EVALUATION OF A LOW-COST SALMON PRODUCTION FACILITY

Annual Report FY 1987

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ABSTRACT

Fiscal year 1987 was the fifth year of a study sponsored by the Bonneville Power Administration (BPA) to evaluate the presently existing, small-scale salmon production facility operated and maintained by the Clatsop Economic Development Committee's (CEDC) Fisheries Project through program measure 704(j)(l) of the Power Planning Council's Fish and Wildlife program.

Activities during the study focused on accomplishment of the following objectives: (1) Investigate the potential for community involvement, (2) evaluate natural outmigration of smolts, (3) provide cumulative production of quality salmon, (4) aid in development of optimum density levels in earthen rearing ponds, and (5) augment a unique "known stock" fishery. The coded-wire tagging program was continued to aid in the accomplishment of the objectives.

The local community continued to provide assistance to the CEDC Fisheries Project. A preliminary value of over $45,000 for in-kind and cash contributions was received from various contributors.

Monitoring of downstream smolt migration from CEDC release sites continued. Data collected is beginning to show that smolt size and stream flow have an effect on smolt migration. Release of comparatively larger smolts and release during elevated stream flows, demonstrates a more rapid migration. Release of larger smolts also enhances adult survival. Smolts released at 9.5 fish/pound survived by nearly ten times that of smolts released at 16.3 fish/pound and by nearly 5 l/2 times when released at about 13.5 fish/pound.

In 1987 the CEDC Fisheries Project reared and released a total of approximately 1.7 million salmon smolts. Coho production was about 300,000, fall chinook at about 1.4 million, and Rogue stock fall chinook at a minimal 20,000.

Since 1983 optimum rearing densities for the two earthen ponds used for coho production have been investigated. Preliminary results indicate that a total production of about 35,000 pounds, corresponding to 10,000 pounds in pond #1 and 25,000 pounds in pond #2, should not be exceeded. This poundage reflects a loading of 16.6 pounds/gal/min and 25 pounds/gal/min in ponds #1 and #2 respectively. In terms of pond volume this correlates to 0.08 pounds/ft3 and 0.17 pounds/ft3.

Fish reared and released by the CEDC Fisheries Project continue to be harvested in the various sport and commercial fisheries from California to Alaska. Preliminary overall adult survival figures for 1987 show a 0.69% for tule chinook, 2.89% for Rogue stock fall chinook, and 0.82% for coho. Chinook survival was up from previous years, whereas coho survival appears to be down.

INTRODUCTION

In 1983 the Bonneville Power Administration (BPA) began funding a project with the Clatsop Economic Development Committee's (CEDC) Fisheries Project that addressed program measure 704(j)(l) of the Power Planning Council's Fish and Wildlife Program. This measure directed emphasis on developing and testing small-scale, low-cost, salmon and steelhead propagation facilities adaptable to Columbia basin locales. Development of such a facility was not necessary because the CEDC program is an existing salmon propagation facility. The facility is being evaluated with respect to the feasibility of implementing similar programs in other locales. Interrelated measure 704(h)(5) regarding the smolt survival index is also being adressed through the evaluation of CEDC's smolt release strategies.

The CEDC Fisheries Project continues to operate and maintain three earthen, gravity flow rearing ponds on the Youngs Bay drainage in Ciatsop County, Oregon, Hickerson and Hill (personal communication, 1984). Annual production levels continue to be approximately 3,000,OOO fall chinook, 300,000 coho, and some chum salmon. Since 1983 a Rogue River stock fall chinook has been reared at levels ranging from about 12,000 to 250,000 with annual increases anticipated if the introduction of this stock proves successful. In 1987 an expansion of rearing area utilizing the estuarine environment was initiated. A small scale pen-rearing program is being evaluated for potential of expanding salmon smolt production. All fish are released into Youngs Bay for subsequent return of adults to the local gillnet fishery and thereby provide the anticipated stimulus to the local economy.

Funding for the Fisheries Project continues to come from several sources. The 1986-87 fiscal period included funding from the Oregon Department of Fish & Wildlife (ODFW), $87,603; Youngs Bay fishermen and processors, $26,971; and many in-kind, cash, and material contributions at a value of about $18,500. BPA provided approximately $55,000, and the Economic Development Administration (EDA) furnished about $88,000. BPA funded the "Evaluation of a Low-Cost Salmon Production Facility", and EDA funds were primarily for the construction of a hatchery building and eventual installation of a small hydropower generator.

The study objectives are:

1. Investigate the potential for community involvement

2. Evaluate natural outmigration of smolts from earthen rearing ponds

3. Provide cumulative production of large numbers of quality salmon while maintaining genetic variability

4. Aid in development of optimum density levels in earthen pond environments

5. Augment a unique 'known stock' fishery

METHODS AND MATERIALS

Community Involvement
(Construction)

In 1986 the CEDC Fisheries Project was awarded a $92,000 grant from EDA for the construction of a hatchery/storage building, the installation of a small hydroelectric system, and for various research equipment and supplies. In 1987 the actual construction of the new building was completed. Total project cost was $115,000 with $23,000 matched by local funds, some of which were through construction assistance. In-kind assistance from the community was over $8,000.

Community Involvement
(Operation and Maintenance)

The local community continues to provide assistance in the form of in-kind and cash contributions. The contributions range from small contributions to substantial cash, materials, or in-kind contributions. The 1987 contributions are shown in Table 1 and Figure 1.

Natural Outmigration of Smolts

CEDC continues to utilize the volitional smolt release strategy. The rearing ponds are maintained at or near full water capacity and the retaining screens are removed, hence allowing fish to leave the pond. Feeding continues for about two weeks at full pond levels and then the ponds are slowly drained over a one-week period flushing the remaining fish out of the pond.

In 1987 size at release for the coho was approximately 10.5 fish/pound in each of the two ponds. In 1986 release size was 12.5 fish/pound in each pond, and in 1985 the size was 16.5 fish/pound in one of the ponds and 13.5 in the other. In 1984 release size was 16.5 fish/pound in one pond and 9.5 in the other. Results are demonstrating substantial survival differences between the larger and smaller size smolts.

In 1987 a small scale project to investigate fall chinook migration survival was continued. In 1986 the project was initiated to determine if the period during which the fall chinook were migrating from the release site to the lower estuary had an impact on subsequent survival levels. Two groups of fish were coded-wire tagged with equal numbers in each group. One group was released at the pond site and the other was trucked to a site in the lower estuary of Youngs Bay. In 1987 this rearing and release strategy entailed coded-wire tagging three groups of fish: One group that was reared and released at the pond site, one group that was reared at the pond site and trucked to Youngs Bay for release, and the third group was reared and released in the estuary of Youngs Bay.

Table 1. Community Contributions to CEDC Fisheries Project, 1987

Contributor	Contribution	In-Kind	Cash
AMCCO	Steel	$60.00	
Astoria Seafood Co., Inc.	Poundage Assessment Match		$461.06
Jim Bergeron	Cash Donation		$50.00
Big Creek Hatchery	Technical Support/Rogue Assistance	$260.00	
Bioproducts, Inc.	Feed Price Discounts	$368.40	
Roy Bjork	Rock Hauling	$100.00	
Clatsop County	Payroll/Admin./Legal	$84.00	
Comforts of Home Sewing Center	Labor	$30.00	
Fishhawk Fisheries	Poundage Assessment Match		$3,270.92
Gnat Creek Hatchery	Circular Tanks	$2,800.00	
Representative Tom Hanlon	Cash Donation		$150.00
David Hill	Technical Assistance	$50.00	
Klaskanine River Hatchery	Tech. Support/Freezer Space	$1,450.02	
Knappton Corporation	Piling	$550.00	
Ivan Larsen	Towing and Trailer Rental	$300.00	
Marings Pacific NW Fish Company	Poundage Assessment Match		$204.51
ODFW	Technical Assistance	$262.47	
OSU Extension(J. Bergeron)	Technical Support	$257.47	
OSU Seafoods Laboratory	Office/Lab Equipment and Office/Lab/Freezer Space	$7,692.50	
Otter Trawl Commission	Xerox Copier Use/Supplies	$352.53	
Pacific Power & Light	1976 Ford 4 X 4 Pickup	$3,000.00	
Jimmy Parker	Rock	$150.00	
Point Adams Packing Co.	Poundage Assessment Match		$9,825.83
Point Adams Packing Co.	Fish Scrap	$200.00	
The Renaissance Company	Cash Donation		$40.00
Dr. & Mrs. P.B. van Weel	Cash Donation		$10.00
Vanderveldt Family	Land Lease	$200.00	
Western Fab - Richard North	Welder Rental & Steel	$62.00	
Youngs Bay Fishermen	Poundage Assessment		$13,209.08
	Subtotal	$18,229.39	$27,221.40
	TOTAL	*	$45,450.79

