERLING	ALEKNAGIK L	13,600	6.990
BOLIO L	AYK	CHINOOK	ELMENDORF H	FINGERLING	CROOKED CR	13,130	8.720
CHENA L	AYK	CHINOOK	ELMENDORF H	FINGERLING	CROOKED CR	32,885	8.610
DONNELLY L	AYK	CHINOOK	ELMENDORF H	FINGERLING	CROOKED CR	6,400	8.720
L HARDING L	AYK	CHINOOK	ELMENDORF H	FINGERLING	CROOKED CR	3,600	8.720
CROOKED CR	CCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	239,593	14.815
LOWELL CR	CCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	95,673	16.700
SEWARD LAGOON	CCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	109,020	16.100
CRYSTAL CR	CSE	CHINOOK	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	550,000	16.600
EARL WEST COVE	CSE	CHINOOK	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	482,700	16.600
HALIBUT COVE LG	LCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	93,874	18.400
HOMER SPIT	LCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	219,572	17.000
NINILCHIK R	LCI	CHINOOK	FT RICHARDSON H	SMOLT	NINILCHIK R	247,329	13.467
SELDOVIA HARBOR	LCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	111,435	16.100
BEACH L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	3,227	69.640
CHENEY L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	5,340	74.255
CLUNIE L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	4,756	73.090
DECEPTION CR	NCI	CHINOOK	FT RICHARDSON H	SMOLT	WILLOW CR	201,091	10.900

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
DELONG L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	5,036	76.030
FISH L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	604	75.600
GRANITE CR	NCI	CHINOOK	TRAIL LAKE H	SMOLT	CROOKED CR	98,429	21.900
GREEN L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	3,580	74.000
GWEN L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	2,060	71.275
HILLBERG L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	1,919	70.730
JEWEL L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	10,220	70.540
L CAMPBELL L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	1,505	72.410
LUCILLE L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	9,650	73.090
MEMORY L	NCI	CHINOOK	ELMENDORF H	FINGERLING	CROOKED CR	16,600	8.940
MONTANA CR	NCI	CHINOOK	FT RICHARDSON H	SMOLT	MONTANA CR	132,465	12.300
OTTER L (FT R)	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	39,225	74.000
SAND L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	14,510	70.540
SHEEP CR	NCI	CHINOOK	FT RICHARDSON H	SMOLT	SHEEP/WILLOW CR	132,125	11.700
SHIP CR	NCI	CHINOOK	ELMENDORF H	SMOLT	SHIP CR	116,336	14.600
SIX MILE CR	NCI	CHINOOK	ELMENDORF H	SMOLT	CROOKED CR	130,578	15.200
TRIANGLE L	NCI	CHINOOK	ELMENDORF H	POSTSMOLT	CROOKED CR	807	75.600
AUKE BAY CR	NSE	CHINOOK	SNETTISHAM H	SMOLT	CRYSTAL CR	92,000	14.350
FISH CR (JNO)	NSE	CHINOOK	SNETTISHAM H	SMOLT	CRYSTAL CR	73,700	13.600
INDIAN R	NSE	CHINOOK	SNETTISHAM H	SMOLT	CRYSTAL CR	269,000	0.600
KASNYKU BAY	NSE	CHINOOK	HIDDEN FALLS H	SMOLT	CRYSTAL CR	101,571	20.986
KASNYKU BAY	NSE	CHINOOK	HIDDEN FALLS H	SMOLT	TAHINI R	57,460	17.500
MONTANA CR	NSE	CHINOOK	SNETTISHAM H	SMOLT	CRYSTAL CR	52,000	11.200
SHEEP CR	NSE	CHINOOK	SNETTISHAM H	SMOLT	CRYSTAL CR	31,556	14.700
SNETTISHAM INLT	NSE	CHINOOK	SNETTISHAM H	SMOLT	CRYSTAL CR	111,000	9.600
SNETTISHAM INLT	NSE	CHINOOK	SNETTISHAM H	SMOLT	KING SALMON R	70,421	10.700
PAXON L	PWS	CHINOOK	GULKANA H	FED FRY	GULKANA R	1,388	0.506
BIG SALT L	SSE	CHINOOK	DEER MOUNTAIN H	SMOLT	KETCHIKAN CR	51,000	25.770
KETCHIKAN CR	SSE	CHINOOK	DEER MOUNTAIN H	SMOLT	KETCHIKAN CR	70,000	26.600
NOATAK R	AYK	CHUM	SIKUSUIAQ H	FINGERLING	NOATAK R	3,002,886	0.846
KITOI BAY	KOD	CHUM	KITOI H	FINGERLING	BIG KITOI CR	4,737,587	2.100
TUTKA BAY	LCI	CHUM	TUTKA BAY H	FED FRY	WESTSIDE CR	2,430,864	0.738
TUTKA CR	LCI	CHUM	TUTKA BAY H	EMERGENT F	WESTSIDE CR	780,336	0.416
JNO BOAT HARBOR	NSE	CHUM	SNETTISHAM H	FED FRY	HIDDEN FALLS	5,170,000	0.800
KASNYKU BAY	NSE	CHUM	HIDDEN FALLS H	FINGERLING	HIDDEN FALLS	29,181,000	1.680
LIMESTONE CR	NSE	CHUM	SNETTISHAM H	FED FRY	SNETTISHAM INLT	8,060,000	0.800
SNETTISHAM INLT	NSE	CHUM	SNETTISHAM H	FED FRY	SNETTISHAM INLT	27,100,000	0.750
CANNERY CR	PWS	CHUM	CANNERY CREEK H	EMERGENT F	CANNERY CR	200,000	0.340

