Evaluation of a Low-Cost Salmon Production Facility

Annual Report FY 1984

by

Andrew W. Hickerson, Research Biologist

and

James M. Hill, Project Coordinator

Clatsop Economic Development Committee Fisheries Project

Prepared for

Thomas J. Clune Project Officer

U.S. Department of Energy

Bonneville Power Administration

Division of Fish and Wildlife

Agreement No. DE-A179083BP11887

Project No. 83-364

December 1984

TABLE OF CONTENTS

	PAGE
List of Figures	ii
List of Tables	iii
Abstract	7
Introduction	2
Description of Study Area	3
Objectives	3
Methods and Materials	5
Community Involvement (Construction)	5
Community Involvement (Operation and Maintenance)	12
Natural Outmigration of Smolts	12
Evaluation	12
Coded-wire Tagging	12
Contribution	13
Stream Surveys	20
Results and Discussion	21
Community Involvement (Construction)	21
Community Involvement (Operation and Maintenance)	21
Natural Outmigration of Smolts	22
Evaluation	23
Stream Surveys	23
Summary of Expenditures	24
Literature Cited	25

LIST OF TABLES

NUMBER		PAGE
1.	Vanderveldt property, pond #l construction cost estimates	6
2.	Vanderveldt property, pond #2 construction cost estimates	7
3.	Crown Zellerbach property, pond #3 construction cost estimates	8
4.	1983 Community contributions	14
5.	1984 Community contributions	15
6.	Summary of 1981-84 releases from CEDC Fisheries Project facilities	18
7.	Preliminary fall chinook, coded-wire tag recoveries for Oregon, Washington, California, and British Columbia ocean fisheries in 1983 form CEDC releases	19
8.	Chinook and coho returns to CEDC traps, 1984	19
9.	Coho contribution to the various fisheries from CEDC releases in 1983 and 1984	24

LIST OF FIGURES

NUMBER		PAGE
1.	Vicinity map of pond sites for CEDC facilities	4
2.	Schematic of coho rearing pond, pond #l of CEDC facilities	9
3.	Schematic of coho rearing pond, pond #2 of CEDC facilities	10
4.	Schematic of CEDC's South Fork Klaskanine pond #3 incubation and rearing facility	11
5.	Comparative length-frequencies of coho sampled in Tucker Creek pond before release and from downstream migrant trap, April 1984	16
6.	Comparative length-frequencies of fall chinook sampled in South Fork Klaskanine pond before release and from seine sample 4 miles downstream of release, May 1984	17

ABSTRACT

Fiscal year 1984 was the second year of a five-year study sponsored by the Bonneville Power Administration (BPA) to evaluate the presently existing low-cost 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.

Community involvement in the construction and operation and maintenance phases of the facility was investigated and documented. During the construction of the three earthen rearing ponds, community support from in-kind and cash contributions was approximately 40% of the total. The support for the construction of each individual pond ranged from 35% to 89% of the overall cost estimates.

Annual community involvement in relation to operation and maintenance activities was documented for FY 1983 and 1984. The contributions by community individuals and organizations amounted to 15% and 28% of the annual operating budget respectively.

Investigation of the natural outmigration of smolts from earthen rearing ponds was initiated in 1984. Cursory results indicate that larger coho smolts (9.5/pound) migrate predominately during periods of increased flows irrespective of daylight conditions, whereas smaller smolts (16.3/pound) migrated during darkness irrespective of floes. There was no differential in fish size with respect to migrational activity. Migration extended over a three-week period. Fall chinook outmigration continued for a six-week period with comparative length-frequencies of migrating smolts and pre-release smolts the same. The chinook entered the tidewater estuary 4 miles below the release site six days after release.

Contributions to the fisheries by CEDC coho were .5 and 2.2% of release numbers during the 1983 and 1984 fisheries respectively. Only one year was included in the contribution value for 1980 brood fall chinook resulting in .2% of the release number harvested. Fall chinook were harvested in the Canadian, Washington, Oregon, and California fisheries; and coho were caught in the Washington, Oregon, and California fisheries.

INTRODUCTION

Clatsop County, Oregon is a region of vast forests, abundant areas of water, and beautiful coastal attractions. Responsive to the area's resources, the economic base is lumbering, fisheries, and tourism. With much of the salmon spawning and rearing habitat in the Columbia River Basin lost to hydroelectric development, problems caused by dwindling echo and chinook stocks, treaty obligations, and interaction of State, Federal, and Tribal management entities; the result has been the demise of several processing plants with at least 2,000 employees. This has meant a reduction of over $20 million annually to this area's economy. Some say the salmon industry is dead, and these empty canneries and endless piling stand as a requiem to mankind's disregard for the environmental effects that dams, pollution, and other biological hazards have on a natural resource. However, in 1976 a group of concerned citizens formed an organization known as the Clatsop Economic Development Committee (CEDC) whose goal was to improve the industrial base for the betterment of the economy of the area. This committee directed its subcommittee on fisheries to develop a program to enhance the economic viability of the salmon industry. The suggestion of an expanded terminal fishery on Youngs Bay, uncluttered by political and management problems, led to the development of a private, nonprofit hatchery system for Youngs Bay that has begun to have a substantial impact on the area's salmon catch. The community itself takes much pride in this program and facility, for it is truly an operation "Bootstrap" wherein all segments of the community have melded their efforts to help shore up a sagging industry. It is the purpose of this BPA-sponsored project to document the success of this program and make the information available for possible implementation of similar programs in other Columbia Basin locales.

BPA has funded the project in 1983 and 1984 with the latter year's activities reported herein. The evaluation is an ongoing project scheduled for completion in 1987. Data and information from three years cf coded-wire tagging and adult recovery activities will be integrated into the documentation of the construction and operation and maintenance of the facility, and respond to the following objectives:

- Investigate the potential for community involvement
- Evaluate natural outmigration of smolts from earthen rearing ponds
- Provide cumulative production of large numbers of quality salmon while maintaining genetic variability
- Aid in development of optimum density levels in earthen pond environments
- Augment a unique "known stock" fishery

Description of Study Area

Since its inception in 1975, the CEDC Fisheries Project has constructed three earthen salmon rearing ponds in the Youngs Bay drainage (Fig. 1). The project continues to operate and maintain the three ponds. The area containing the ponds is leased to Clatsop County. Two ponds are located on Tucker Creek, a tributary to Youngs Bay, and are leased from the Vanderveldt family. The third pond is leased from Crown Zellerbach Corporation and is approximately four miles above the tidal influence of Youngs Bay.

Objectives

During 1984, the Clatsop Economic Development Committee (CEDC) Fisheries Project, under contract with the Bonneville Power Administration (BPA), continued the evaluation of a low-cost salmon production facility, measure 704 (j)(l) of the council's fish and wildlife program.