* All of 1987 poundage assessment receipts have not been submitted yet

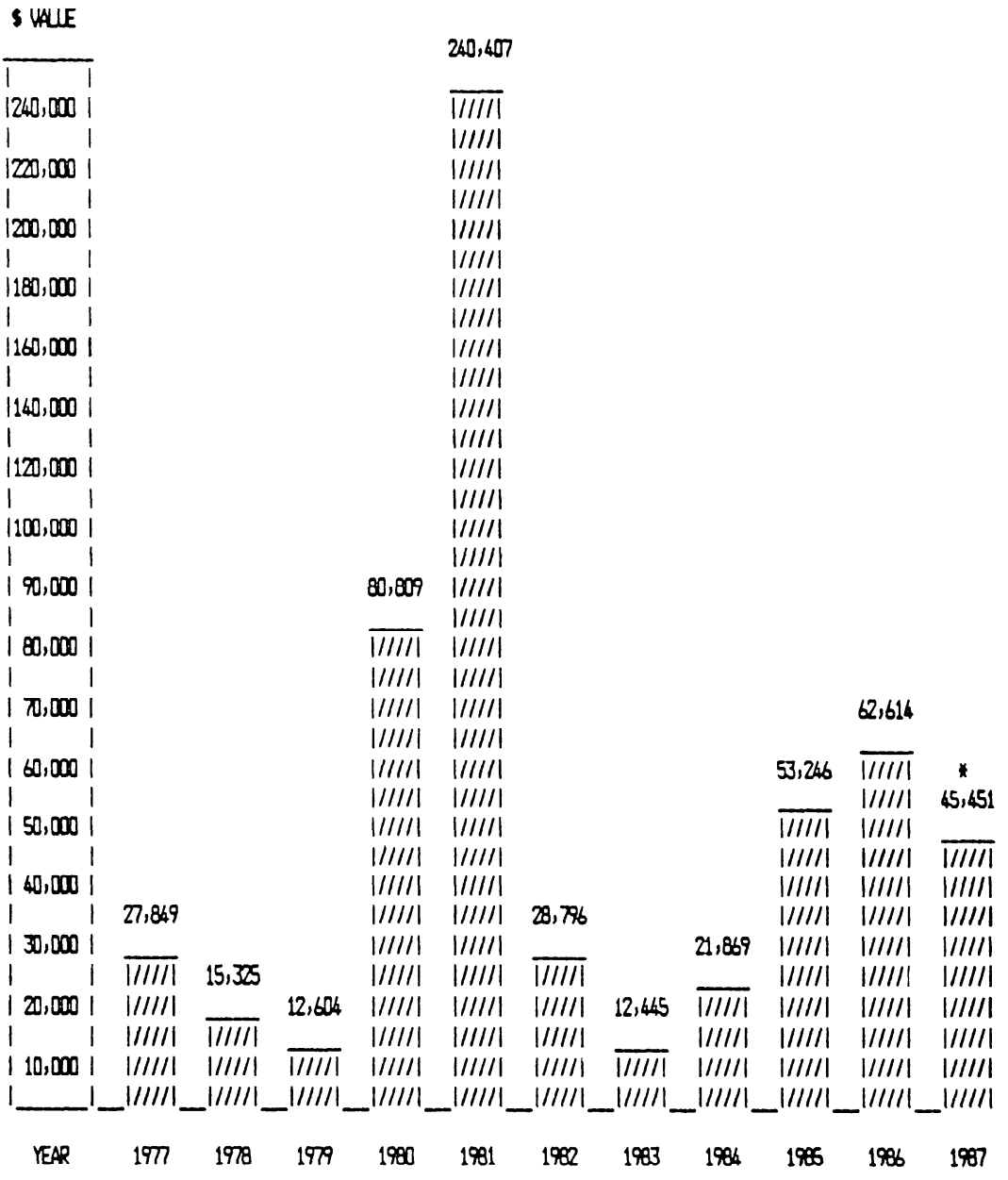

Figure 1. Annual Community Contributions to CEDC Fisheries Project

* All of 1987 poundage assessment receipts have not been submitted yet

Cumulative Production of Quality Salmon

Again in 1987 CEDC's major releases were coho and chinook salmon. Releases were similar to those in past years (Table 2). Due to the available rearing space being near its maximum capacity, production levels are limited. Production levels of some salmon stocks are limited because of a limited egg supply. The ODFW continues to provide eggs and/or fry to help meet production goals. The Project continues to investigate ways of increasing production, improving adult survival, and enhancing the quality of returning adults. Present efforts to accomplish these goals include experimentation with estuarine net-pen rearing, evaluation of increased smolt size at release, and examination of the potential for triploid salmon releases.

Development of Optimum Density Levels

Since 1983 CEDC has been attempting to determine the optimum rearing densities for its two coho rearing ponds. Since 1983 rearing and release numbers have been changed to evaluate the effects of the varying densities. With a 10 fish/pound target release size, the number reared in pond #1 should not exceed 100,000 fish, and in pond #2 the number should not exceed 250,000 which corresponds to 10,000 pounds and 25,000 pounds respectively.

The fall chinook production in 1987 was reduced to about 1.3 million. This was down from an average of about 3 million in years past.

Augment a Unique Known Stock Fishery

Fish released from CEDC facilities are harvested in various sport and commercial fisheries from Alaska to California. Coded-wire tag recoveries from the various fisheries show the expanse of harvest.

In conjunction with ODFW's comparatively large smolt production, enough fish return to Youngs Bay to justify an extensive terminal fishery. Fish are sampled at the processing plants and coded-wire tags are recovered. Analysis of CWT recoveries allows for contribution estimates of certain stocks and species to the various fisheries. The 1987 CWT information of CEDC releases exhibits an adult survival of 0.69% for tule fall chinook, 2.89% for Rogue stock chinook, and 0.82% for coho (Tables 3, 4, & 5). Chinook survival was up from previous years and coho survival was down.

The expansion formula for return estimates utilized fishery sampling rates and the CWT release rate.

Spawning ground surveys of streams in the Youngs Bay drainage were conducted to estimate adult escapement to these areas. Survey activities included walking the streams once each week for three consecutive weeks during peak spawning, snout removal of all fish containing coded-wire tags, and caudal severing of all fish examined to prevent counting again on subsequent surveys. Survey information is displayed in Table 6.

Table 2. Summary of 1981 - 87 Releases from CEDC Fisheries Project Facilities

Date	Tag Code	Release Site	Species	Release Numbers Total	# Tagged	% Tagged
4/9/81	—	#1	chum	520,000	—	—
5/15/81	7-21/58	#3	CHF	1,800,915	73,242	4.06
5/22/81	7-21/59	#1 & #2 a	CHF	1,357,693	48,898	3.60
4/1/82	7-21/44	#1 & #2 a	coho	300,000	53,000	17.67
5/28/82	7-24/12 b	#3	CHF	1,918,862	79,695	4.15
5/28/82	7-24/13 b	#3	CHF	822,366	33,857	4.12
4/5/83	—	#1	coho	98,278	—	—
4/5/83	7-24/51	#2	coho	216,490	27,404	12.66
5/15/83	7-28/35	#3	CHF	2,480,354	105,139	4.24
8/4/83	7-28/57	#3	RCHF c	32,095	28,758	89.60
8/4/83	7-28/58	#3	RCHF c	18,053	16,176	89.60
4/13/84	7-31/41	#1	coho	93,431	26,817	28.70
4/13/84	7-31/42	#2	coho	207,943	26,697	12.84
5/15/84	7-31/43	#3	CHF	2,867,097	106,911	3.73
6/22/84	—	Youngs Bay	chum	10,000	—	—
8/24/84	LV clip	#3	RCHF c	12,638	—	—
4/1-30/85	7-33/44	#1	coho	98,543	25,574	25.95
4/1-6/85	7-33/43	#2	coho	203,683	24,690	12.12
5/20-6/1/85	7-33/45	#3	CHF	2,994,772	101,415	3.39
5/6/85	—	#2	chum	953,420	—	—
8/1-2/85	7-32/34	#3	RCHF c	10,751	10,568	98.30
"	7-32/35	"	"	10,208	10,034	"
"	7-32/36	"	"	10,431	10,254	"
"	7-32/37	"	"	9,221	9,064	"
"	7-32/38	"	"	10,189	10,016	"
"	LV clip	"	"	31,057	—	—
4/1-15/86	7-38/50 d	#1	coho	47,338	9,304	19.70
"	7-38/51 d	"	"	46,913	9,220	"
"	7-38/52 d	"	"	46,400	9,119	"
"	7-38/47 d	#2	"	86,550	10,845	12.50
"	7-38/48 d	"	"	77,725	9,744	"
"	7-38/49 d	"	"	84,450	10,593	"
"	7-38/43 d	"	" e	4,775	4,775	100.00
"	7-38/44 d	"	" e	5,013	5,013	"
"	7-38/45 d	"	" e	4,613	4,613	"
5/5-30/86	7-29/32 d	#3	CHF	984,445	24,479	2.50
"	7-29/33 d	"	"	990,374	24,574	"
"	7-29/34 d	"	"	1,008,315	25,052	"
5/12/86	7-29/35 d	#3 f	"	26,442	24,938	94.30
7/20/86	7-29/36	#3	RCHF	208,705	24,955	12.00
"	7-38/46	"	"	42,735	5,114	12.00
4/1-12/87	—	#1	coho	80,448	—	—
4/1-12/87	—	#2	coho	219,076	—	—
5/19/87	7-42/51	#3 f	CHF	49,738	49,738	100.00
5/20/87	7-42/48	#3	CHF	1,249,820	43,128	4.00
5/20/87	7-42/53	YB Net Pen	CHF	42,903	42,903	100.00
7/13/87	7-42/46	#3 g	RCHF	20,000	2,760	

a Fish reared in both ponds but tagged with same code
b Two tag codes for same group
c Experimental release of Rogue River fall chinook
d Replicate tagging
e Triploid
f Transferred by truck for release in Youngs Bay
g Released 2 weeks early due to major mortality; estimated number

Table 3. Harvest and Survival Summary of CEDC Released Tule Chinook: 1980 - 1984 Broods

BROOD YEAR	1980		1981		1982		1983		1984	
	NUMBER OF FISH									
YEAR OF CATCH	1983	1984	1984	1985	1985	1986	1986	1987 *	1987 *	1988
BC N Troll				240	0	100	227		231	
BC S Troll				288	258	225	511		9,730	
BC Net					47				654	
WA Troll					165					
WA Sport					94					
OR Troll	80	53	72		0		54		2,405	
OR Sport					0		0		178	
YOUNGS BAY Gillnet	734	604	216	289	282	189	214		3,482	
Columbia River Gillnet	293	187				540	483		3,248	
OR Buoy 10 - Sport					0				321	
CA Troll					0					
CA Sport					94					
Hatchery Returns			48			1	1	54	295	
TOTAL	1,107	844	336	817	940	1,055	1490	54	20,544	
BROOD SURVIVAL PERCENTAGE	.05	.03	.01	.03	.03	.04	.05	.002	.69	
BROOD SURVIVAL BY ALL AGE CLASSES =	.06		.04		.08		.05			

* Preliminary

Table 4. Harvest and Survival Summary of CEDC/ODFW Released Rogue Stock Chinook; 1982 - 1984 Broods

BROOD YEAR	1982		1983 *		1984		1985	
	NUMBER OF FISH							
YEAR OF CATCH	1985	1986	1986	1987	1987 **	1988	1988	1989
BC N Troll		8			0			
BC S Troll	33	47			24			
BC Net	2	0			6			
WA Troll	20							
WA Sport	95							
OR Troll	1,330	283			1,684			
OR Sport	153	12			79			
YOUNGS BAY Gillnet	838	233			311			
Columbia River Gillnet		149			206			
OR Buoy 10 - Sport	22	25			54			
CA Troll	135	159						
CA Sport	51	7						
Hatchery Returns	50	23			1			
TOTAL	2,729	946			2,365			
BROOD SURVIVAL PERCENTAGE	5.44	1.89	*	*	2.89			
BROOD SURVIVAL BY ALL AGE CLASSES =	7.33%							

* This group was marked with LV clip only; no CWT

** Preliminary

Table 5. Harvest and Survival Summary of CEDC Released Coho Adults; 1980 - 1984 Broods

BROOD YEAR	1980	1981	1982	1983	1984
		NUMBER OF FISH			
YEAR OF CATCH	1983 *	1984	1985	1986	1987
BC N Troll			0	0	0
BC S Troll		126	19	215	113
BC Net		71	4	0	0
WA Troll					
WA Sport		95	311		
OR Troll	1,663	24	311	960	1,116
OR Sport	974	924	726	694	813
YOUNGS BAY Gillnet	655	3,002	3,118	2,181	745
Columbia River Gillnet		2,015	707	2,777	422
OR Buoy 10 - Sport		972	162	250	84
CA Troll	291	766	28	207	
CA Sport	129	355	18	41	
Hatchery Returns		118	21	347	14
TOTAL		8,468	5,425	7,672	3,307
BROOD SURVIVAL PERCENTAGE		2.69	1.8	2.54	.82
BROOD SURVIVAL BY ALL AGE CLASSES =		2.69	1.8	2.54	.82

* Complete Information Unavailable

Table 6. Stream Survey Data for Tule and Rogue Stock Fall Chinook 1983 - 1987

Species	Stream	Number of Fish				
		1983	1984	1985	1986	1987
Tule	SF Klaskanine	18	67	22	93	127
	NF Klaskanine	35	17	1	3	--
	Youngs River	0	9	1	14	--
	Lewis & Clark	256	194	63	104	594
	Tucker Creek	0	0	0	0	--
	Walluski	0	0	2	0	--
Rogue	SF Klaskanine	0	0	9	14	0

RESULTS AND DISCUSSION

Community Involvement
(Construction)

The only construction in 1987 other than small routine maintenance construction activities was the construction of the EDA-sponsored hatchery building and the installation of the small hydroelectric generator (Figure 1). Community participation in conjunction with this activity was substantial. The Clatsop County surveyor provided preconstruction services through property line determination and construction site layout. His service was worth $940. Also, a small contribution of essential technical assistance was provided by a local engineer at a value of $50. Prior to actual building construction, the Port of Astoria was involved through excavation services. The site preparation required extensive soil removal to level the area for the 30' X 100' hatchery building. The Port of Astoria's assistance was valued at $5,200.