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking						Number	Average
Location	Area	Species	Hatchery	Lifestage	Broodstock	Stocked	Weight (gm)
TAKATZ BAY	SSE	CHUM	HIDDEN FALLS H	EMERGENT F	HIDDEN FALLS	23,005,363	0.410
RUSSELL CR	AKP	COHO	RUSSELL CR H	FINGERLING	MORTENSON CR	25,000	1.000
28 MILE PIT	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	800	3.330
31 MILE PIT	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	800	3.330
8 MILE L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	15,000	3.240
BIRCH L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	40,000	3.330
CHENA L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	15,000	3.390
CLEAR CR	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	80,000	2.460
EARTHMOVER PIT	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	1,000	3.240
FOSTER CR	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	80,000	2.460
HANGER PIT	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	2,600	3.240
JOHNSON PIT #1	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	500	3.330
JUNE CR	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	117,108	3.055
LONG L (FBK)	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	700	3.240
LOST L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	4,700	3.390
MANCHU L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	2,900	3.330
MOOSE L (EIEL)	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	10,000	3.330
QUARTZ L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	150,000	3.390
ROUND POND	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	400	3.240
SANSING L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	200	3.240
UNIV OF AK FAIR	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	50	0.580
WESCOTT L	AYK	COHO	CLEAR H	FINGERLING	WOOD CR	1,000	3.330
ARC L	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	5,000	0.930
BEAR L	CCI	COHO	TRAIL LAKE H	FINGERLING	BEAR L	347,173	1.000
CENTENNIAL L	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	5,000	0.930
CROOKED CR	CCI	COHO	CROOKED CR H	SMOLT	CROOKED CR	61,903	26.700
ENGINEER L-STER	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	46,200	0.830
LOWELL CR	CCI	COHO	ELMENDORF H	SMOLT	BEAR L	63,806	21.320
LYON CR	CCI	COHO	CROOKED CR H	PRESMOLT	CROOKED CR	136,100	10.000
PORTAGE L	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	5,000	0.930
SCOUT L	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	21,000	0.930
SEWARD LAGOON	CCI	COHO	ELMENDORF H	SMOLT	BEAR L	118,741	22.175
UNION L	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	17,000	0.930
WILLIWAU CR	CCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	23,000	0.930
CRYSTAL CR	CSE	COHO	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	413,316	9.713
HAMMER SLOUGH	CSE	COHO	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	2,000	12.860
NORDIC DR CR	CSE	COHO	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	2,000	12.860
SANDY BEACH CR	CSE	COHO	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	2,000	12.860
SLIPPERY CR	CSE	COHO	CRYSTAL LAKE H	FED FRY	CRYSTAL CR	318,176	0.510
BEAR CR (COLD B	KOD	COHO	RUSSELL CR H	FINGERLING	MORTENSON CR	300,000	2.250
CRESCENT L(KOD)	KOD	COHO	KITOI H	FINGERLING	L KITOI L	241,373	1.130

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
DARK L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	7,500	0.980
HIDDEN L (KOD)	KOD	COHO	KITOI H	FINGERLING	L KITOI L	137,585	1.130
ISLAND L (KOD)	KOD	COHO	KITOI H	FINGERLING	L KITOI L	22,500	0.980
KALSIN L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	17,500	1.180
L KITOI L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	43,807	1.529
MAYFLOWER L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	6,500	1.180
MISSION L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	10,000	0.910
ORBIN L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	7,500	0.910
OZINKIE L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	20,000	0.700
PONY L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	2,100	1.180
POTATOE L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	7,500	0.910
SOUTHERN L	KOD	COHO	KITOI H	FINGERLING	L KITOI L	3,500	0.910
CARIBOU L (HOM)	LCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	150,000	0.960
HOMER SPIT	LCI	COHO	ELMENDORF H	SMOLT	CROOKED CR	62,547	21.750
SELDOVIA L	LCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	80,000	0.940
BEAR PAW L	NCI	COHO	FT RICHARDSON H	FINGERLING	L SUSITNA R	8,980	3.700
BENKA L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	24,600	1.259
BLODGETT L	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	118,000	1.000
BUTTERFLY L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	141,000	1.000
CASWELL CR	NCI	COHO	FT RICHARDSON H	FINGERLING	CASWELL CR	9,000	2.700
CHRISTENSEN L	NCI	COHO	ELMENDORF H	FINGERLING	BEAR L	37,143	3.680
CORNELIUS L	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	91,000	1.100
COTTONWOOD L	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	239,000	1.100
DELYNDIA L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	141,000	1.000
E PAPOOSE L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	172,000	1.000
ECHO L	NCI	COHO	FT RICHARDSON H	FINGERLING	L SUSITNA R	4,600	3.700
FINGER L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	256,000	1.170
FINGER L	NCI	COHO	ELMENDORF H	FINGERLING	BEAR L	145,433	3.780
FISH CR	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	198,000	1.000
GRANITE CR	NCI	COHO	CROOKED CR H	PRESMOLT	CROOKED CR	42,700	10.000
HOCK L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	72,000	1.000
HORSESHOE L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	465,725	8.553
INGRAM CR	NCI	COHO	TRAIL LAKE H	FINGERLING	CROOKED CR	80,344	0.940
JIM CR	NCI	COHO	BIG LAKE H	SUBCATCH	BIG L (BIG L)	7,550	17.000
JUNCTION L-PALM	NCI	COHO	FT RICHARDSON H	FINGERLING	L SUSITNA R	2,180	3.700
LOON L	NCI	COHO	FT RICHARDSON H	FINGERLING	L SUSITNA R	21,575	3.700
LUCILLE L	NCI	COHO	ELMENDORF H	FINGERLING	BEAR L	44,463	3.600
MATANUSKA L	NCI	COHO	ELMENDORF H	FINGERLING	BEAR L	12,986	3.600
MEADOW CR	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	1,637,434	4.698
MEMORY L	NCI	COHO	ELMENDORF H	FINGERLING	BEAR L	8,300	3.920
MY LAKE	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	58,000	1.000
NANCY L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	2,374,126	1.113
NANCY L	NCI	COHO	FT RICHARDSON H	SMOLT	L SUSITNA R	618,016	15.789
PRATOR L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	19,838	1.259
RABBIT SLOUGH	NCI	COHO	BIG LAKE H	SUBCATCH	BIG L (BIG L)	6,275	17.000