Specific objectives of fiscal year 1984 activities were as follows:

1) Investigate the potential for community involvement in relation to
   a) construction
   b) operation and maintenance
2) Evaluate the cumulative production of large numbers of quality salmon while maintaining genetic variability through
   a) coded-wire tagging activities of 150,000 fish from the three rearing ponds
   b) recovery and evaluation of coded-wire tag return data
3) Evaluate natural outmigration of smolts from earthen rearing ponds by
   a) trapping migrating smolts

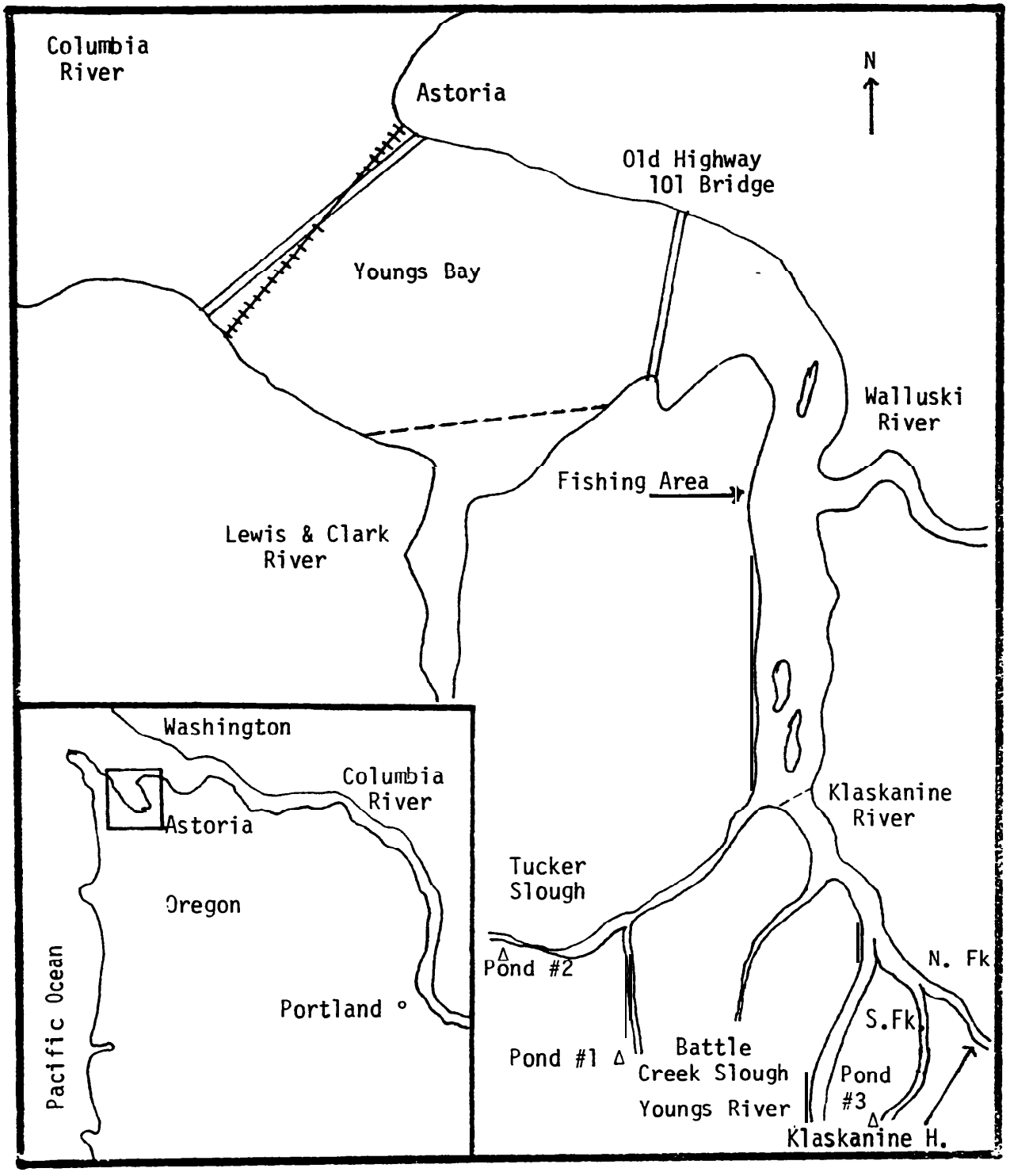


Figure 1. Vicinity map of pond sites for CEDC facilities, Δ.

METHODS AND MATERIALS

Community Involvement (Construction)

The extent of community involvement during the construction of the three rearing ponds is presented in Tables 1, 2, and 3. Ponds 1 and 2 were constructed on streams with maximum flows of approximately 7 cfs. (Fig. 1).

The first rearing pond (pond #l) was an existing farm pond owned by a private landowner. An area of approximately 2 acres including the pond is leased to the Clatsop County Fisheries Project at no cost. Prior to salmon rearing activities, the pond needed necessary improvements to bring into being a functional rearing and release site. The major improvements needed were intake and outlet restraining screens, and outlet "monk" to allow pond draining, an overflow system, and some major dike improvement. Table 1 shows the material, donator, and cost estimates of the needed and provided improvements. Schematic of the finished facility shown in Fig. 2.

The second rearing pond (pond #2) was constructed approximately l/2 mile from pond #l on property of the same owners as pond #l. The site was unprepared, and preliminary surveying and engineering was provided by the Oregon Department of Fish and Wildlife (ODFW). Fisheries Project personnel completed initial clearing which included tree and brush removal. Table 2 lists the materials and services, donator, and cost estimates for the construction of the pond. Schematic of the finished facility shown in Fig. 3.

The third rearing pond (pond #3) was excavated on Crown Zellerbach property and utilizes water from the South Fork Klaskanine River approximately 4 miles above the tidal influence of Youngs Bay (Fig. 4). Major components of construction included excavation of the pond, construction of diversion dam and intake structure, pipeline ditching and pipe laying, and outlet structure fabrication and installation. Table 3 lists the donations for the construction of the pond. The construction of this pond, unlike ponds #1 and #2, included grant money from the Pacific Northwest Regional Commission (PNRC). This grant provided materials for dam and intake construction, 1,200 feet of 30" pipeline, and personnel to coordinate and oversee the construction phases. Completion allowed for rearing and release from the pond but no early rearing capabilities.

Egg incubation and early rearing capabilities were accomplished with the aid of an Economic Development grant. Egg incubators and plumbing supplies were purchased, and a concrete raceway and pollution abatement pond were constructed with the $48,000 grant. Schematic shown in Fig. 4.