The installation activities of the small hydropower generator also attracted assistance from local people. The powerhouse was built over an embankment of a Cavenham Forest Industries, Inc. logging road. A hoist truck was needed to lift the generator, lower it over the bank, and place it on the preconstructed concrete pad. Pacific Power and Light Company provided the necessary equipment and accomplished the task at a value of approximately $500. The specific location of the electric generator was chosen so that adequate head pressure could be attained to provide the pressure necessary to operate the generator, and also so the discharge water could be collected and utilized for egg incubation and early rearing of the young salmon. Figure 2 shows the schematic layout of the generator and new hatchery building in relation to the existing water intake for the hatchery building. If the powerhouse would have been built below the intake dam on the small tributary of the South Fork Klaskanine River, the water would not have been available for use in the hatchery building. Approximately 2,500 feet of 8" PVC pipe will supply water to the generator. A 12" discharge pipe allows the water to re-enter the stream about 50 feet above the existing intake. Water quality from the discharge pipe of the small hydrogenerator should not be detrimental to fish eggs or young fish, but this will be monitored closely when the system is put into operation.

Community Involvement
(Operation and Maintenance)

The local community continues to be a major provider of cash, services, and in-kind contributions. The contribution value by individuals or organizations ranges from $10 to thousands of dollars for various cash or in-kind contributions (Table 1). The contributors are primarily from the Clatsop County area and demonstrate their support of the Fisheries Project through these various avenues of assistance.

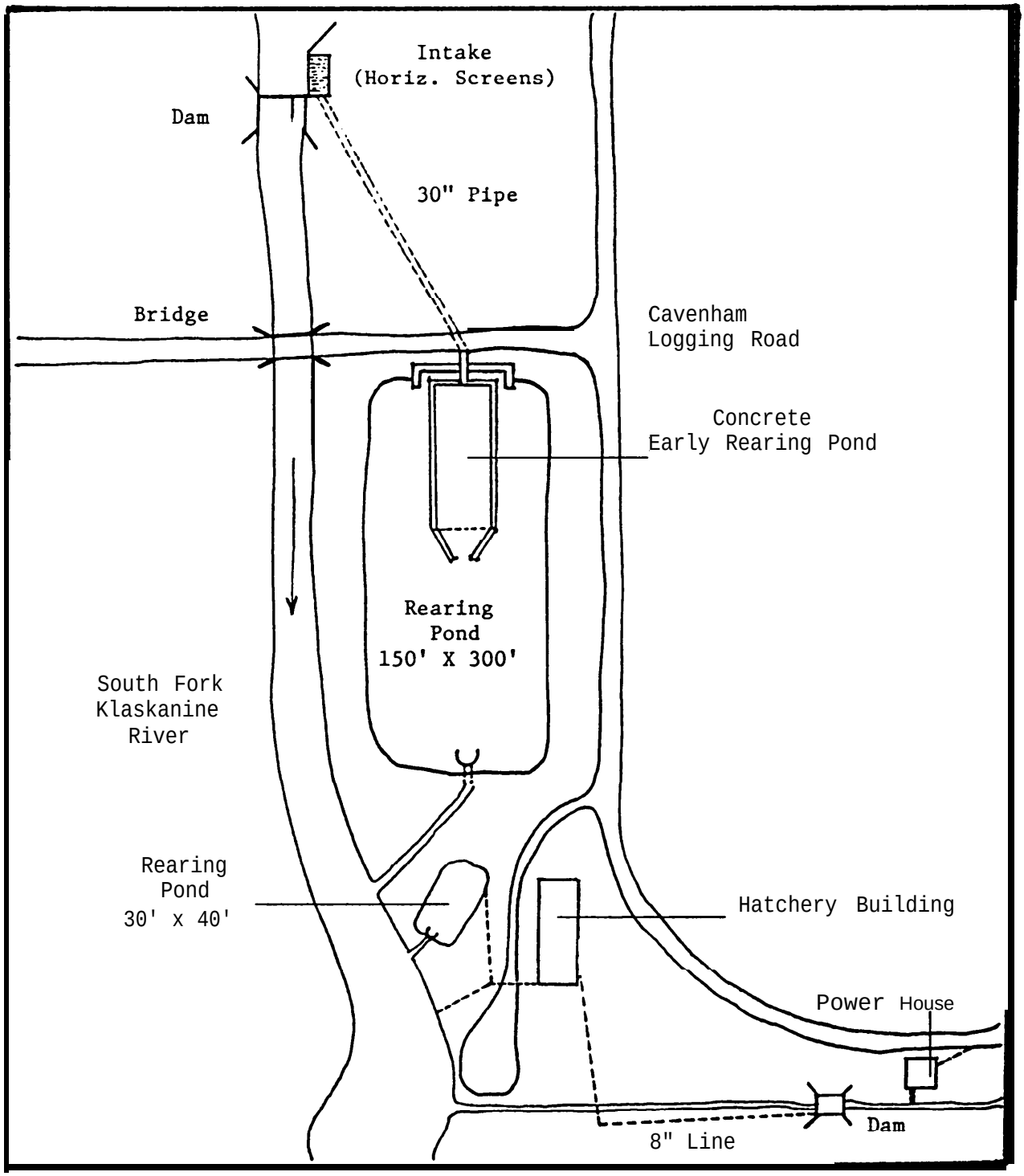

Figure 2. Schematic of CEDC's South Fork Klaskanine Pond #3 Incubation and Rearing Facility, 1987

Many of the in-kind contributions are difficult to put a value on but most are based on the value that the contributor determines. Such contributions as freezer and office space are determined by using local rental rates. For example, freezer space provided by Klaskanine hatchery has a certain value based on poundage and area utilized. The technical assistance provided by various contributors is somewhat arbitrary and may not give a fair value, however, it is intended to show that there is that assistance and that it comes from several organizations and individuals. The ODFW assistance is undervalued because such aspects such as fish hauling, provision of salmon eggs, various consultations, fish health examinations, and numerous other means of assistance are not included. It needs to be mentioned that local ODFW facilities provide assistance to the Fisheries Project whenever feasible, and that private hatcheries must foot the bill for such activities.

The voluntary poundage assessment program in Youngs Bay that was initiated in 1981 continues to be a valuable source of monetary assistance. The commercial fishermen that fish in the Youngs Bay fishery continue to voluntarily assess themselves 5% of the poundage value they receive upon sale of harvested salmon. The processing plants that purchase the fish match the contribution by the fishermen, so in actuality it is 10% of the poundage value that is forwarded to the CEDC Fisheries Project. The fishermen participation level continues at about the 99% level (Figure 3). Contributions have not yet been received from all fish processors participating in the Youngs Bay assessment program, but the total 1987 assessment value is projected to be about $55,000 (Figure 4).

Natural Outmigration of Smolts

In 1987, after the retaining screens from the coho ponds were removed, no seining activity was conducted. Information from prior seining activity reflects the fairly rapid migration of smolts from the pond. From the release site to the tidal influence of Youngs Bay the distance is about 1.5 miles and the coho travel this distance in 1 - 2 days. However, how long the fish remain in the estuary before entering the ocean is not known. The release size of the coho over the last several years has ranged from 9.5 fish/pound to 16.5 fish/pound, and there has been no significant migration differences as compared between the various smolt sizes. The fish within this size range have apparently smolted and are ready to migrate to the ocean.

In 1987, three groups of fall chinook were coded-wire tagged in an effort to continue the evaluation of smolt migration (Table 2). One group of 1,249,820 was reared at the South Fork pond site to a size of 57.5 fish/pound and released into the river. Prior to release, 43,128 of this group were coded-wire tagged. A second group of 49,738 was reared at the South Fork and all were coded-wire tagged before release. This group was trucked to Youngs Bay and released and was also 57.5 fish/pound. A third group of 42,903 was reared in a Youngs Bay net pen, coded-wire tagged, and released directly into the Bay from the pen. Unfortunately this group attained an average size of 45.4 fish/pound. All three groups were released the same day. Upon