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking						Number	Average
Location	Area	Species	Hatchery	Lifestage	Broodstock	Stocked	Weight (gm)
ROCKY L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	11,740	1.068
SHIP CR	NCI	COHO	ELMENDORF H	SMOLT	SHIP CR	58,820	20.200
SIX MILE CR	NCI	COHO	CROOKED CR H	PRESMOLT	CROOKED CR	27,125	10.000
TWIN LAKES	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	95,000	1.000
VICTOR L	NCI	COHO	ELMENDORF H	FINGERLING	BEAR L	6,638	3.920
W PAPOOSE L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	164,000	1.000
WASILLA CR	NCI	COHO	BIG LAKE H	SUBCATCH	BIG L (BIG L)	6,575	17.000
WASILLA L	NCI	COHO	BIG LAKE H	FINGERLING	BIG L (BIG L)	267,000	1.070
WOLF L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	12,400	1.259
YOHN L	NCI	COHO	BIG LAKE H	FINGERLING	L SUSITNA R	46,000	1.000
DREDGE L	NSE	COHO	SNETTISHAM H	SMOLT	SNETTISHAM INLT	50,000	6.800
FISH CR (JNO)	NSE	COHO	SNETTISHAM H	SMOLT	SNETTISHAM INLT	50,000	12.300
SHEEP CR	NSE	COHO	SNETTISHAM H	SMOLT	SNETTISHAM INLT	100,000	10.900
SNETTISHAM INLT	NSE	COHO	SNETTISHAM H	SMOLT	SNETTISHAM INLT	171,000	17.250
SWEETHEART L	NSE	COHO	SNETTISHAM H	SMOLT	SNETTISHAM INLT	23,000	8.200
TWIN L	NSE	COHO	SNETTISHAM H	SMOLT	SNETTISHAM INLT	8,182	124.267
FLEMING SPIT	PWS	COHO	FT RICHARDSON H	SMOLT	EYAK L	62,000	22.000
STRELNA L	PWS	COHO	CLEAR H	FINGERLING	WOOD CR	58,000	3.240
WHITT ARMY DOCK	PWS	COHO	ELMENDORF H	SMOLT	BEAR L	107,428	24.300
3 MILE CR	SSE	COHO	CRYSTAL LAKE H	SMOLT	CRYSTAL CR	2,000	12.860
CABLE CR	SSE	COHO	KLAWOCK H	FINGERLING	CABLE CR	20,000	1.400
KETCHIKAN CR	SSE	COHO	DEER MOUNTAIN H	SMOLT	REFLECTION L	7,714	20.500
KLAWOCK L	SSE	COHO	KLAWOCK H	SMOLT	KLAWOCK R	1,005,000	15.929
REFLECTION L	SSE	COHO	DEER MOUNTAIN H	FINGERLING	REFLECTION L	108,000	3.000
TUNGA L	SSE	COHO	KLAWOCK H	SMOLT	KLAWOCK R	221,736	8.980
17 MILE L	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	60,000	0.018
180 PARKS HWY	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	3,000	3.820
BATHING BEAUTY	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	350	2.690
BOLIO L	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	20,000	0.018
CHENA HS #32.9	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	1,000	3.410
CHENA HS #42.8	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	1,000	3.410
CHENA HS #45.5	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
CHENA HS #47.9	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	800	3.410
DUNE L	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L/CLEAR H	5,000	2.420
EARTHMOVER PIT	AYK	GRAYLING	CLEAR H	BROODSTOCK	MOOSE L (GLEN)	324	105.400
FIREBREAK L	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L/CLEAR H	2,000	2.420
HARDING L	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	1,169,806	0.018
HIDDEN L	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
JOHNSON PIT #1	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
LUKE L	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	600	3.960
SANSING L	AYK	GRAYLING	CLEAR H	CATCHABLE	MOOSE L (GLEN)	812	92.500
SHEEFISH L	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	800	3.960

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
STEESE HWY 29.5	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	1,000	3.410
STEESE HWY 30.6	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	1,000	3.410
STEESE HWY 33.0	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
STEESE HWY 33.5	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
STEESE HWY 34.6	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	800	3.410
STEESE HWY 35.8	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	1,000	3.410
STEESE HWY 36.6	AYK	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	1,000	3.410
TRIANGLE L	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	80,000	0.018
WALDEN POND	AYK	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	15,000	0.018
AUREL L	KOD	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	20,000	0.018
CASCADE L	KOD	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
CICELY L	KOD	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.018
HEITMAN L	KOD	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	30,000	0.018
"Y" L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	3,900	3.960
CANOE L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	4,200	3.820
FINGER L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	6,758	3.960
FIRE L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	7,000	3.960
KEPLER-BRADLY L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	8,000	3.820
KNIK L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	5,000	3.960
LONG L (KB)	NCI	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	64,000	0.018
MATANUSKA L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	7,600	3.820
MEIRS L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	20,100	1.919
WALDEN L (FT R)	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	3,000	3.960
WILLOW L	NCI	GRAYLING	CLEAR H	FINGERLING	MOOSE L (GLEN)	28,600	3.820
BEAVER L(SITKA)	NSE	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	15,000	0.018
SWAN L (SIT)	NSE	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	15,000	0.018
ARIZONA F & G	OUT	GRAYLING	CLEAR H	EYED EGGS	MOOSE L (GLEN)	195,600	0.020
ARIZONA L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
BEAR CUB L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
CARIBOU L (PWS)	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	8,000	0.020
CONNER L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	15,000	0.020
DICK L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
ELBOW L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	5,000	0.020
FORGOTTEN L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
GRASS L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
L JUNCTION L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	5,000	0.020
LITTLE ECHO L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
MEERS L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	40,000	0.020
MOOSE CR	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	50,000	0.020
THOMPSON L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	10,000	0.020
THREE MILE L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	8,000	0.020
TOLSONA L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	80,000	0.020