Table 1. **Vanderveldt property, pond #l construction cost estimates. ***

Material	Donator	Cost Est.
36" Culvert drain	Bumblebee Shipyard	$ 500.00
48" Riser pipe	Palmberg Paving	175.00
Channel iron	Bumblebee Shipyard	100.00
Fabrication time/materials	Clatsop Comm. College	150.00
Concrete	Bayview Transit Mix	85.00
Dike construction	Tommy Johnson	750.00
Electric power installation	Pacific Power & Light	450.00
	subtotal	$2,210.00
Lumber, 4" X 4", 2" X 6" plywood	Fisheries Project Budget	150.00
Perforated screens	Fisheries Project Budget	600.00
Nails, bolts, screws, misc.	Fisheries Project Budget	75.00
	subtotal	$ 825.00
	TOTAL	$3,035.00

* Existing farm pond

Table 2. Vanderveldt property, pond #2 construction cost estimates.

Material	Donator	Est. Cost
36" Culvert drain	Bumblebee Shipyard	$ 500.00
48" Riser pipe	Palmberg Paving	175.00
Channel iron	Bumblebee Shipyard	125.00
Fabrication time/materials	Clatsop Comn. College	175.00
Engineering Services	ODFW	350.00
lumber 4" X 4" supports	Port of Astoria	50.00
Winch truck rental	Port of Astoria	250.00
Pond excavation/dike construction	Crown Zellerbach Corp.	1,650.00
Pond excavation/dike construction	Tommy Johnson	1,400.00
Pond excavation/dike construction	Carl Utzinger	3,500.00
Pond excavation/dike construction	Harold Strosser	250.00
Pond excavation/dike construction	Bill Cunningham	200.00
	subtotal	$8,625.00
Concrete	Fisheries Project Budget	250.00
Perforated screens	Fisheries Project Budget	600.00
Luther, plywood, 2" X 4"	Fisheries Project Budget	100.00
Carpentry supplies/mist.	Fisheries Project Budget	75.00
	subtotal	$1,025.00
	TOTAL	$9,650.00

Table 3. Crown Zellerbach property, pond #3 construction cost estimates.

Material	Donator	Cost Est.
48" X 20' riser pipe	Crown Zellerbach Wauna Mill	$ 250.00
30" X 150' plastic manifold pipe	CZ Wauna Mill	9,000.00
Preliminary site surveying	ODFW	600.00
Site preparation; tree felling, area cleanup	CZ Clatsop Division	2,500.00
Pond site engineering	CZ Clatsop Division	
Pond excavation	Crown Zellerbach Corp.	13,000.00
Pipeline ditching	Crown Zellerbach Corp.	3,400.00
Dam design & engineerin	ODFW	700.00
Dam construction (labor4	Job Corps students	9,000.00
	subtotal	$ 40,450,00
Dam construction materials, pipeline, intake structure, personnel	PNRC *	73,500.00
	subtotal	$ 73,500.00
	TOTAL	$113,950.00

* Pacific Northwest Regional Commission

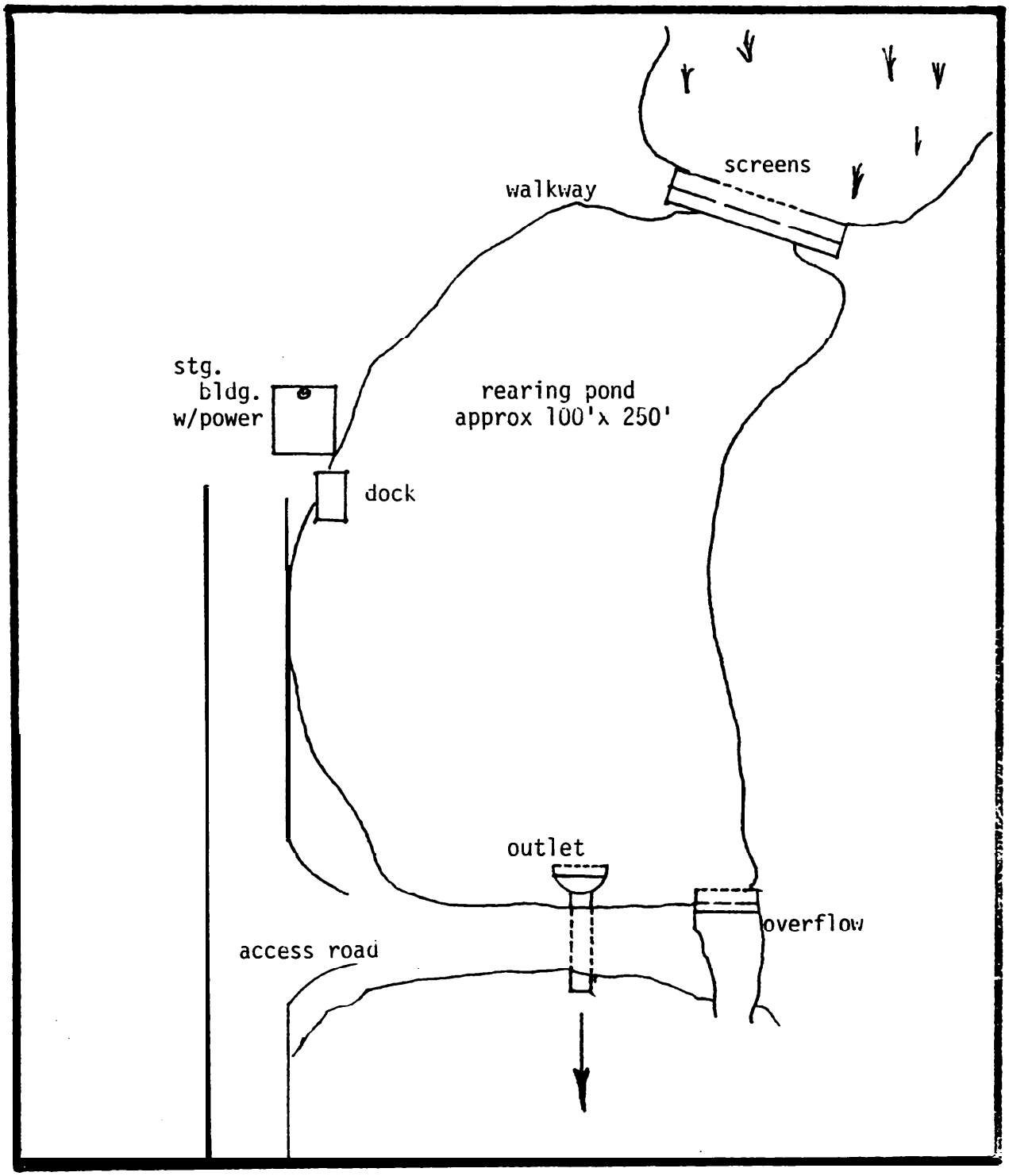


Figure 2. Schematic of coho rearing pond, pond #1 of CEDC facilities.