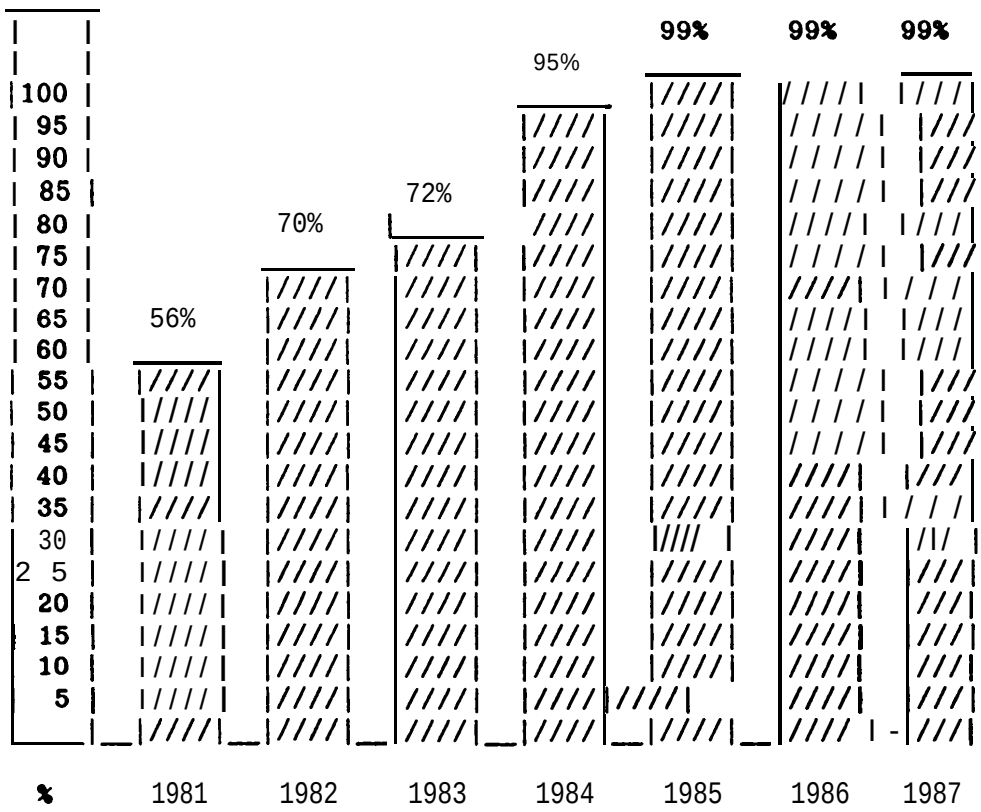

Figure 3. Youngs Bay Commercial Gillnet Voluntary Assessment Participation

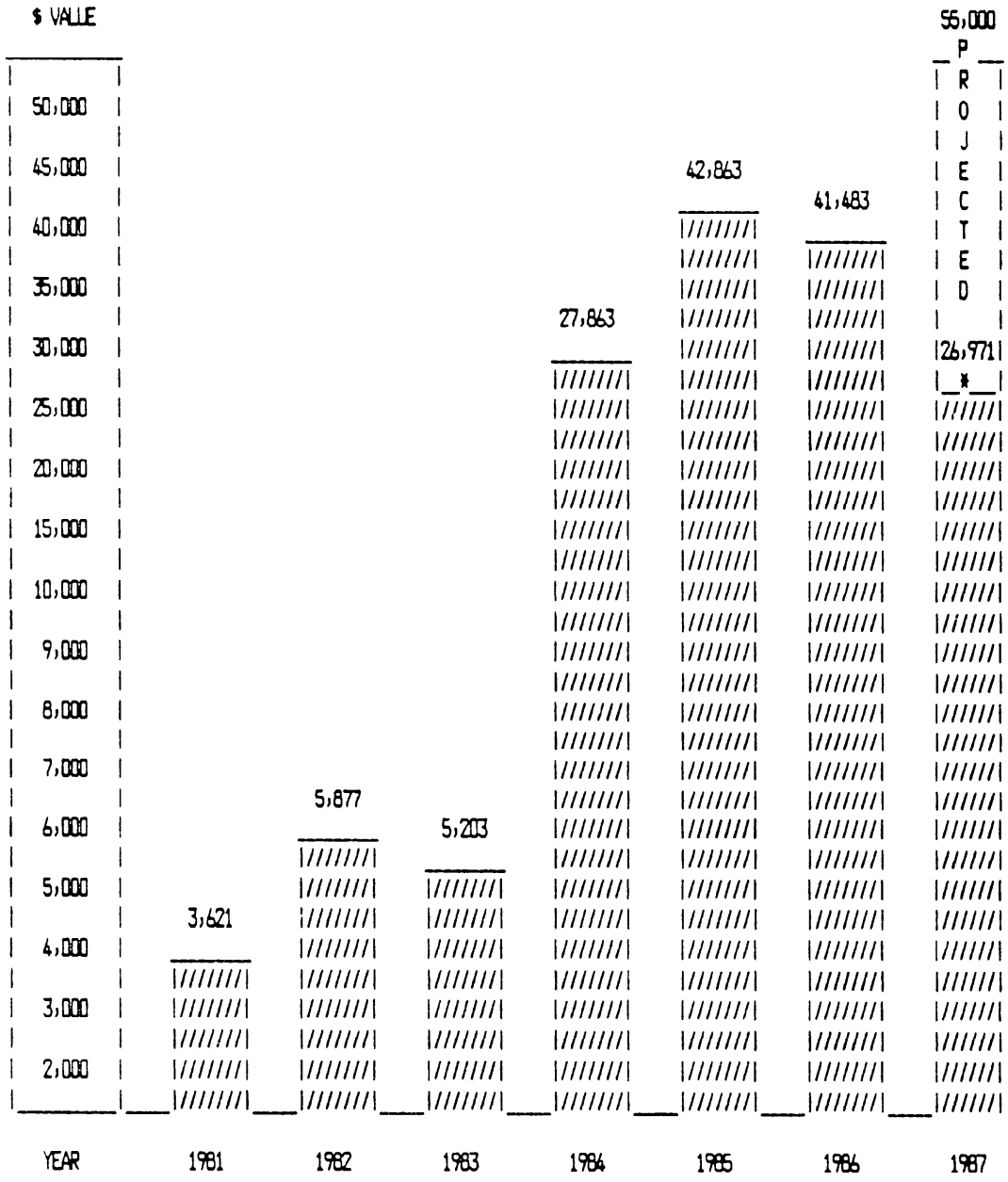

Figure 4. Youngs Bay Voluntary Poundage Assessment Contributions; 1981 - 1987

* All of 1987 assessment receipts have not been submitted yet

adult recovery, survival will be compared with respect to the three different rearing and release strategies.

After release from the South Fork pond, seining of the river at a point 4.5 miles below the release site was performed each day until some of the released fish were collected in the seine. The time that it took these fish to migrate the 4.5 mile distance was two days (Table 7). Prior to 1986 the migration time took six days and the flow was about 8,000 gpm. In 1986 the two-day migration time was correlated to an increase in flow; 15,000 gpm. However in 1987, with a flow of 8,000 gpm, the migration was also two days. A possible explanation may be the fish size. From 1984 to 1986, fish size ranged from 69 fish/pound to 77 fish/pound. In 1987 the size was a large 57.5 fish/pound. It appears that flow and fish size may have an effect on smolt migration. Time of release since 1984 has been mid-May (Table 2).

Cumulative Production of Quality Salmon

The production levels for 1987 are shown in Table 2. Fall chinook releases were lower than previous years. Production levels were lowered for this stock of chinook in anticipation of receiving nearly one million Rogue River stock fall chinook. Subsequently, the availability of the Rogue stock eggs did not materialize. Since 1983 a cooperative effort by ODFW and CEDC to evaluate the introduction of the Rogue stock chinook to the Youngs Bay system has been occurring. The reason for introduction is the anticipated increase in harvest value as compared to the tule chinook. Since the first return of Rogue adults to Youngs Bay in 1985, the price to commercial gillnet fishermen has ranged from $1.50/pound then, to $2.10/pound in 1987. The price paid for the tule fall chinook fluctuates around the $.50/pound value. The Rogue stock maintains its quality longer than the tule chinook after it enters Youngs Bay and is proving to be a more desirable stock for harvest in the Youngs Bay commercial and sport fishery. An overall 2.89% survival (Table 4) was realized as compared to a 0.69X survival for the tule chinook.

In regard to the quality of tule fall chinook in the Youngs Bay fishery, CEDC personnel are investigating the potential of triploidization for subsequent enhanced quality. Project personnel hope to be able to respond to some of the concerns such as quality at harvest time, migratory effects (will the fish actually return?), straying, and feasibility of triploid production. With respect to these concerns it is hopeful that the fish will return and provide a higher quality product to the various fisheries. However, fish remaining in the ocean without a desire to migrate to natal streams may be a benefit to ocean fisheries in terms of extended harvest potential and also for a possible trophy fishery. Some of these questions and concerns will start to be answered in the near future. In 1986 approximately 14,000 coho were released, of which nearly 70% were triploid. In 1987 adults from this release started to be harvested. Preliminary coded-wire tag recoveries show that approximately 25 fish were harvested in the ocean fisheries off of Oregon, and 7 were taken in the Youngs Bay gillnet fishery. CEDC

Table 7. Migration Rate of Fall Chinook Smolts Released from CEDC's South Fork Pond to the Tidal Influence of Youngs Bay (4.5 miles), 1984 - 1987

Release Year	Smolt Size (Fish/lb)	River Flow (gpm)	Migration Time (Days)
1984	69.1	8,000	6
1985	72	8,000	6
1986	77	15,000	2
1987	57.5	8,000	2

personnel were unable to examine these fish so actual determination of triploid or normal fish was not available. Sampling techniques in the various ocean fisheries do not include sex determination. The one tagged fish sampled in Youngs Bay was determined to be a male, so it may have been one of the 30% that was determined to be normal at release. 1988 coded-wire tag recoveries will enable researchers to answer some of the questions regarding migration effects. If information gained is favorable, releases of triploid fall chinook may be implemented to further examine the feasibility of triploidization for quality enhancement.

Coho production in 1987 was about 300,000 smolts. These fish were received in December, 1986 as 25 fish/pound fingerlings from ODFW's Cascade hatchery. The fish were released at 10.3 fish/pound from each of the two rearing ponds. In an effort to determine optimum release size for the coho production a comparative release-size study was initiated in 1984 (Table 8). As might be expected the results are beginning to demonstrate that the larger smolts survive at a better rate than the smaller smolts. In 1985, smolts released at 9.5 fish/pound survived by nearly ten times that of the smolts released at 16.3 fish/pound. The 13.4 fish/pound smolts released in 1985 fared better than the 16.3 fish/pound smolts by almost 5 l/2 times. However, in 1986 with smolts released at equal sizes, pond #l fish still survived by over two times that of pond #2. With these earthen ponds in very close proximity (l/4 mile apart), with similar flows and water temperatures, and with other characteristics essentially the same, it was assumed that smolt sizes could be compared. With equal size smolts released, pond #l survival was better than pond #2 by about two times. There is still a much larger margin than this between the larger and smaller smolts.

The production levels of the CEDC Project are at or near capacity. For production increases to be realized, additional rearing space must be utilized. CEDC personnel are investigating the potential of estuarine rearing through utilization of floating net pens. In 1987 a small net-pen system was secured in Youngs Bay and an initial group of 50,000 fall chinook was reared and released at the site. Observations of this first group (Table 2), showed an accelerated growth rate over the earthen pond fish, and exhibited little stress due to fluctuating salinity levels (Figure 5). A small level of the disease *Vibrio anguillarum* occurred and the fish were treated with 3% terramycin (TM-50) in the food for ten days to help curb disease mortality. Fish were released at a healthy 45.4 fish/pound. In the future, net pen optimum capacities will be investigated, however, these fish were reared under fairly low density levels. At release the density was about 0.65 pounds of fish per cubic foot of water. It has been suggested that levels of 0.75 to 1.0 pounds per cubic foot of rearing space be maintained (Conrad Mahnken, National Marine Fisheries Service, personal communication, 1987). Based on 0.75 pounds per cubic foot, the current capacity of the pens is about 18,000 pounds, and in 1988 rearing levels of approximately 130,000 coho and 250,000 fall chinook are anticipated to utilize this capacity.

Table 8. Coho Release Size and Survival Percentage of Fish Released from CEDC Ponds, 1984 - 1987

Release Year	Release Site	Release Size	Harvest Year	Survival Percentage
1984	Pond #l	9.5 f/lb	1985	4.9
	Pond #2	16.3 f/lb		0.5
1985	Pond #l	13.4 f/lb	1986	5.6
	Pond #2	16.3 f/lb		1.04
1986	Pond #1	12.5 f/lb	1987	1.4
	Pond #2	12.5 f/lb		0.6
* 1987	Pond #1	10.3 f/lb	1988	
	Pond #2	10.3 f/lb		