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
TWO MILE L	PWS	GRAYLING	CLEAR H	EMERGENT F	MOOSE L (GLEN)	5,000	0.020
BATHING BEAUTY	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	350	4.130
BOLIO L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	14,900	4.130
CHENA HS #47.9	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	800	4.130
CHET L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,600	4.130
COAL MINE #5	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	2,600	4.130
DELTA UNNAME-2	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	800	4.130
GHOST L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,000	4.130
GRAYLING L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,000	4.130
LOST L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	7,226	4.130
NICKEL L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,000	4.130
PAUL'S POND	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,000	4.130
ROCKHOUND L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	600	4.130
SHEEFISH L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	800	4.130
SILVER FOX L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,200	4.130
STEESE HWY 29.5	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	1,000	4.130
STEESE HWY 34.6	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	800	4.130
TRIANGLE L	AYK	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	6,500	4.130
LONG L (KB)	NCI	LAKE TROUT	CLEAR H	FINGERLING	PAXON L	10,600	4.050
RUSSELL CR	AKP	PINK	RUSSELL CR H	EMERGENT F	KITOI BAY	9,000,000	0.500
KITOI BAY	KOD	PINK	KITOI H	FINGERLING	BIG KITOI CR	94,172,516	0.520
TUTKA BAY	LCI	PINK	TUTKA BAY H	FED FRY	TUTKA BAY	4,855,926	0.569
TUTKA LAGOON	LCI	PINK	TUTKA BAY H	FED FRY	TUTKA BAY	6,264,395	0.592
INGRAM CR	NCI	PINK	TUTKA BAY H	EMERGENT F	TUTKA BAY	252,975	0.244
CANNERY CR	PWS	PINK	CANNERY CREEK H	EMERGENT F	CANNERY CR	94,818,767	0.200
31 MILE PIT	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	500	1.080
BACKDOWN L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,200	1.090
BATHING BEAUTY	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	350	1.080
BIRCH L	AYK	RAINBOW	CLEAR H	SUBCATCH	SWANSON R	54,723	27.525
BLACK RAPIDS L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	2,000	1.090
BULLWINKLE L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	800	1.090
CHENA L	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	22,020	95.033
CHENA L	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	8,071	76.500
CHET L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,600	1.090
DOC L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	520	1.090
DUNE L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	10,000	1.280

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

=====						Number	Average
Stocking							
Location	Area	Species	Hatchery	Lifestage	Broodstock	Stocked	Weight (gm)
=====							
EARTHMOVER PIT	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,005	1.280
FIREBREAK L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	2,000	1.280
FOUR MILE L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	20,000	1.280
GESKAMINA L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	5,000	1.280
GHOST L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,000	1.090
GRAYLING L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,000	1.080
HARDING L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	248,658	1.208
HIDDEN L (FAIR)	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	1,800	89.700
JAN L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	8,800	1.150
JOHNSON PIT #1	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	2,000	1.080
KENS POND	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,000	1.090
KOOLE L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	30,000	1.280
L HARDING L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	3,600	1.080
LES'S L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	750	1.280
LOST L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	4,700	1.080
MANCHU L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	2,900	1.150
MARK L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	4,000	1.090
MOOSE L (EIEL)	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	2,254	89.700
N TWIN L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	4,000	1.090
NICKEL L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,000	1.090
NO MERCY L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,500	1.090
PILEDRIIVE SL-BB	AYK	RAINBOW	CLEAR H	SUBCATCH	SWANSON R	52,927	15.100
PILEDRIIVE SL-SR	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	13,297	112.350
PILEDRIIVE SL-SR	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	13,247	77.500
QUARTZ L	AYK	RAINBOW	CLEAR H	SUBCATCH	SWANSON R	41,627	25.308
QUARTZ L (FBK)	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	150,000	0.980
RAINBOW L (FBK)	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	20,000	1.280
ROBERTSON L #2	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,600	1.150
ROCKHOUND L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	600	1.090
S TWIN L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	4,000	1.090
SANSING L	AYK	RAINBOW	CLEAR H	SUBCATCH	SWANSON R	500	22.500
SPENCER L	AYK	RAINBOW	CLEAR H	SUBCATCH	SWANSON R	5,000	28.170
TVSA DERBY	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	500	94.900
WALDEN POND	AYK	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	2,960	71.000
WEASEL L	AYK	RAINBOW	CLEAR H	FINGERLING	SWANSON R	1,600	1.090
BARBARA L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	11,000	1.150
CABIN L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	15,000	1.150
CARTER L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	9,527	1.300
CHUGACH ESTATES	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	6,000	1.150
ENCELEWSKI L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	20,000	1.180
JEROME L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,000	1.080
JOHNSON L-KASI	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	17,000	1.180
LONGMARE L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	34,071	1.150
RAINBOW L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	5,000	1.080
SPORT L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	15,000	1.180
STORMY L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	50,057	1.080