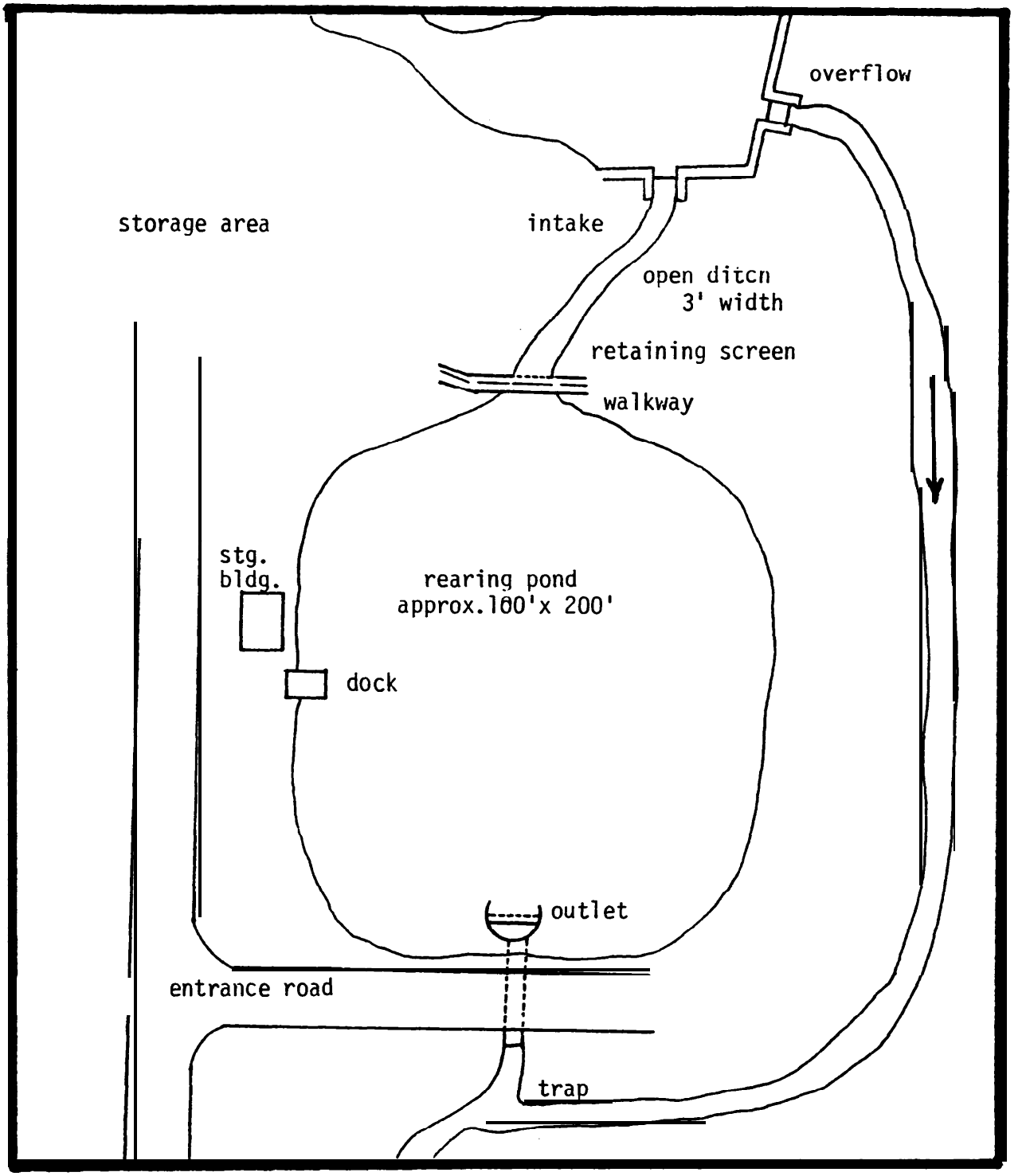


Figure 3. Schematic of coho rearing pond, pond #2 of CEDC facilities.

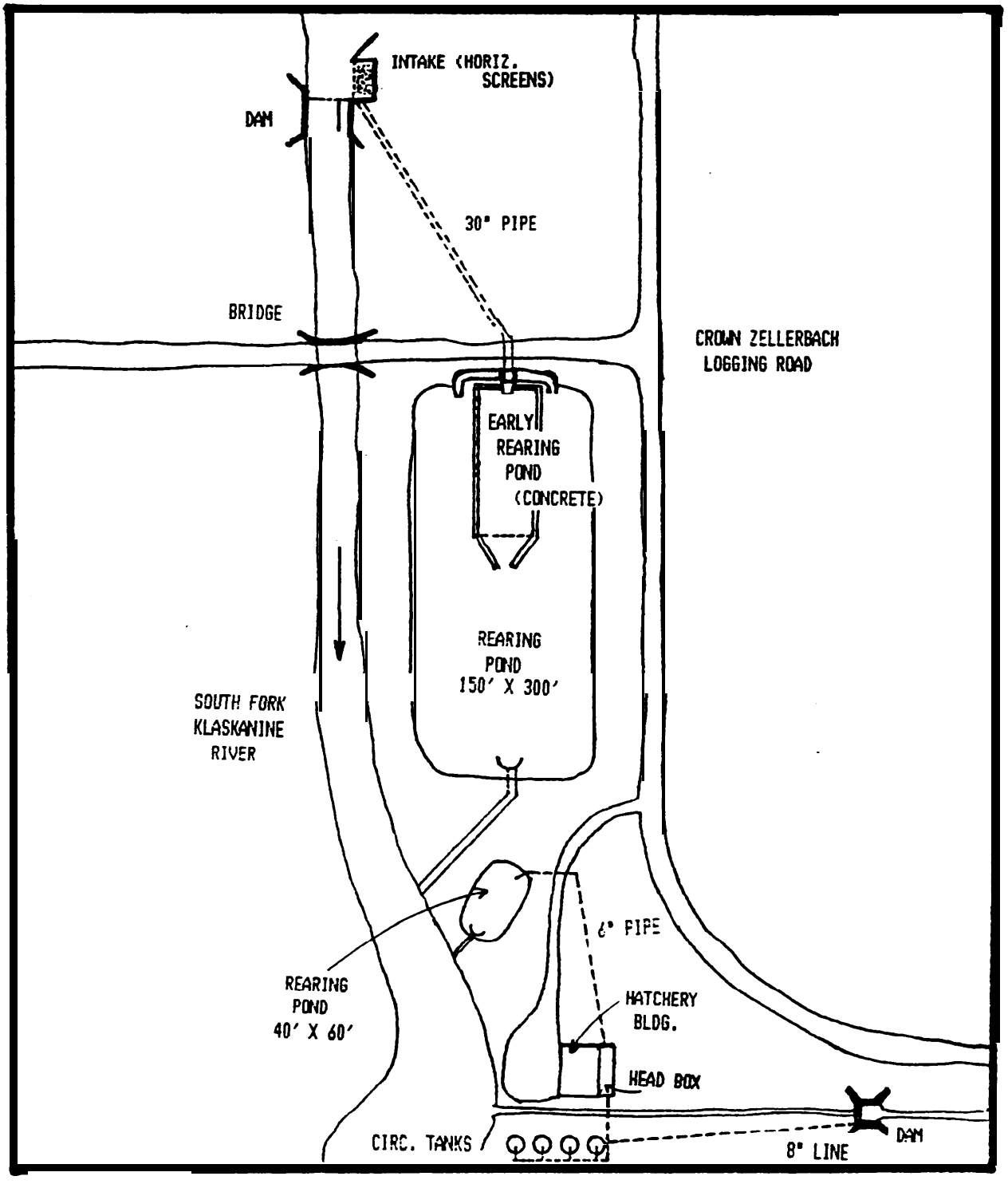


Figure 4. Schematic of CEDC's South Fork Klaskanine pond #3 incubation and rearing facility.