* No CWT

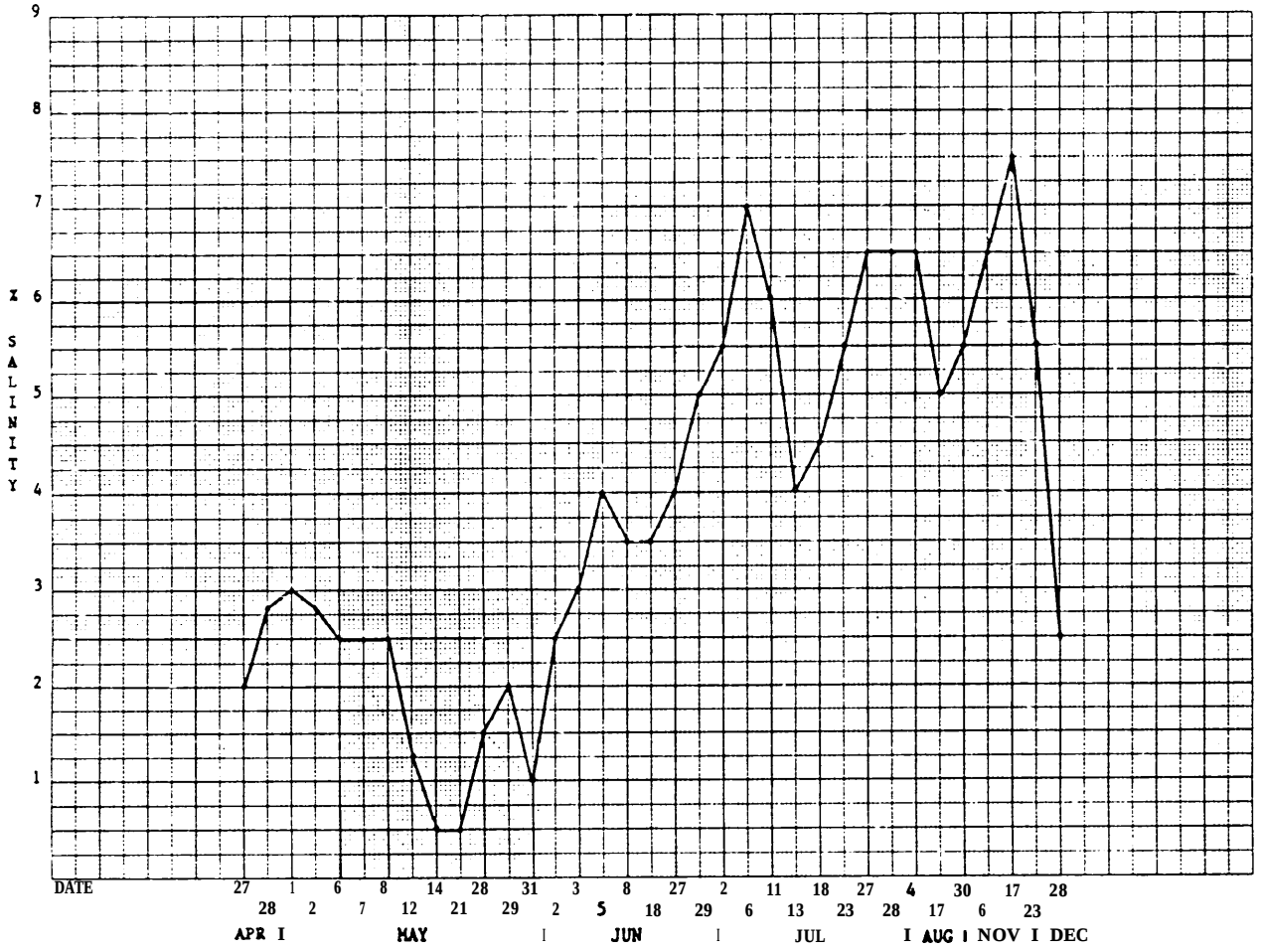

Figure 5. Salinity Levels (parts per thousand) Taken at Tide Point In The Youngs Bay Estuary Using YSI Model 33 SCT (Salinity/Conductivity/Temperature) Meter At 8' Depth, 1987.

In 1987 the egg incubation capacity of the CEDC program was increased. With the new hatchery building in operation, present capacity allows for the incubation of approximately 2.5 million eggs. If additional incubators were available, hatchery space and available water would allow for incubation of approximately 4 million eggs. However, the 1987 drought conditions made incubation of a couple million eggs difficult. Water recirculation methods were implemented to assure adequate flow through the incubators. The eggs survived at normal levels and displayed no signs of abnormality upon hatching.

The activities involved in the production of fish at CEDC facilities are shown in Table 13, and in more detail in Table 14. As compared to previous years (Tables 9, 10, 11 & 12), percentages are roughly the same. The major activities, category B, represent the physical labor directly related to production. As might be expected, this utilizes most of the time by Project personnel. Administrative and public relation activities, category D, take up about 30% of employee time.

The time spent on travel, category A, is one that Project personnel hope to reduce in the near future to help maximize hatchery efficiency. It is hopeful that with the new hatchery building completed, a communication system between the field site and the intown office can be employed. If logistical problems can be overcome a reduction in travel time would be realized, and consequential increases in time spent in actual production activities would occur.

Category E represents time that is spent on activities before and after normal work hours. These activities are usually during the night and entail actions that are responsive to adverse weather conditions. These duties such as water control, intake cleaning, and screen cleaning are essential to the livelihood of the fish. This time is referred to as "Standby" time and Project personnel must be ready to respond at any time during the night.

Periodically Project personnel are involved in small-scale contract obligations; hatchery assistance at nearby hatcheries or other "in-kind" service activities related to local fishery enhancement efforts. The time spent in these activities is minimal and is shown in category C.

The Project employs three full-time field biologists, one full-time administrator, one full-time administrative assistant, and occasional temporary help. As a result of the recent net-pen expansion, additional personnel will be required to perform the additional tasks of rearing and maintenance activities.

Development of Optimum Density Levels

The carrying capacities of rearing ponds depend to a large extent on conditions existing at the various hatcheries. Capacities must be established at the hatchery itself to be of benefit in planning the program of each rearing site. Some of the factors that influence the carrying capacities of rearing ponds are: (1) species of fish, (2) size of fish, (3) water temperature, (4) water quality, (5) water

Table 9. CEDC Fisheries Project Personnel Labor Breakdown, 1985

Category	[A]	[B]	[C]	[D]	[E]
	Travel	Pond Maintenance Gr/Bldg. Maintenance Feeding Feed Preparation Data Collection Early Rearing Construction Water Control	Contract Obligations Stream Surveys Sampling Coded-Wire Tagging Hatchery Assistance	Public Relations Conf./Meetings Administrative Reports Clerical Bookkeeping	Stand-by
TOTAL HOURS	869.58	3,570.50	902.50	3,068.50	29.75
% OF TOTAL	10.30%	42.30%	10.70%	36.5%	.35%

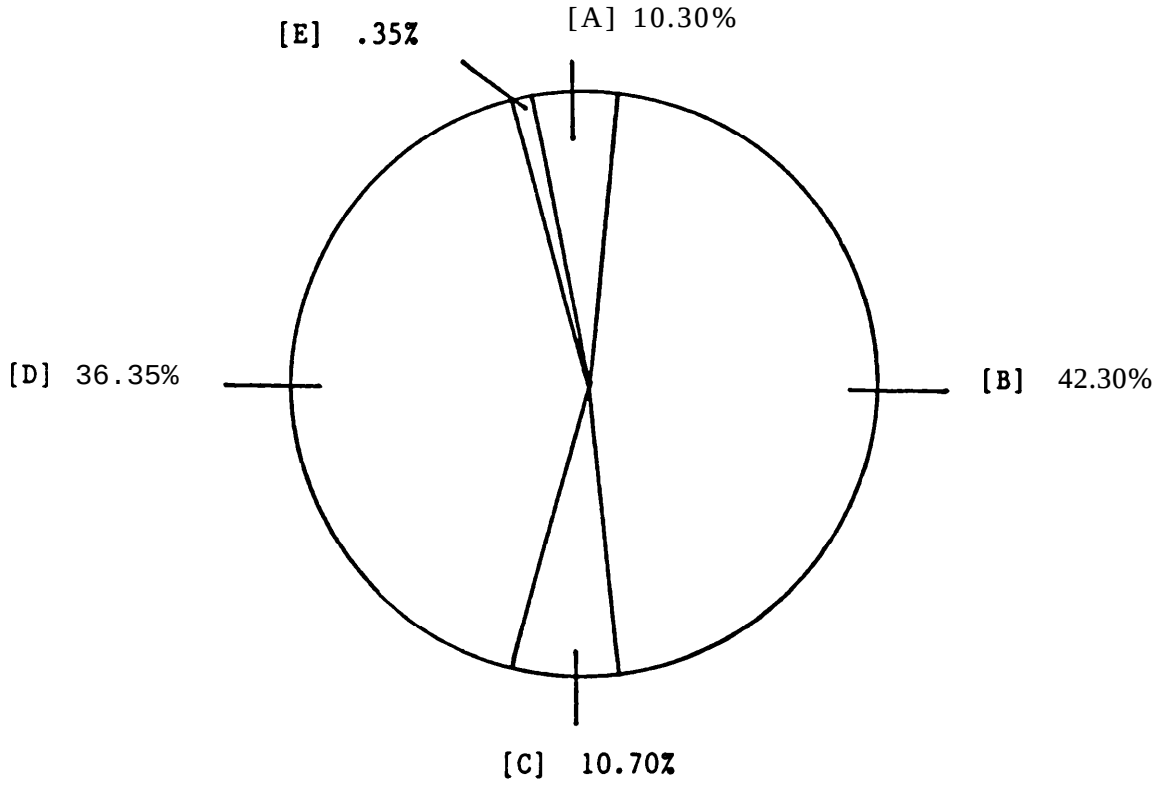

Table 10. Project Quarterly Time Summary, 1985

CATEGORIES	JAN-MAR Hour	JAN-MAR %	APR-JUNE Hour	APR-JUNE %	JULY-SEPT Hour	JULY-SEPT %	OCT-DEC Hour	OCT-DEC %	TOTAL Hour	TOTAL %
Travel	196.50	8.67%	192.50	9.30%	215.50	10.10%	265.00	12.70%	869.50	10.16%
Pond Maintenance	147.00	6.49%	166.50	8.05%	140.50	6.59%	128.50	6.16%	582.50	6.81%
Ground/Bldg. Maintenance	87.50	3.86%	118.00	5.70%	188.50	8.84%	146.50	7.02%	540.50	6.32%
Feeding	278.00	12.27%	419.00	20.25%	124.00	5.81%	59.50	2.85%	880.50	10.29%
Feed Preparation	32.50	1.43%	39.50	1.91%	26.50	1.24%	4.00	.19%	102.50	1.20%
Data Collection	48.50	2.14%	99.50	4.81%	88.50	4.15%	74.00	3.55%	310.50	3.63%
Early Rearing	245.00	10.81%	17.50	.85%	5.00	.23%	210.00	10.07%	477.50	5.58%
Contract Obligations	33.00	1.46%	33.00	1.59%	19.00	.89%	6.00	.29%	91.00	1.06%
Stream Surveys	6.00	.26%	1.00	.05%	84.50	3.96%	40.50	1.94%	132.00	1.54%
Sampling	0.00	0.00%	10.00	.48%	208.50	9.77%	48.50	2.32%	267.00	3.12%
Coded-Wire Tagging	98.00	4.32%	73.00	3.53%	36.00	1.69%	13.50	.65%	220.50	2.58%
Hatchery Assistance	86.00	3.79%	40.00	1.93%	36.00	1.69%	30.00	1.44%	192.00	2.24%
Construction	133.00	5.87%	57.00	2.75%	162.50	7.62%	192.00	9.20%	544.50	6.36%
Water Control	66.00	2.91%	30.00	1.45%	17.50	.82%	18.50	.89%	132.00	1.54%
Research/Development	11.00	.49%	11.50	.56%	13.00	.61%	16.00	.77%	51.50	.60%
Public Relations	37.50	1.65%	33.00	1.59%	84.50	3.96%	33.00	1.58%	188.00	2.20%
Conferences/Meetings	107.00	4.72%	66.50	3.21%	78.50	3.68%	112.00	5.37%	364.00	4.25%
Administrative	95.00	4.19%	158.00	7.63%	171.00	8.02%	167.50	8.03%	591.50	6.91%
Reports	136.50	6.02%	107.00	5.17%	55.00	2.58%	61.50	2.95%	360.00	4.21%
Clerical	320.00	14.12%	281.00	13.58%	225.50	10.57%	210.75	10.10%	1,037.25	12.12%
Bookkeeping	94.75	4.18%	109.50	5.29%	128.00	6.00%	195.50	9.37%	527.75	6.17%
In-Kind Services	7.50	.33%	6.50	.31%	25.00	1.17%	53.50	2.56%	92.50	1.08%
TOTAL	2,266.25	100.00%	2,069.50	100.00%	2,133.00	100.00%	2,086.25	100.00%	8,555.00	100.00%
STAND-BY	0.00	0.00%	0.00	0.00%	0.00	0.00%	29.75	1.43%	29.75	.35%

Table 11. CEDC Fisheries Project Personnel Labor Breadkown, 1986

Category	[A]	[B]	[C]	[O]	[E]
	Trave l	Pond Maintenance Gr/Bldg. Maintenance Feeding Feed Preparation Data Col lection Early Rearing Construct ion Water Control	Contract Obl igations Stream Surveys Sampling Coded-Wire lagging Hatchery Ass istance	Public Relations Cont./Meetings Administrative Reports Clerical Bookkeeping	Stand-by
TOTAL HOURS	951.50	3,528.00	626.50	2,874.75	264.83
% OF TOTAL	11.54%	42.79%	7.6%	34.86%	3.21%