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

=====						Number	Average
Stocking							
Location	Area	Species	Hatchery	Lifestage	Broodstock	Stocked	Weight (gm)
=====							
SUMMIT L (SEW)	CCI	RAINBOW	FT RICHARDSON H	FED FRY	BIG L (BIG L)	250,000	0.170
THETIS L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	15,000	1.150
TIRMORE L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	12,000	1.150
VAGT L	CCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	9,000	1.080
AUREL L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,000	1.200
BIG L (KOD)	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,600	1.200
BULL L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	2,000	1.200
CAROLINE L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,400	1.200
CASCADE L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,300	1.200
CICELY L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,150	1.200
DOLGOI L	KOD	RAINBOW	KITOI H	FINGERLING	KITOI L	5,600	1.500
DRAGONFLY L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,550	1.200
HEITMAN L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,250	1.200
HORSESHOE L-KOD	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,000	1.200
JACK L-KOD	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,000	1.200
JUPITER L	KOD	RAINBOW	KITOI H	FINGERLING	KITOI L	3,250	1.500
LEE L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	2,800	1.200
LILLY POND	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,600	1.200
LONG L (KOD)	KOD	RAINBOW	KITOI H	FINGERLING	KITOI L	3,600	1.500
LUPINE L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,600	1.200
MARGARET L	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,600	1.200
SATURN L	KOD	RAINBOW	KITOI H	FINGERLING	KITOI L	2,650	1.500
TANIGNAK L	KOD	RAINBOW	KITOI H	FINGERLING	KITOI L	3,000	1.500
TWIN L (KOD)	KOD	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,547	1.200
"X" L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	20,843	1.100
"Y" L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	7,900	1.080
BARLEY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,720	1.200
BEACH L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	14,188	63.533
BEACH L	NCI	RAINBOW	FT RICHARDSON H	BROODSTOCK	SWANSON R	9	1.000
BEVERLY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	8,400	1.100
BIG BEAVER L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	16,100	1.300
BIG L (BIG L)	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	24,043	55.333
BIG NO LUCK	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	6,812	1.300
BLODGETT L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	5,760	1.300
CAMPBELL CR	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	6,303	92.750
CAMPBELL PT L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	4,988	98.000
CAMPBELL PT L	NCI	RAINBOW	FT RICHARDSON H	BROODSTOCK	SWANSON R	7	1.000
CARPENTER L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	35,280	1.200
CHENEY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	12,652	71.150
CHENEY L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	3,214	70.000
CHESTER CR	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	4,390	97.750
CHESTER CR	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	119	33.000
CLUNIE L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	8,049	89.833
CLUNIE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	6,102	1.075
CRYSTAL L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	105,420	1.200

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
DAWN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	12,400	1.200
DELONG L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	9,416	72.675
DELONG L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	4,252	35.500
DERBY POND	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	1,039	113.567
DIAMOND L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	55,630	1.000
DISHNO L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	1,000	71.000
E TWIN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	4,122	1.300
EKLUTNA L	NCI	RAINBOW	FT RICHARDSON H	FED FRY	BIG L (BIG L)	350,000	0.170
EKLUTNA L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	207,837	0.300
FISH L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	1,188	36.100
FLORENCE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	5,460	1.080
GONDOR L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	10,000	0.200
GREEN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	3,470	45.600
GWEN L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	4,089	89.167
HILLBERG L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	2,534	45.600
HONEYBEE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	46,406	1.200
IDA L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	8,000	1.080
IRENE L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	1,821	94.000
JEWEL L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	12,050	59.200
JEWEL L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	4,063	70.000
KALMBACK L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	52,000	1.000
KASHWITNA L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	30,407	1.470
KEPLER-BRADLY L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	7,116	113.500
KEPLER-BRADLY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	8,928	1.400
KNIK L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	10,000	1.000
L LONELY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	44,825	1.100
LAKE OTIS	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	1,534	95.500
LALEN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	9,400	1.300
LAZY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	2,300	1.300
LITTLE NO LUCK	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	3,457	1.300
LONG L (KB)	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	30,575	1.100
LONG L (MI86)	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	4,400	1.300
LORRAINE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	13,201	1.300
LOWER FIRE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	11,308	63.150
LUCILLE L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	20,254	69.050
LYNDA L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	2,000	1.300
LYNNE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	7,061	1.200
MARION L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	8,300	1.000
MATANUSKA L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	12,189	88.200
MIRROR L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	14,980	63.533
MIRROR L	NCI	RAINBOW	FT RICHARDSON H	BROODSTOCK	SWANSON R	13	1.000
MORVO L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	17,340	1.000
N FRIEND L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	23,985	1.247
OTTER L (FT R)	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	7,091	95.933
OTTER L (FT R)	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	12,733	35.575
PORTAGE VALLY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	5,087	95.000
RAVINE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	2,500	1.080

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
REED L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	3,900	1.000
ROBIN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	10,000	0.200
S FRIEND L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	12,713	1.290
SAND L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	13,780	64.067
SAND L	NCI	RAINBOW	FT RICHARDSON H	BROODSTOCK	SWANSON R	21	1.000
SEYMOUR L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	45,840	1.300
SHULIN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	50,006	1.300
SIX MILE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	4,140	1.200
SOUTH ROLLY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	13,200	1.000
SPRING L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	563	71.000
STEPAN L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	6,000	1.300
TAKU CAMPBELL L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	5,231	93.667
TAKU CAMPBELL L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	SWANSON R	2,391	70.000
THOMPSON L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	1,024	71.000
TIGGER L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	1,900	1.080
TRADE FAIR POND	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	700	102.300
TRIANGLE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	1,178	45.600
TWIN ISLAND L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	15,105	1.300
TWIN LAKES	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	6,300	1.300
U SIX MILE L	NCI	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	400	72.000
UNIVERSITY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	50,013	0.300
VERA L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	11,050	1.200
VISNAW L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	17,250	1.300
W BEAVER L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	10,257	1.300
WALBY L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	5,390	1.200
WEINER L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	4,140	1.080
WISHBONE L	NCI	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	5,270	1.300
BLUEBERRY L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	2,463	1.290
BUFFALO L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	1,305	65.700
CARIBOU L (PWS)	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	10,000	1.290
CRATER L (CORD)	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	SWANSON R	5,762	1.150
CRATER L (L LOU)	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	3,200	1.400
DJ L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	400	1.290
GERGIE L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	7,514	1.290
L CRATER L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	400	1.400
MIRROR L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	9,502	65.700
NORTH JANS L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	11,629	1.290
OLD ROAD L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	550	65.700
ROUND L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	650	65.700
RUTH L (GLEN)	PWS	RAINBOW	FT RICHARDSON H	CATCHABLE	BIG L (BIG L)	545	90.000
SCULPIN L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	27,933	1.290
SQUIRREL CR L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	1,507	65.645
TEX SMITH L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	3,400	1.400
THREE MILE L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	4,000	1.290
TOLSONA L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	30,004	1.400
VAN L	PWS	RAINBOW	FT RICHARDSON H	FINGERLING	BIG L (BIG L)	80,408	1.000