Community Involvement (Operation & Maintenance)

Community involvement in general operation and maintenance activities is documented in Tables 4 and 5. Cash contributions, materials, and services were recorded as received with value estimates determined by open market comparison and value estimation by the contributor.

Natural Outmigration of Smolts

Coho were released from the Tucker Creek ponds #l and #2 beginning April 1, 1984. The retaining screens were removed while maintaining full pond levels. Daily feeding continued throughout the migration period. Release sizes were 9.5 fish/ pound from pond #1 and 16.3/pound from pond #2. Outmigrant traps were placed below each pond. Traps were monitored during daylight and dark and during different stream flows. Length-frequency samples were taken prior to release from the pond and compared to length-frequencies from trap samples (Fig. 5). Environmental parameters monitored were flow and water temperatures.

Monitoring of fall chinook outmigration began on May 7, 1984 when pond #3 screens were removed, allowing fish to enter the South Fork Klaskanine River. Pond level was slowly lowered and drained, releasing all fish over a 7-day period. Fish were fed minimal amounts during this time. Daily seining in the South Fork Klaskanine River was done at a single selected site 4 miles below the pond and l/4 mile above tidewater to determine volitional migration swiftness. Since these fish were tagged and fin clipped, tagged to untagged ratios in the seine samples were calculated to cross check with pre-release population estimates. Pre-release and seine sample length-frequency measurements were recorded to determine if there was a differential in fish size with respect to migration (Fig. 6).

Evaluation

Coded-wire tagging (CWT)

To aid in the evaluation of the feasibility of low-cost salmon production facilities in terms of the stated objectives, a three-year CWT program was implemented. The 1984 tagging operation was contracted to ODFW. Coho CWT occurred during February with 28.7% and 12.8% tagged from ponds 81 and #2 respectively. The cumulative volitional release of 301,374 occurred during April (Table 6).

The fall chinook tagging from the South Fork Klaskanine pond #3 was accomplished April 17 through April 23. Of the 2,867,097 released, 3.73% were tagged.

Release numbers and the tagged percentages from the three ponds were estimated, utilizing Bailey's modification of the Petersen method (Ricker 1958) for population estimates from the following data:

Pond	M	C	R	N	s(N)
1	26,405	3,640	1,028	93,431	+ 2,465
2	27,541	3,676	486	207,943	± 8,767
3	107,990	11,495	432	2,867,097	± 135,008

Where $N = \frac{M\ (C + 1)}{R+1}$

N = Estimated population size
M = Number marked
C = Total fish recaptured
R = Number of marked fish recaptured

$$(P < 0.05) = \pm\ s(N) = \sqrt{\frac{N^2\ (C - R)}{(C + 1)(R + 2)}}$$

Contribution

Information was obtained from ODFW, Washington Department of Fisheries, Canada Department of Fisheries and Oceans, and Alaska Department of Fish and Game for the 1983 ocean fisheries catch data. The ocean catch number were expanded by those agencies (Table 7). Youngs Bay gillnet fishery CWT information was obtained jointly by ODFW, National Marine Fisheries Service (NMFS), and CEDC personnel through cannery sampling. Sampling rate at the canneries was 60% for fall chinook and 57% for coho in 1983. The 1984 cannery sample rates for chinook and coho were 37.5% and 19.3% respectively. The expansion formula used for preliminary contribution analysis was:

$$\text{Expanded number} = \frac{\text{(observed tags) (mark return rate)}}{\text{sampling rate}}$$

The mark return rate in the formula is the return rate of marked fish to the facility traps (Table 8). Since the fall chinook are unable to return adequately because of low flows, release mark rate was used.

The 1983 contribution of CEDC released fish to the Youngs Bay fishery was 1,135 fall chinook and 928 coho. Total catch was 3,860 chinook and 3,558 coho. The 1984 contribution for chinook and coho was 1,003 and 7,097 from a total of 3,700 and 40,600 respectively.

Table 4. 1983 Community contributions.

Contributor	Contribution	In-Kind	Cash
Astoria Seafood Co., Inc.	Matching assessment	8	$ 697.32
Bank of Astoria	Printing of Project checks	22.95	
Big Creek Hatchery	Technical support	120.00	
Bioproducts, Inc.	Donation		3,000.00
Bornstein Seafoods	Matching assessment		1,904.09
Clatsop County	Payroll, admin., legal	2,500.00	
Crown Zellerbach Corp.	Lease	225.00	
Gnat Creek Hatchery	Technical support	25.00	
Jim Imlah	Cat work (moving time)	150.00	
Klaskanine River Hatchery	Freezer space, tech. support	1,650.00	
Eldon Korpela	Nets	150.00	
lLou Larson, Attorney	Legal services	125.00	
Lovell, McCall Tire Service	Use of special tires	75.00	
national Marine Fisheries Serv.	Stream survey assist., materials	700.00	
Ocean Foods	Donation		250.00
OSU Extension - Jim Bergeron	Technical support	250.00	
CSU Seafood Laboratory	Fish food, office space/equip.	3,597.00	
Otter Trawl Commission	Copy machine use/supplies	150.00	
Joan Pratt	Accounting counsel	50.00	
United Food & Comm. Worker Union	Donation		50.00
Vanderveldt Family	Lease	200.00	
Youngs Bay Fishermen	Voluntary assessment		2,601.41
	subtotal	$9,989.95	$8,502.82
	TOTAL	$18,492.77	

Table 5. 1984 Community contributions.