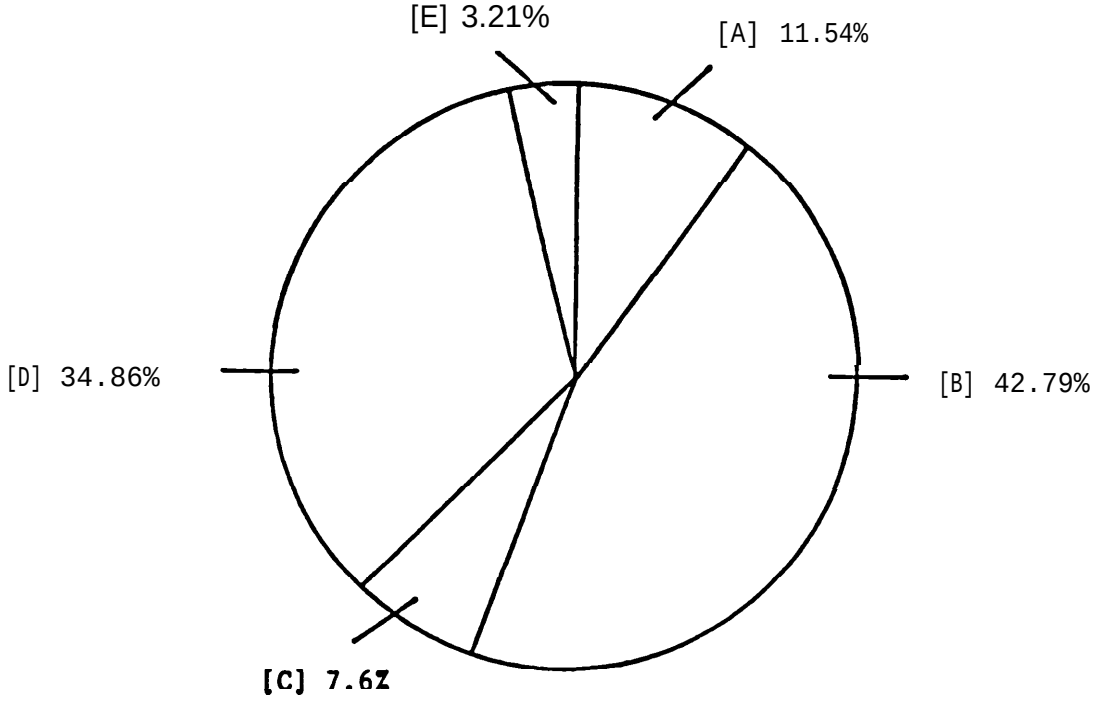

Table 12. Project Quarterly Time Summary, 1986

CATEGORIES	JAN-MAR Hour	JAN-MAR %	APR-JUNE Hour	APR-JUNE %	JULY-SEPT Hour	JULY-SEPT %	OCT-DEC Hour	OCT-DEC %	TOTAL Hour	TOTAL %
Travel	235.25	10.79%	213.50	10.24%	257.25	13.47%	245.50	11.72%	951.50	11.51%
Pond Maintenance	148.00	6.79%	133.00	6.38%	102.00	5.34%	91.00	4.34%	474.00	5.73%
Ground/Bldg. Maintenance	88.00	4.04%	169.00	8.10%	161.00	8.43%	117.25	5.60%	535.25	6.47%
Feeding	377.50	17.31%	312.50	14.99%	33.00	1.73%	57.00	2.72%	780.00	9.43%
Feed Preparation	49.00	2.25%	17.50	.84%	.50	.03%	3.50	.17%	70.50	.85%
Data Collection	50.50	2.32%	36.00	1.73%	11.50	.60%	59.00	2.82%	157.00	1.90%
Early Rearing	221.50	10.16%	35.50	1.70%	36.50	1.91%	460.00	21.96%	753.50	9.11%
Contract Obligations	0.00	0.00%	0.00	0.00%	0.00	0.00%	2.00	.10%	2.00	.02%
Stream Surveys	0.00	0.00%	1.00	.05%	89.00	4.66%	57.00	2.72%	147.00	1.78%
Sampling	0.00	0.00%	6.00	.29%	131.50	6.89%	34.50	1.65%	172.00	2.08%
Coded-Wire Tagging	71.50	3.28%	135.00	6.47%	8.50	.45%	73.00	3.48%	288.00	3.48%
Hatchery Assistance	1.00	.05%	4.00	.19%	3.00	.16%	9.50	.45%	17.50	.21%
Construction	103.50	4.75%	173.25	8.31%	321.50	16.84%	77.00	3.68%	675.25	8.17%
Water Control	24.00	1.10%	1.00	.05%	14.00	.73%	43.50	2.08%	82.50	1.00%
Research/Development	8.50	.39%	12.00	.58%	4.00	.21%	4.00	.19%	28.50	.34%
Public Relations	55.00	2.52%	17.00	.82%	92.50	4.84%	28.50	1.36%	193.00	2.33%
Conferences/Meetings	40.50	1.86%	65.00	3.12%	48.00	2.51%	70.50	3.37%	224.00	2.71%
Administrative	202.00	9.26%	201.00	9.64%	230.00	12.05%	164.00	7.83%	797.00	9.64%
Reports	112.00	5.14%	45.50	2.18%	30.50	1.60%	15.50	.74%	203.50	2.46%
Clerical	307.00	14.08%	339.00	16.26%	226.50	11.86%	214.50	10.24%	1,087.00	13.14%
Bookkeeping	80.50	3.69%	68.75	3.30%	93.50	4.90%	127.50	6.09%	370.25	4.48%
In-Kind Services	5.00	.23%	99.75	4.78%	15.00	.79%	140.50	6.71%	260.25	3.15%
TOTAL	2,180.25	100.00%	2,085.25	100.00%	1,909.25	100.00%	2,094.75	100.00%	8,269.50	100.00%
STAND-BY	129.33	5.93%	87.50	4.20%	7.50	.39%	40.50	1.93%	264.83	3.20%

Table 13. CED Fisheries Project hsonwl Labor Breakdown 1987

Category	[AI	[B]	[C]	[D]	[E]
	Trave l	Pond Ma i ntencance Gr/Bldg. Maintenance Feeding Feed Preparation Data Col lection Early Rearing Construct ioon Water Control	Contract Obl igatins Stream Surveys Sampling Coded-Wire Tagging Hatchery Assistance	Publ ic Relations Conf./Metings Administrative Reports Clerical Bookkeeping	Stand-by
TOTAL HOURS	1,073.50	4,133.00	309.50	2,683.75	559.50
% OF TOTAL	12.26%	47.18%	3.53%	30.64%	6.39%

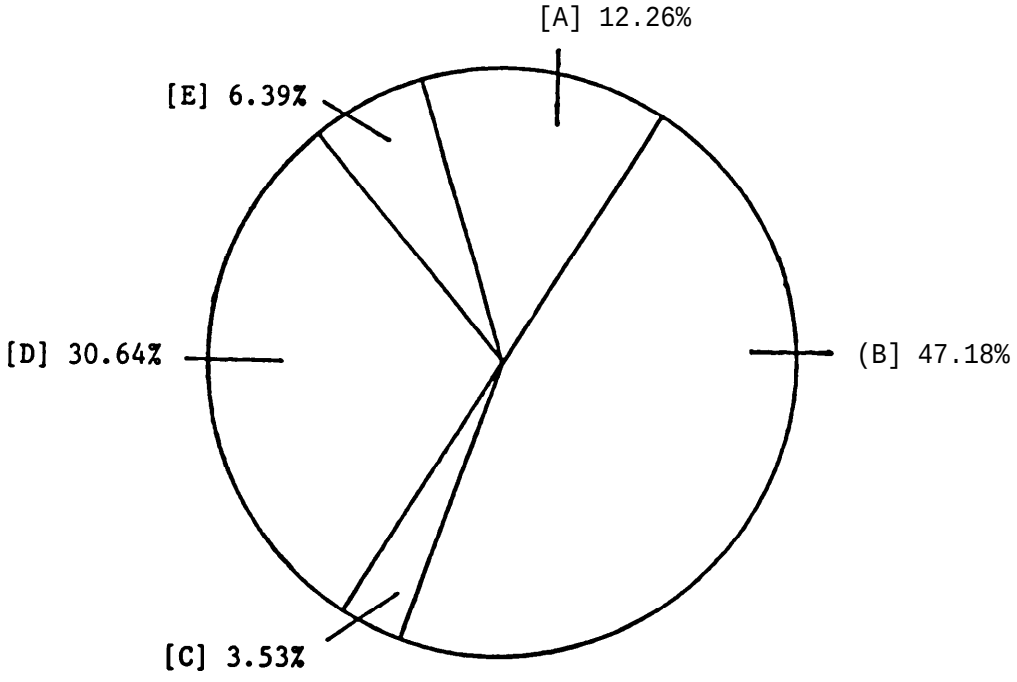

Table 14. Project Quarterly Time Summary, 1987

CATEGORIES	JAN-MAR Hour	JAN-MAR %	APR-JUNE Hour	APR-JUNE %	JULY-SEPT Hour	JULY-SEPT %	OCT-DEC Hour	OCT-DEC %	TOTAL Hour	TOTAL %
Travel	300.50	13.85%	287.00	12.68%	237.00	10.89%	249.00	14.03%	1,073.50	12.80%
Pond Maintenance	89.50	4.13%	110.50	4.88%	205.50	9.44%	67.00	3.78%	472.50	5.64%
Ground/Bldg. Maintenance	170.50	7.86%	158.00	6.98%	134.00	6.16%	105.50	5.95%	568.00	6.78%
Feeding	345.50	15.93%	322.00	14.23%	80.00	3.67%	51.50	2.90%	799.00	9.53%
Feed Preparation	32.00	1.48%	63.00	2.78%	17.50	.80%	10.50	.59%	123.00	1.47%
Data Collection	79.50	3.67%	45.50	2.01%	43.50	2.00%	14.00	.79%	182.50	2.18%
Early Rearing	167.50	7.72%	114.00	5.04%	68.50	3.15%	331.50	18.68%	681.50	8.13%
Contract Obligations	0.00	0.00%	0.00	0.00%	61.50	2.82%	3.50	.20%	65.00	.78%
Stream Surveys	3.00	.14%	0.00	0.00%	0.00	0.00%	27.50	1.55%	30.50	.36%
Sampling	0.00	0.00%	0.00	0.00%	78.00	3.58%	4.00	.23%	82.00	.98%
Coded-Wire Tagging	0.00	0.00%	107.50	4.75%	3.00	.14%	0.00	0.00%	110.50	1.32%
Hatchery Assistance	0.00	0.00%	1.00	.04%	7.50	.34%	13.00	.73%	21.50	.26%
Construction	186.00	8.58%	350.50	15.48%	502.00	23.06%	175.00	9.86%	1,213.50	14.47%
Water Control	61.00	2.81%	3.00	.13%	4.00	.18%	25.00	1.41%	93.00	1.11%
Research/Development	35.50	1.64%	37.00	1.63%	1.50	.07%	6.00	.34%	80.00	.95%
Public Relations	48.25	2.22%	46.00	2.03%	104.00	4.78%	50.50	2.85%	248.75	2.97%
Conferences/Meetings	56.50	2.60%	44.00	1.94%	60.00	2.76%	78.50	4.42%	239.00	2.85%
Administrative	151.50	6.98%	149.00	6.58%	164.00	7.53%	140.50	7.92%	605.00	7.22%
Reports	58.50	2.70%	43.50	1.92%	13.50	.62%	10.00	.56%	125.50	1.50%
Clerical	281.25	12.97%	250.00	11.04%	272.00	12.49%	263.00	14.82%	1,066.25	12.72%
Bookkeeping	84.00	3.87%	98.00	4.33%	109.00	5.01%	108.25	6.10%	399.25	4.76%
In-Kind Services	18.50	.85%	34.00	1.50%	11.00	.51%	40.50	2.28%	104.00	1.24%
TOTAL	2,169.00	100.00%	2,263.50	100.00%	2,177.00	100.00%	1,774.25	100.00%	8,383.75	100.00%
STAND-BY	71.00	3.27%	4.00	.18%	90.00	4.13%	394.50	22.23%	559.50	6.67%

volume, (6) rate of flow, (7) rate of change, (8) re-use of water, and (9) disease history.