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking Location	Area	Species	Hatchery	Lifestage	Broodstock	Number Stocked	Average Weight (gm)
HARDING L	AYK	SHEEFISH	CLEAR H	FINGERLING	CLEAR HATCHERY	60,000	0.150
SANSING L	AYK	SHEEFISH	CLEAR H	BROODSTOCK	KOY-YUKON MIX	12	5000.000
HARDING L	AYK	SOCKEYE	GULKANA H	EMERGENT F	GULKANA R	503,000	0.156
BEAR CR (TUST)	CCI	SOCKEYE	CROOKED CR H	FINGERLING	BEAR CR (SEW)	3,047,000	0.390
GLACIER FLATS	CCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	3,225,400	0.295
HIDDEN L-COOPER	CCI	SOCKEYE	TRAIL LAKE H	FED FRY	HIDDEN L-COOPER	6,085,307	0.090
PACKERS L	CCI	SOCKEYE	TRAIL LAKE H	FINGERLING	PACKERS L	2,989,179	0.355
CHENIK L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	2,601,000	0.200
ELUSIVAK L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	551,900	0.200
HAZEL L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	783,000	0.270
KERSHNER L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	521,000	0.200
L PAINT L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	552,400	0.200
LEISURE L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	2,100,000	0.230
PORT DICK L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	221,700	0.200
U PAINT L	LCI	SOCKEYE	CROOKED CR H	FINGERLING	GLACIER FLATS	1,103,000	0.200
BIG L (BIG L)	NCI	SOCKEYE	BIG LAKE H	FED FRY	MEADOW CR	1,203,000	0.261
MEADOW CR	NCI	SOCKEYE	BIG LAKE H	FED FRY	MEADOW CR	13,288,844	0.154
CROSSWIND L	PWS	SOCKEYE	GULKANA H	EMERGENT F	GULKANA R	2,487,000	0.156
DAVIS L	PWS	SOCKEYE	MAIN BAY H	FED FRY	COGHILL L	657,287	0.260
ESTHER PASS L	PWS	SOCKEYE	MAIN BAY H	FED FRY	COGHILL L	153,031	0.260
GULKANA R	PWS	SOCKEYE	GULKANA H	EMERGENT F	GULKANA R	6,204,000	0.156
L GULKANA R	PWS	SOCKEYE	GULKANA H	EMERGENT F	L GULKANA R	185,631	0.156
MAIN BAY	PWS	SOCKEYE	MAIN BAY H	SMOLT	COGHILL L	330,025	10.985
PASS L	PWS	SOCKEYE	MAIN BAY H	FED FRY	COGHILL L	594,210	0.260
SUMMIT L (PAX)	PWS	SOCKEYE	GULKANA H	EMERGENT F	GULKANA R	12,026,000	0.156
BADGER L	SSE	SOCKEYE	BEAVER FALLS H	EMERGENT F	HUGH SMITH L	1,291,000	0.153
HECKMAN L	SSE	SOCKEYE	BEAVER FALLS H	EMERGENT F	HECKMAN L	429,000	0.190
HUGH SMITH L	SSE	SOCKEYE	BEAVER FALLS H	EMERGENT F	HUGH SMITH L	1,206,000	0.158
KLAWOCK R	SSE	SOCKEYE	KLAWOCK H	EMERGENT F	KLAWOCK R	592,465	0.219
MARGARET L	SSE	SOCKEYE	BEAVER FALLS H	EMERGENT F	HECKMAN L	518,000	0.180
PATCHING L	SSE	SOCKEYE	BEAVER FALLS H	EMERGENT F	HECKMAN L	2,378,000	0.170
SALMON L (KET)	SSE	SOCKEYE	BEAVER FALLS H	EMERGENT F	SALMON L (KET)	315,000	0.190
CROOKED CR	CCI	STEELHEAD	CROOKED CR H	SMOLT	CROOKED CR	11,600	68.800
CRYSTAL CR	CSE	STEELHEAD	CRYSTAL LAKE H	FINGERLING	CRYSTAL CR	90,392	4.590
BRIDGE CANYON R	LCI	STEELHEAD	FT RICHARDSON H	SMOLT	ANCHOR R	10,342	61.000

Appendix 1. Salmonids stocked by FRED Division in 1988

Includes all releases as of 1 December 1988

Stocking						Number	Average
Location	Area	Species	Hatchery	Lifestage	Broodstock	Stocked	Weight (gm)
CHENEY L	NCI	STEELHEAD	FT RICHARDSON H	SMOLT	ANCHOR R	4,054	61.000
DELONG L	NCI	STEELHEAD	FT RICHARDSON H	SMOLT	ANCHOR R	4,143	61.000
GWEN L	NCI	STEELHEAD	FT RICHARDSON H	SMOLT	ANCHOR R	3,169	60.000
JEWEL L	NCI	STEELHEAD	FT RICHARDSON H	SMOLT	ANCHOR R	5,842	61.000
SAND L	NCI	STEELHEAD	FT RICHARDSON H	SMOLT	ANCHOR R	6,000	61.000
SIX MILE CR	NCI	STEELHEAD	CROOKED CR H	SMOLT	CROOKED CR	95,661	43.150
JUNEAU DUMP	NSE	STEELHEAD	KLAWOCK H	SMOLT	KLAWOCK R	0	29.900
KLAWOCK L	SSE	STEELHEAD	KLAWOCK H	SMOLT	KLAWOCK R	19,959	45.000
WARD L	SSE	STEELHEAD	KLAWOCK H	SMOLT	KLAWOCK R	19,648	45.000