Contributor	Contribution	In-Kind	Cash
Advanced Hydrolyzing Systems	Totes, glassware, net	$ 375.00	$
Big Creek Hatchery	Technical support	180.00	
Bioproducts, Inc.	Donation		1,059.30
Bonneville Hatchery	Aluminum pipe	500.00	
Bornstein Seafoods	Matching assessment		9,801.40
Clatsop Community College	Dock space rental	30.00	
Clatsop County	Payroll, admin., legal	1,292.00	
Crown Zellerbach Corp.	Lease	225.00	
Dale Curry	Consultation	80.00	
Gnat Creek	Technical support	25.00	
Donald Hill	Cedar posts, equip. rental	160.00	
Jim Hill	Firewood, skylight	150.00	
Klaskanine Hatchery	Freezer, tech. support	825.00	
Eldon Korpela	Nets	40.00	
MacDick's Drive Inn	Buckets	16.00	
Maring's Pacific NW Fish Co.	Matching assessment		272.08
National Marine Fisheries Serv.	Circular tanks	300.00	
Jim Nichols	Donation		5.00
Oregon Dept. of Fish & Wildlife	Technical assistance	250.00	
OSU Extension - Jim Bergeron	Technical assistance	250.00	
OSU Seafoods Laboratory	Office/freezer space, office/lab equipment	7,543.00	
Otter Trawl Commission	Copy machine use/supplies	492.00	
Oxbow Hatchery	Wooden troughs	100.00	
Port of Astoria	Gate valves	300.00	
Joan Pratt	Accounting counsel	50.00	
Fenton Stokeld	Buckets	10.00	
Vanderveldt Family	Lease	200.00	
Dr. & Mrs. P.B. van Wee1	Donation		10.00
Youngs Bay Fishermen	Voluntary assessment		17,789.52
	subtotal	$13,393.00	$28,937.30
	TOTAL	$42,330.30	

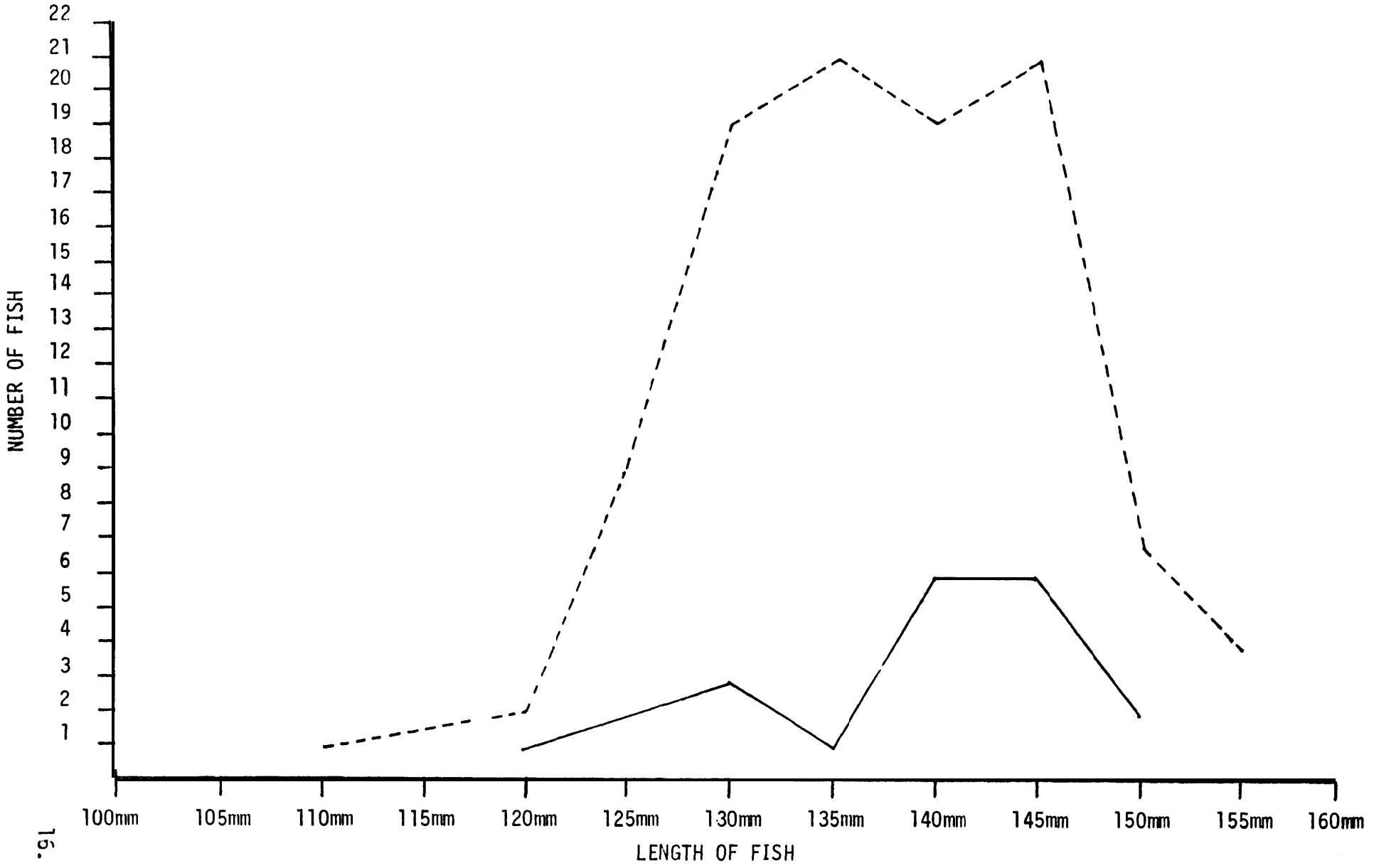


Figure 5. Comparative length-frequencies of coho sampled in Tucker Creek pond before release (dotted line) and from downstream migrant trap (solid line), April 1984.