The best way to determine the proper holding capacities of rearing ponds at a particular locality is to examine the results of several seasons of production. Production capacities of CEDC's rearing ponds with respect to some of these influencing factors are shown in Tables 15, 16, & 17. Prior to 1985 the production from each of the coho rearing ponds was approximately 100,000 smolts and 200,000 smolts in pond #1 and pond #2 respectively,with no rearing or release problems. In 1986, pond loading was increased in each pond. Approximately 140,000 fish were reared in pond #1 and 263,000 in pond #2, which corresponds to 11,200 pounds and 21,040 pounds. During release, dissolved oxygen levels in pond #1 dropped to below 4 ppm, and before the fish left the pond approximately 20,000 were lost due to suffocation. The fish in pond #2 experienced no visual stress during rearing or release with dissolved oxygen levels staying above 5 ppm.

Consequently, with the poor experience in 1986, production levels were reduced again in 1987 (Table 17). With these reduced levels no problems were experienced. From the cumulative information it appears that poundages of 10,000 and 25,000 should not be exceeded in pond #1 and pond #2 respectively; and based on the favorable smolt size of 10 fish/pound, a combined production of 350,000 fish should not be exceeded. Also, as can be noted from Table 5, adult survival of fish released from the more crowded environment was lower than that of previous years' releases where rearing densities were lower. However, additional research would need to be conducted to determine if it was actually rearing conditions or some other factor, such as ocean conditions, that was responsible for the lower survival.

Annual production of fall chinook since 1981 has been about 3 million fish. In 1987 production was reduced because of financial constraints (Table 2). As compared to loading densities of the coho ponds, pond $3 chinook loading densities are much lower (Table 15, 16, & 17). Maximum capacity of this pond has not been tested, but information gained from a comparison of the reduced production level to the previous higher levels may be valuable. However, year to year comparisons are not as valid as within year comparisons because of the variability of the affecting factors.

Augmentation cf a Unique Known Stock Fishery

The CEDC Fisheries Project rearing and release sites are on tributaries of Youngs Bay, Hickerson and Hill (personal communication, 1984). In conjunction with the Oregon Department of Fish and Wildlife's comparatively large releases, enough adult salmon are produced to justify an extensive terminal fishery in Youngs Bay. The 1987 gillnet season opened on August 9 and ended on November 6. The season is uninterrupted and is open 24 hours a day.

In this terminal fishery the fish are predominately of hatchery origin and escapement is generally adequate for hatchery production of coho. However, surplus eggs from hatcheries on the mainstem Columbia are

Table 15. CEDC Fisheries Project Production Capacities, 1985

REARING SITE & SPECIES	Number of Fish	Rearing Time Period	Approximate Size When Received FISH/LB	Approximate Size When Released FISH/LB	Approximate Pond Capacity GAL.	Average Pond Flows G.P.M.	Pond Water Turnover Rate HOURS	Optional Flow Available G.P.M.	Fish Density FISH/GAL	Pond Loading When Received LB/GL/MN	Pond Loading When Released LB/GL/MN	Pond Loading When Released LB/GL
Earthen Pond #1 Coho	100,000	12/1/84 to 4/1/85	24	10	1,000,000	600	27	0	.1	6.9	16.6	.01
Earthen Pond #2 Coho	200,000	12/1/84 to 4/1/85	24	16	1,100,000	1,000	18	0	.18	8.3	12.5	.01
Earthen Pond #3 Tule chf	3,000,000	3/12/85 to 6/1/85	350	80	750,000	5,000	2.5	3,000	4	1.7	7.5	.05
Concrete Raceway Inside Pond #3 Rogue chf	83,000	6/9/85 to 8/1/85	73	10	40,000	3,000	.25	3,000	2	.37	2.6	.2
Earthen Pond #4 coho-WT	17,936	6/1/85 to 12/31/85	122	14	60,000	250/300	4/3.3	0	.3	.60	5.1	.02

Table 16. CEDC Fisheries Project Production Capacities, 1986

REARING SITE & SPECIES	Number of Fish	Rearing Time Period	Approximate Size When Received FISH/LB	Approximate Size When Released FISH/LB	Approximate Pond Capacity GAL.	Average Pond Flows G.P.M.	Pond Water Turnover Rate HOURS	Optional Flow Available G.P.M.	Fish Density FISH/GAL	Pond Loading When Received LB/GL/MN	Pond Loading When Released LB/GL/MN	Pond Loading When Released LB/GL
Earthen Pond #1 Coho	140,000	12/1/85 to 4/1/86	25	12.5	1,000,000	600	27	0	.14	9.3	18.7	.011
Earthen Pond #2 Coho	263,000	12/1/85 to 4/1/86	25	12.5	1,100,000	1,000	18	0	.24	10.5	21	.02
Earthen Pond #3 Tule chf	3,000,000	3/12/86 to 5/15/86	700	75	750,000	5,000	2.5	3,000	4	1.4	13.3	.05
Concrete Raceway Inside Pond #3 Rogue chf	250,000	3/4/86 to 7/20/86	1,100	35	40,000	3,000	.25	3,000	6.3	.08	2.4	.18
Earthen Pond #4 coho-WT												

Table 17. CEDC Fisheries Project Production Capacities, 1987

REARING SITE & SPECIES	Number of Fish	Rearing Time Period	Approximate Size When Received FISH/LB	Approximate Size When Released FISH/LB	Approximate Pond Capacity GAL.	Average Pond Flows G.P.M.	Pond Water Turnover Rate HOURS	Optional Flow Available G.P.M.	Fish Density FISH/GAL	Pond Loading When Received LB/GL/MN	Pond Loading When Released LB/GL/MN	Pond Loading When Released LB/GL
Earthen Pond #1 Coho	80,500	12/1/86 to 4/1/87	25	9.2	1,000,000	600	27	0	.08	5.4	14.6	.009
Earthen Pond #2 Coho	220,000	12/1/86 to 4/1/87	25	10.8	1,100,000	1,000	18	0	.2	8.8	20.4	.008
Earthen Pond #3 Tule chf	1,300,000	1/7/87 to 5/20/87	1,200	57	750,000	5,000	2.5	3,000	1.73	.22	4.6	.03
Concrete Raceway Inside Pond #3 Rogue chf	180,000	2/1/87 to 6/1/87	1,200	78	40,000	3,000	.25	3,000	4.5	.05	.77	.06
Earthen Pond #4 coho-WT					60,000	250/300	4/3.3	0				

available if escapement is not adequate, because harvest opportunities of returning adults are restricted to protect endangered stocks and species. The fish returning to and harvested in Youngs Bay are not mixed with mainstem stocks, and hence, are available for harvest.

The 1987 harvest of coho in Youngs Bay was approximately 14,180 adults and 2,690 jacks. With a hatchery escapement of 974 adults, the harvest rate was approximately 93%. This high harvest rate may be a result of the unusually dry and warm conditions during the fishery. With lack of adequate water to influence adult migration, the fishery was responsive in harvesting the fish as they waited in the estuary. Harvest levels of coho since 1981 are shown in Figures 6 and 7 with the value of the catch shown in Table 18. The overall catch value (Figure 8), includes all species; coho, chinook, and chum. The large chinook harvest of over 20,000, with an average price of $.85/lb helped to maintain the overall catch value near half a million dollars. The majority of the fish harvested are produced from ODFW's Klaskanine hatchery and of the total Youngs Bay coho harvest in 1987, about 4.5 percent was from CEDC releases. Harvest summaries of fish produced from CEDC facilities are shown in Tables 3,4, and 5. Not only does the Youngs Bay enhancement effort provide fish for local interest groups, but it also has an impact on the various fisheries throughout the ocean migration. Fish are harvested in the ocean fisheries from British Columbia to California. Over 10,000 chinook were harvested in British Columbia from CEDC releases alone (Table 3).

Adult salmon returning to Youngs Bay that are not harvested, return to various streams of the Youngs Bay drainage. Stream survey information gives an estimate of the numbers of fish returning to some of the streams (Table 6). Table 19 shows the numbers of fish collected at CEDC's traps. In 1987 coho jack returns were quite high, suggestive of a responsive high adult return in 1988. Adult returns of coho and chinook to CEDC facilities were low. The major factor contributing to the decline may have been the extremely low flows. Stream survey information shows a fair number of chinook in the South Fork and Lewis & Clark rivers, but the majority of the fish were concentrated in the lower stretches of river. In the South Fork adults came only as close as three miles of the trap. From tidewater to the trap the distance is about 4.5 miles. In past years, when flows have been normal, fish have made it to the trap.