APPENDIX 2

Life-Stage Survival Summaries for Fish Released in 1988

Appendix 2. FRED Division Life-Stage Survival Report , includes stocks released in 1988

			Adjusted		% surv	Fry	Fish	
			green eggs	Eyed eggs	to eyeup	emerged	released	Comments
BEAVER FALLS	SOCKEYE	87 HUGH SMITH L	3,396,000	2,762,000	81.3	2,497,000	2,497,000	
BEAVER FALLS	SOCKEYE	87 KARTA	387,000	336,000	86.8	315,000	315,000	
BEAVER FALLS	SOCKEYE	87 NAHA	3,820,000	3,499,000	91.6	3,325,000	3,325,000	
BIG LAKE	COHO	86 BIG LAKE	3,180,000	2,930,000	92.1	2,810,000	2,720,000	2.68 M released in 87
BIG LAKE	COHO	87 BIG LAKE	3,300,000			3,073,000	2,625,000	
BIG LAKE	COHO	86 LITTLE SUSITNA	18,000	17,000	94.4	16,300	16,000	
BIG LAKE	COHO	87 LITTLE SUSITNA	3,824,000			3,543,000	3,943,000	
BIG LAKE	SOCKEYE	87 MEADOW CR	20,300,000	17,900,000	88.2	14,400,000	14,500,000	
BROOD DEV CENTE	RAINBOW	86 SWANSON SELECT	93,200	71,000	76.2	70,400		FOH for broodstock
BROOD DEV CENTE	RAINBOW	87 SWANSON SELECT	66,048	53,366	80.8	52,359		FOH for broodstock
BROOD DEV CENTE	RAINBOW	88 SWANSON SELECT	121,360	95,900	79.0	94,700		FOH for broodstock
CANNERY CREEK	CHUM	87 CANNERY CR	487,000			200,000	200,000	
CANNERY CREEK	PINK	87 CANNERY CR	108,000,000			94,819,000	94,819,000	
CLEAR	ARCTIC CHAR	87 ALEGNAGIK	183,000	155,000	84.7	111,000	70,800	
CLEAR	COHO	87 WOOD CR	652,000	622,000	95.4	603,000	581,000	
CLEAR	GRAYLING	88 CLEAR H	181,000					
CLEAR	GRAYLING	88 MOOSE L	2,820,000			2,287,000	2,155,000	
CLEAR	LAKE TROUT	87 PAXON L	89,100	67,700	76.0	54,400	53,800	
CLEAR	RAINBOW	87 SWANSON R		1,530,000		1,480,000	1,190,000	1.06M released in 87
CLEAR	RAINBOW	88 SWANSON R		1,530,000		1,340,000	573,000	FOH for release in 89
CLEAR	SHEEFISH	87 CLEAR H	1,769,000			400,000	60,000	
CROOKED CREEK	COHO	86 CROOKED CR	1,300,000			252,000	223,000	161k released in 87
CROOKED CREEK	COHO	87 CROOKED CR	815,000			288,500	206,000	
CROOKED CREEK	SOCKEYE	87 TUSTUMENA L	21,000,000	18,800,000	89.5	18,300,000	14,706,000	
CROOKED CREEK	STEELHEAD	86 CROOKED CR	127,000	105,000	82.7	98,000	107,000	

Appendix 2. FRED Division Life-Stage Survival Report , includes stocks released in 1988

			Adjusted green eggs	Eyed eggs	% surv to eyeup	Fry emerged	Fish released	Comments
CRYSTAL LAKE	CHINOOK	86 CRYSTAL CR	1,912,000	1,410,000	73.7	1,363,000	1,033,000	86k destroyed- BKD
CRYSTAL LAKE	COHO	86 CRYSTAL CR	770,000	606,000	78.7	595,000	553,000	460k fry released in 87
CRYSTAL LAKE	COHO	87 CRYSTAL CR	933,000	788,000	84.5	769,000	650,000	FOH for release in 89
CRYSTAL LAKE	STEELHEAD	87 CRYSTAL CR	141,000	108,000	76.6	102,000	90,000	
DEER MOUNTAIN	CHINOOK	86 KETCHIKAN CR	1,025,000	934,000	91.1	597,000	423,000	302k released in 87
DEER MOUNTAIN	COHO	86 REFLECTION L	45,000	36,000	80.0	35,000	29,000	21k released in 87
DEER MOUNTAIN	COHO	87 REFLECTION L	283,000	264,000	93.3	258,000	217,000	inc 12/88 release
ELMENDORF	CHINOOK	87 CROOKED CR	1,290,000	1,198,000	92.9	1,178,000	1,175,000	
ELMENDORF	CHINOOK	87 SHIP CR	135,000	124,000	91.9	122,000	116,000	
ELMENDORF	COHO	86 BEAR CR				312,000	290,000	
ELMENDORF	COHO	87 BEAR CR	284,000	273,000	96.1	261,000	255,000	
ELMENDORF	COHO	86 CROOKED CR				67,000	62,300	xfer from Trail Lakes
ELMENDORF	COHO	86 SHIP CR	63,000	59,700	94.8	58,900	58,800	
FT RICHARDSON	CHINOOK	88 DESHKA R	167,000				144,000	ee xfer to PWSAC
FT RICHARDSON	CHINOOK	87 MONTANA/WILLOW	591,000	525,000	88.8	504,000	466,000	
FT RICHARDSON	CHINOOK	87 NINILCHIK R	292,000	260,000	89.0	250,000	247,000	
FT RICHARDSON	COHO	87 CASWELL CR	206,000	205,000	99.5	205,000	9,000	FOH for release in 89
FT RICHARDSON	COHO	86 EYAK L	284,000	178,000	62.7	176,000	166,000	104k released in 87
FT RICHARDSON	COHO	86 LITTLE SUSITNA	550,000	540,000	98.2	540,000	446,000	
FT RICHARDSON	COHO	87 LITTLE SUSITNA	538,000	527,000	98.0	526,000	209,000	FOH for release in 89
FT RICHARDSON	RAINBOW	87 BIG LAKE	876,000	782,000	89.3	676,000	628,000	407k released in 87
FT RICHARDSON	RAINBOW	88 BIG/SWANSON	5,960,000	4,794,000	80.4	3,030,000	4,000,000	xfer to Clear
FT RICHARDSON	RAINBOW	87 SWANSON R	6,290,000	5,530,000	87.9	3,740,000	3,741,000	3.7M released in 87
FT RICHARDSON	STEELHEAD	87 ANCHOR R	49,000	35,600	72.7	35,300	33,550	
GULKANA	CHINOOK	87 E FK GULKANA R	13,400			1,390	1,390	
GULKANA	SOCKEYE	87 E FK GULKANA R	310,000			186,000	186,000	