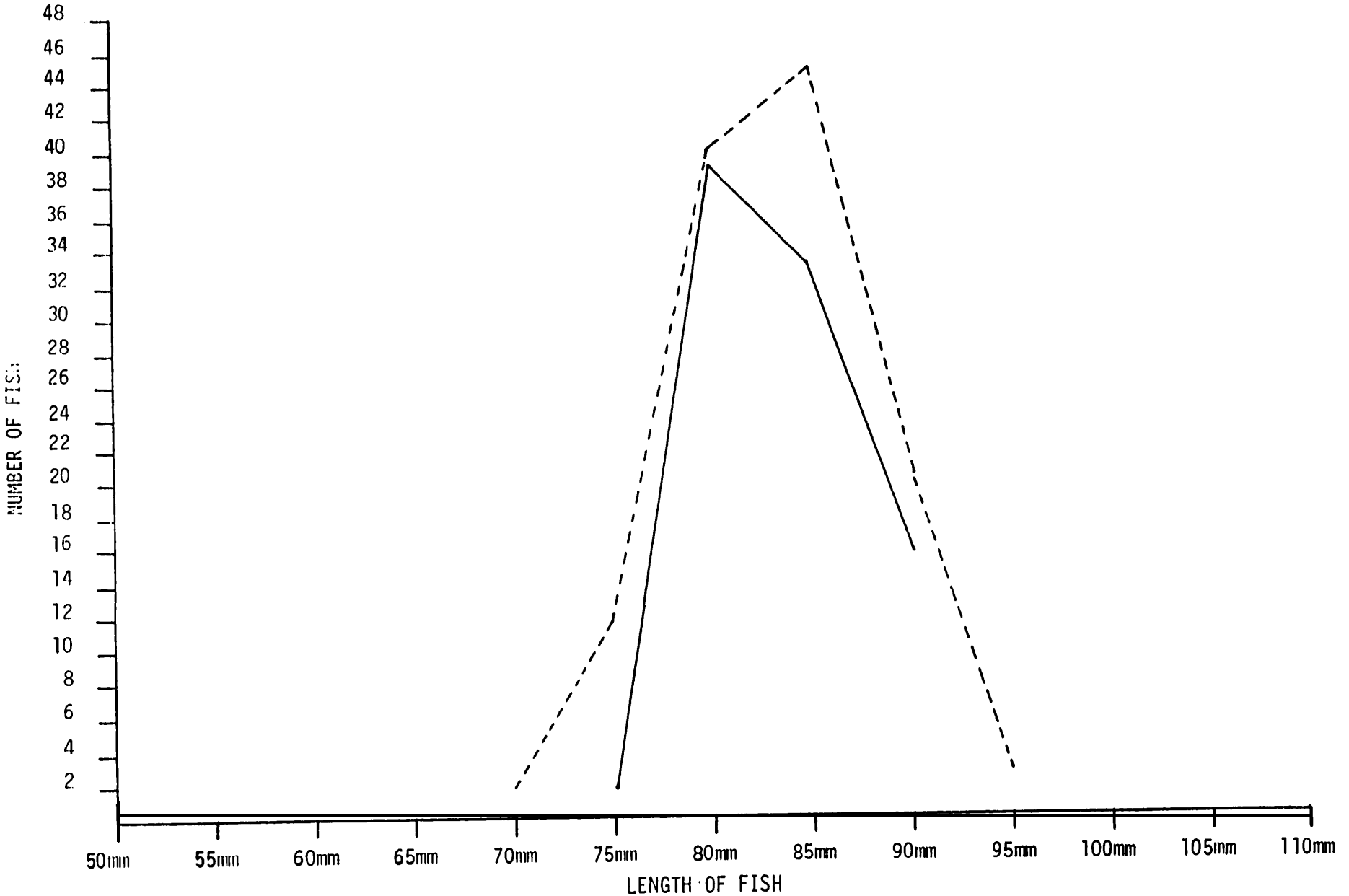


Figure 6. Comparative length-frequencies of fall chinook sampled in South Fork Klaskanine pond before release (dotted line) and from seine sample 4 miles downstream of release (solid line), May 1984.

Table 6. Summary of 1981-84 releases from CEDC Fisheries Project facilities.

Date	Tag Code	Release Site	Species	Release Numbers Total	# Tagged	% Tagged
4/09/81		#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
4/01/82	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
	7-24/13[b]	#3	CHF	822,366	33,857	4.12
4/05/83	-	#1	Coho	98,278	-	-
4/05/83	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
8/04/83	7-28/57	#3	RCHF[c]	32,095	28,758	89.60
	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	-	-

[a]Fish reared in both ponds but tagged with same code.

[b]Two tag codes for same group.

'Experimental release of Rogue River fall chinook.

Table 7. Preliminary fall chinook, coded-wire tag recoveries for Oregon, Washington, California, and British Columbia ocean fisheries in 1983 from CEDC releases

Tag Code Brood	7-21/58 80 Tags-Fish	7-21/59 80 Tags-Fish	7-24/12 81 Tags-Fish	7-24/13 81 Tags-Fish
Oregon Troll		3 = 82		
Washington Troll	6 = 145	27 = 652		
Washington Sport	3 = 73	13 = 354		
California			4 = 96	
B.C. Central Troll		10 = 272		
B.C. Northwest Troll	10 = 242	20 = 544		
B.C. Southwest Troll	25 = 604	80 = 2,176		
B.C. Georgia Straight Troll		5 = 136		
B.C. Johnson Straight Net			5 = 120	
B.C. Central Net				5 = 121
TOTAL = 5,617 fish	44 = 1,064	158 = 4,216	9 = 216	5 = 121

Table 8. Chinook and coho returns to CEDC traps, 1984

Species	Trap site	Sex	# trapped	# CWT recovered	Release site of CWT recoveries	Brood
Rogue chf	S. Fork	jack	65	65	S. Fork	82
coho	Pond #1	male	36			81
		female	44			81
		jack	90	18	Pond #1	82
coho	Pond #2	male	29	4	Pond #2	81
		female	71	8	Pond #2	81
		jack	20	3	Pond #1	82
				1	Pond #2	82

Stream Surveys

The major streams in the Youngs Bay drainage were surveyed to assess degree of straying of CEDC released fish. Streams were surveyed once each week for three consecutive weeks. The fish were examined for marks and snouts removed from marked fish. The caudal fin was severed on all observed dead fish to avoid counting them a second or third time. By the end of the third week, very few live fish were observed. Data from the streams surveyed in 1983 and 1984 is as follows:

Stream	# fish		# coded-wire tags recovered/release agency	
	1983	1984	1983	1984
S.F. Klaskanine	18	67	0	1/CEDC 3 no tags
N.F. Klaskanine	35	17	0	1/ODFW
Youngs River	0	9	0	
Lewis and Clark	256	194	3/NMFS 4/CEDC 4/ODFW	4/CEDC 2 no tags
Tucker Creek	0	0	0	0

RESULTS AND DISCUSSION

Comnunity Involvement (Construction)

The CEDC Fisheries Project has constructed three earthen rearing ponds since 1975. The construction efforts included substantial community support including land leases at no cost. The total cost estimate for the renovation and construction of the three ponds is $126,635. Community involvement represents 40% of the total. Ponds #l and #2 were constructed on small streams with maximum flaws of approximately 7 cfs.

Pond #l was an existing farm pond taken over by the Fisheries Project to rear and release salmon. Prior to salmon production, the area and pond needed necessary improvements to make it a useable facility. The total cost estimate for the renovation was approximately $3,000 with community contributions amounting to 73% of the total.

Pond #2 was constructed l/2 mile from pond #l on property owned by the same as pond #l. The pond was constructed on an unprepared site reflecting the construction cost increase as compared to pond #l. Community support of $8,625 represents 89% of the total $9,650.