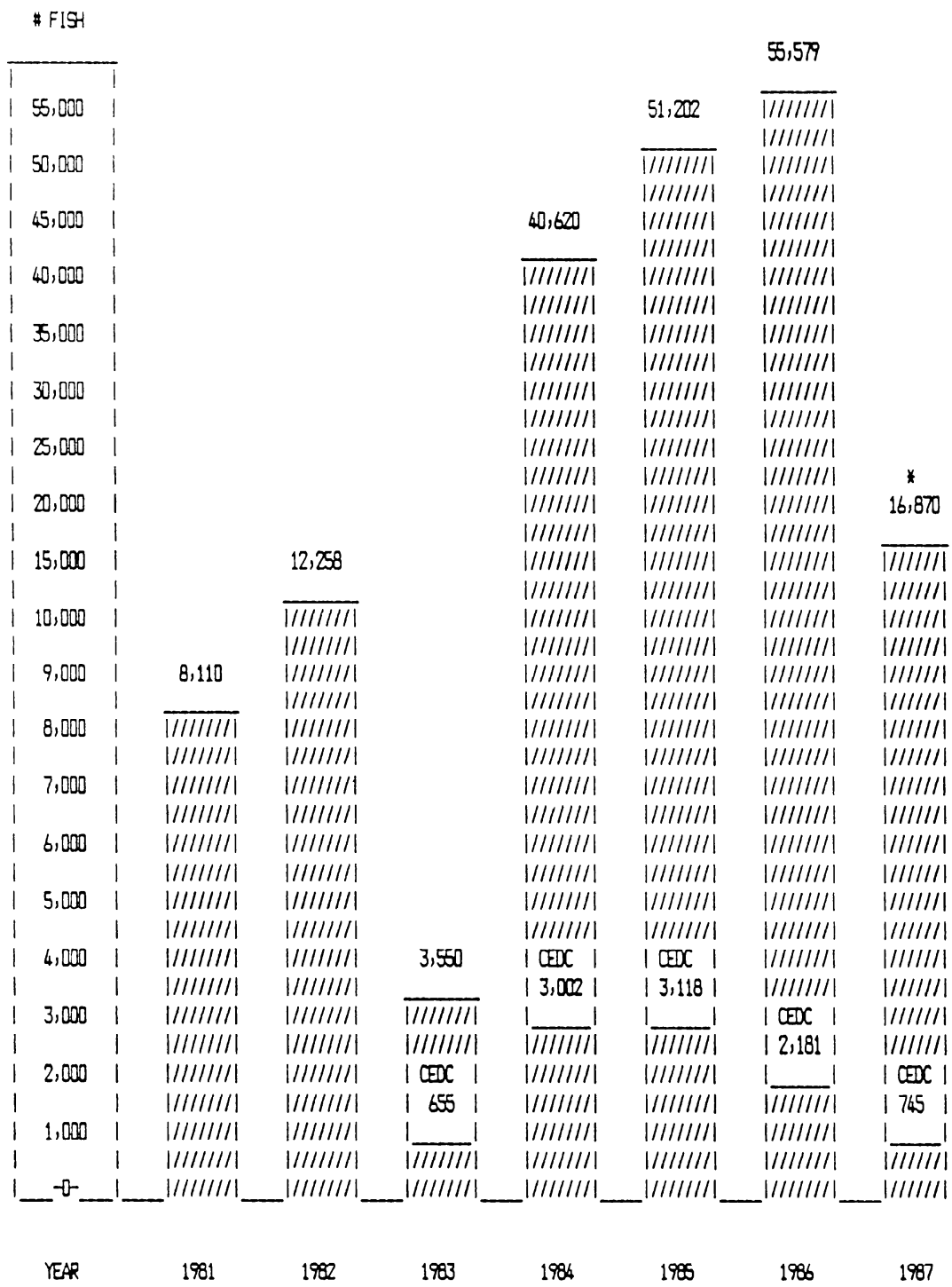

Figure 6. Youngs Bay Coho Harvest (Numbers); 1981 - 1987

* Preliminary

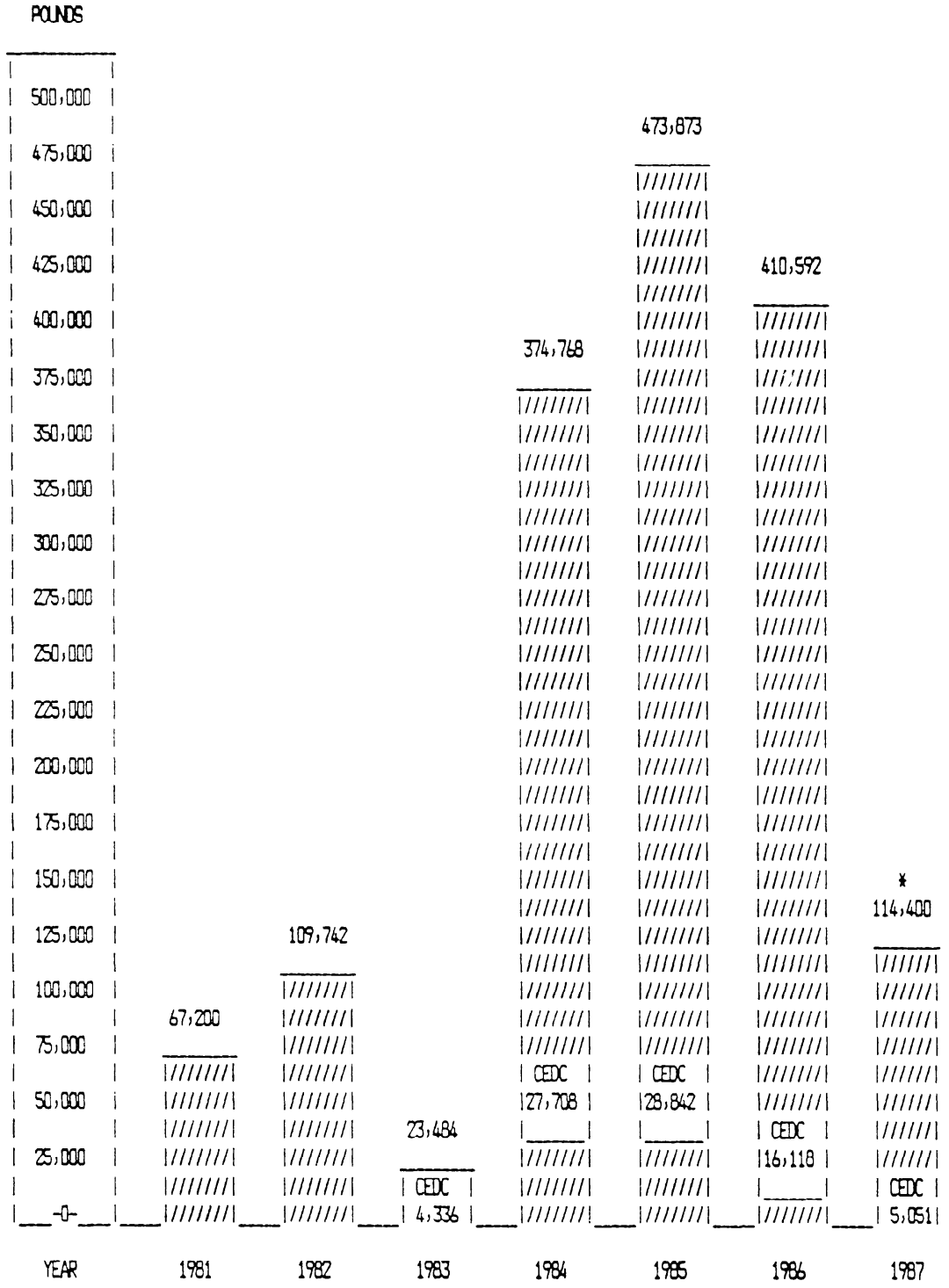

Figure 7. Youngs Bay Coho Harvest (Pounds); 1981 - 1987

* Preliminary

Table 18. Youngs Bay Catch Direct Poundage Value
1981 - 1987

	chinook			coho			chum		
Year	Number	Pounds	Value	Number	Pounds	Value	Number	Pounds	Value
1981	4,690	113,300	$65,414	8,110	67,200	$67,195	280	2,400	$1,382
1982	5,129	101,772	$67,000	12,258	109,742	$95,000	264	3,237	$2,000
1983	3,553	66,002	$48,000	3,550	23,484	$24,000	5	60	—
1984	3,696	74,179	$62,000	40,620	374,768	$421,000	177	2,212	$1,000
1985	3,466	64,393	$57,000	51,202	473,873	$454,000	19	209	$100
1986	5,455	95,683	$74,900	55,579	410,592	$404,235	5	50	—
* 1987	22,270	374,400	$317,794	16,870	114,400	$171,600	265	2,600	$3,900

* Preliminary

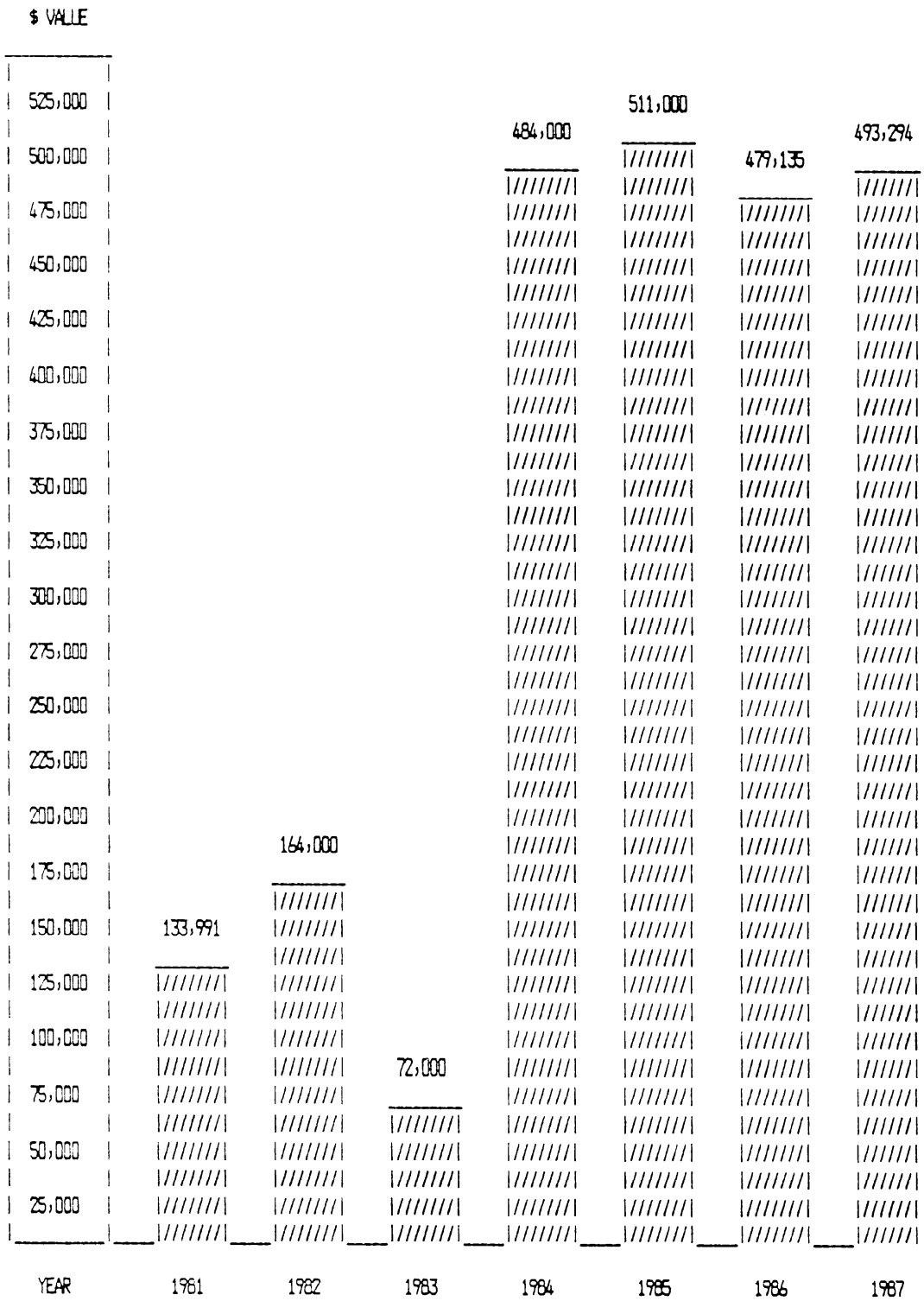

Figure 8. Youngs Bay Catch Value; 1981 - 1987

* Preliminary

Table 19. Chinook and Coho Returns to CEDC Traps, 1985 – 1987

			Number Trapped		
Species	Trap Site	Sex	1985	1986	1987
Tule FCH	South Fork	M	9	1	0
		F	1	1	0
		J	2	9	0
Rogue FCH	South Fork	M	28	7	0
		F	22	16	0
		J	2	32	1
Coho	Pond #2	M	8	169	10
		F	12	111	4
		J	71	60	330
	Pond #1	M		41	- -
		F		26	- -
		J		13	- -

SUMMARY OF BPA PROJECT EXPENDITURES, 1987

Personal Services:	
Wages	17,886.80
Benefits	8,298.34
Total Wages/Benefits	$26,185.14
Operations and Maintenance:	
Travel	1,499.92
Supplies	27,703.83
Contract Tagging	594.13
Total Operational	$29,797.88
Indirect Costs	8,456.45
TOTAL EXPENDITURES	$55,983.02

LITERATURE CITED

Unpublished Paper:

Hickerson, A. W. and J. M. Hill. 1984. Evaluation of a Low-Cost Salmon Production Facility. Annual report prepared for the Bonneville Power Administration, Division of Fish and Wildlife. 26 pages.