Appendix 2. FRED Division Life-Stage Survival Report , includes stocks released in 1988

			Adjusted		% surv	Fry	Fish	
			green eggs	Eyed eggs	to eyeup	emerged	released	Comments
GULKANA	SOCKEYE	87 GULKANA R	33,000,000			21,220,000	21,220,000	
HIDDEN FALLS	CHINOOK	86 CRYSTAL CR	151,400	116,000	76.6	104,600	101,500	
HIDDEN FALLS	CHINOOK	86 TAHINI R	66,500	62,200	93.5	60,400	57,500	
HIDDEN FALLS	CHUM	87 HIDDEN FALLS	72,200,000	57,460,000	79.6	53,222,000	5,170,000	Xfer as eyed eggs to PNP
HIDDEN FALLS	CHUM	87 SNETTISHAM	6,850,000					
KITOI	CHUM	87 KITOI BAY	6,140,000	5,280,000	86.0	4,900,000	4,740,000	
KITOI	COHO	87 LITTLE KITOI L	627,000	582,000	92.8	559,000	527,000	
KITOI	PINK	87 KITOI BAY	115,000,000	104,000,000	90.4	100,000,000	94,200,000	
KITOI	RAINBOW	88 BIG KITOI L	87,000	35,000	40.2	35,000	18,100	
KLAWOCK	COHO	87 CABLE CR	83,000	73,000	88.0	25,000	20,000	
KLAWOCK	COHO	87 KLAWOCK R	1,894,000	1,703,000	89.9	1,662,000	1,373,000	inc 12/88 release
KLAWOCK	SOCKEYE	87 KLAWOCK R	1,478,000	796,000	53.9	592,000	592,000	
KLAWOCK	STEELHEAD	87 KLAWOCK R	95,000	77,000	81.1	67,000	40,000	20 k transport mortality
MAIN BAY	SOCKEYE	86 COGHILL				331,000	330,000	
MAIN BAY	SOCKEYE	87 COGHILL L	11,100,000	7,190,000	64.8	5,359,000	1,405,000	
RUSSELL CREEK	COHO	87 MORTENSON CR	508,000	432,000	85.0	410,000	325,000	FOH for release in 89
RUSSELL CREEK	PINK	87 KITOI BAY		10,000,000		9,000,000	9,000,000	xfer from Kitoi
SIKUSUILAQ	CHUM	87 NOATAK R	3,650,000	3,240,000	88.8	3,034,000	3,003,000	
SNETTISHAM	CHINOOK	86 CRYSTAL CR	1,160,000	672,000	57.9	562,000	361,000	
SNETTISHAM	CHINOOK	87 CRYSTAL CR	2,760,000	1,960,000	71.0	1,500,000	269,000	FOH for release in 89
SNETTISHAM	CHINOOK	86 KING SALMON R	144,000	133,000	92.4	130,000	70,400	
SNETTISHAM	CHINOOK	86 SNETTISHAM	155,000	119,000	76.8	116,000		
SNETTISHAM	CHUM	87 HIDDEN FALLS	6,850,000	6,470,000	94.5	5,360,000	5,170,000	
SNETTISHAM	CHUM	87 SNETTISHAM	47,000,000	45,600,000	97.0	37,800,000	35,200,000	

Appendix 2. FRED Division Life-Stage Survival Report , includes stocks released in 1988

			Adjusted		% surv	Fry	Fish	
			green eggs	Eyed eggs	to eyeup	emerged	released	Comments
SNETTISHAM	COHO	84 SNETTISHAM	721,000	696,000	96.5	688,000	283,000	275k released 85-87
SNETTISHAM	COHO	85 SNETTISHAM	1,720,000	1,570,000	91.3	1,480,000	851,000	120,000 stocked in 1986
SNETTISHAM	COHO	86 SNETTISHAM	1,600,000	1,550,000	96.9	1,480,000	426,000	104 k released in 87
TRAIL LAKES	CHINOOK	86 CROOKED CR	427,000	378,000	88.5	374,000	366,000	268k released in 87
TRAIL LAKES	COHO	87 BEAR CR	860,000	817,000	95.0		633,000	
TRAIL LAKES	COHO	87 CROOKED CR	821,000	817,000	99.5		721,000	
TRAIL LAKES	SOCKEYE	87 HIDDEN L	7,060,000				6,085,000	
TRAIL LAKES	SOCKEYE	87 PACKER L	3,700,000	3,177,000	85.9		2,989,000	
TUTKA BAY	CHUM	87 WESTSIDE CR	3,600,000	3,037,000	84.4	3,240,000	3,211,000	
TUTKA BAY	PINK	87 TUTKA LAG	19,500,000	17,560,000	90.1	15,600,000	15,600,000	

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

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