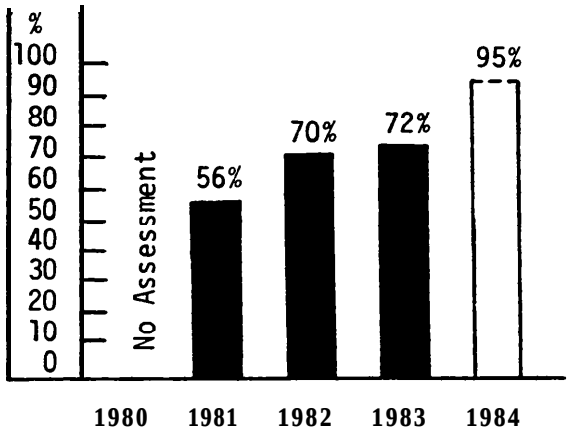
Pond #3 was constructed on land owned by Crown Zellerbach Corporation. The project included construction of a diversion dam on the South Fork Klaskanine that is capable of controlling flows in excess of 300 cfs. This project, being much larger than the construction of the first two ponds, utilized grant money provided by the PNRC. The estimated total project cost was $113,950 with the donated portion of $40,450 accounting for approximately 35%. The community contributions were responsible for the local match requirements in securing the grant.

In regards to construction, community involvement percentage is greater in the smaller scale projects. In larger and more sophisticated projects which require extensive material and service costs, the community efforts are substantial; but percentage of the total project is lower. The renovation and construction projects on pond #1 and #2 took approximately one week each. It seems the short term projects are more responsive to the transformational capabilities by the community.

Community Involvement (Operation and Maintenance)

Community contributions for fiscal years 1983 and 1984 show the extent of support other than prior construction contributions. As demonstrated in Tables 4 and 5, even the small in-kind and cash contributions add up to a substantial contribution. These items are necessities to the successful operation and maintenance of the facilities, and if they weren't provided by community individuals and organizations they would have to be purchased, hence reducing the money available for actual fish rearing expenses.

One of the biggest portions of this support is from the local fishermen. The fishermen participating in the Youngs Bay terminal fishery voluntarily access themselves 5% of their poundage value which is forwarded to the CEDC project to purchase fish food. This amount fluctuates with the numbers of returning fish, but the involvement of fishermen has increased annually and has nearly reached the 100% level. The 1984 percentage is estimated, as total fishermen participating in the fishery for the latest season hasn't been determined. The assessment program started in 1981 and the following chart shows annual increase in participation;



The dollar amount that the fishermen contribute is also voluntarily matched by canneries that buy fish in the fishery.

The contribution in 1983 and 1984 amount to 15% and 28% of the annual operating budget respectively.

Natural Outmigration of Smolts

Releases of the 1982 brood coho from pond #l and #2 occurred simultaneously beginning on April 1, 1984. Smolt traps below each pond were monitored day and night with the resultant data indicating that the smaller fish (16.3/pound) migrated predominately during darkness irrespective of flow. The larger fish (9,5/pound) from pond #l generally moved when flows increased irrespective of daylight conditions. One may suspect the larger fish were more anxious or ready to migrate. Length-frequencies from the ponds before release compared to those taken from the migrating fish indicated no differential migration with respect to fish size. Visual observation of fish sampled from the traps for smolting characteristics indicated all fish were smolted.

The 1983 brood fall chinook outmigration began on May 7, 1984. Ai. the seining site 4 miles below the pond outlet, it took the first fish 6 days to arrive. The migration occurred for 6 weeks. Simple gut analysis indicated that the fish were finding and

consuming food material. Also, as with the coho, there was no differential in migration with respect to size indicating the smaller fish had smolted. Visual examination also indicated smolting in all fish.

Evaluation

Coded-wire tag recovery activities and the resultant information provided for estimated catch percentages to the various fisheries. The 1980 brood fall chinook provided 6,415 fish to the Canadian, Washington, Oregon, and Youngs Bay fisheries in 1983. Catch percentages were 61.9, 19.0, 1.3, and 17.7 for the same fisheries respectively. Alaska reported no fish from CEDC releases caught in 1983. A catch of 0.2% of the total release number was realized for these 3-year old fish. When catch data becomes available to provide information from the 1984 and 1985 fisheries, the percent survival of this brood will increase. In the Youngs Bay fishery in 1984 approximately 750 fish from the 1980 brood chinook were harvested. 1981 brood also started providing to the fisheries as 337 were harvested in the 1983 ocean fishery, and 200 were caught in the 1984 Youngs Bay fishery. An interesting observation is that 96 were caught off California in 1983.

Chinook adult returns to CEDC traps has been minimal as low flows inhibit the successful return. Stream survey information indicates successful spawning activity in the South Fork Klaskanine below the trap.

Adult coho contributions to the various fisheries indicate a sharp increase in survival from the 1980 brood to the 1981 brood (Table 9). The 1980 brood provided .5X of the total number released, and the 1981 brood provided a 2.2% catch.

The coho jack returns to the CEDC traps in 1984 provided cursory information with respect to fish size at release. Smolts were released from pond #1 at an average size of 9.5/pound and from pond #2 at 16.3/pound. CWT recovery data (Table 8) showed a return of 21 tagged fish from the larger release size and only 1 from the smaller. The 1984 Youngs Bay fishery information indicated a catch of 461 jacks from the pond #1 release and none from pond #2. Interesting information could develop from the 1985 fisheries.

Stream Surveys

Stream survey data for spawning chinook in the Youngs Bay drainage indicates a degree of straying from the release stream. The Lewis and Clark River had the largest number of fish observed. This is the closest stream to the ocean in the Youngs Bay drainage (Fig. 1), and fish would encounter few nets in the fishery prior to reaching the stream. More fish may have been destined for other streams further up the drainage, but the extensive fishery may have harvested them before attaining access. In the South Fork Klaskanine, an increase in fish numbers occurred. In 1983 the fish were from the 1980 brood only, and in 1984 there were fish from both the 1980 and 1981 broods. The one tagged fish in 1984 was from the 1980 brood.

Table 9. Coho contribution to the various fisheries from CEDC releases in 1983 and 1984.

Tag Code Brood	1983 7-21/44 '80	1983 7-24/51 '81	1984 7-24/51 '81	1984 7-31/41 '82
California Sport	19		46	
California Troll	42		127	
Oregon Sport	174		117	
Oregon Troll	296		3	
Washington Sport	172	2	10	
Washington Coastal Gillnet	4			
Washington Troll	26			
Columbia Gillnet			176	
Youngs Bay Terminal	928		6,636	461
Wash. Columbia River (Buoy 10)			89	
Oregon Columbia River (Buoy 10)			9	

Summary of Expenditures - FY 1984

Personnel Services	$14,997.60
Benefits	6173.81
Travel and Transportation	976.48
Supplies	2,699.46
Contract Tagging	8116.65
Total Direct Costs	$32,964.00
Indirect Costs	4,273.58
TOTAL	$37,237.58

LITERATURE CITED

Ricker, W. E. 1958. Handbook of Computations for Biological Statistics of Fish Populations. Bull. Fish. Res. Board Can. 191:300.