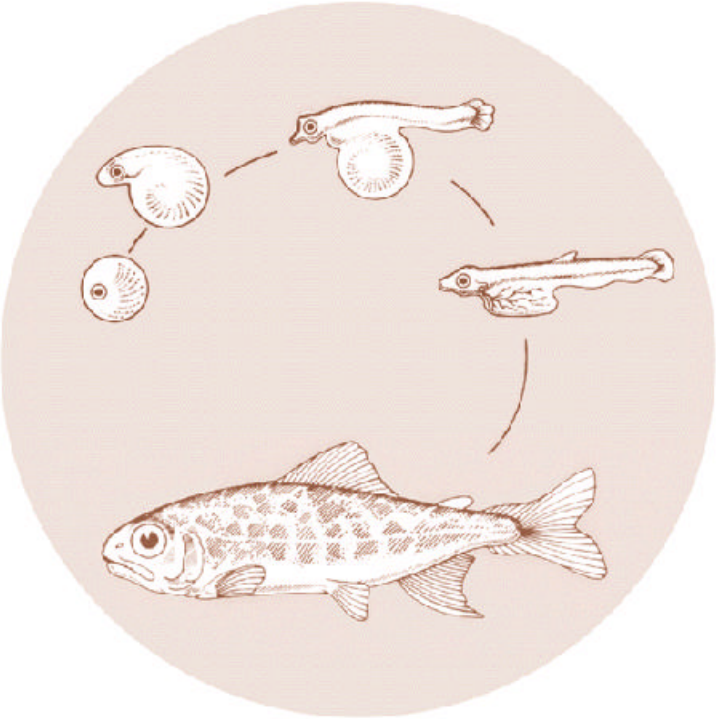
May 1989

EVALUATION OF A LOW-COST SALMON PRODUCTION FACILITY

Annual Report FY 1988



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Evaluation of a Low-Cost Salmon Production Facility

Annual Report FY 1988

by

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Astoria, Oregon 97103

Funded by

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U.S. Department of Energy

Bonneville Power Administration

Division of Fish and Wildlife

Agreement No. DE-A179-83BP11887

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ABSTRACT

Fiscal year 1988 was the sixth year of study sponsored by the Bonneville Power Administration to evaluate an existing, small-scale salmon production facility operated and maintained by the Clatsop County Economic Development Committee's (CEDC) Fisheries Project through program measure 703(g)(1) 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 rearing densities in earthen rearing ponds, and (5) Augment a unique "known stock" fishery.

Cash and in-kind contributions from the local community to the Fisheries Project have been substantial, and ranged in value from approximately $18,000 in 1983 to over $110,000 in 1988. Major contributions were realized during times of construction, at which time support came in the form of heavy equipment use. Also, major contributions come in the form of voluntary poundage assessments from local fishermen during the Youngs Bay commercial fishery. These assessments have ranged from approximately $4,000 in 1981 to a projected 1988 value of $140,000.

A volitional release strategy is utilized at CEDC rearing and release sites. Downstream smolt migration from the release sites has shown that smolt size and stream flow have an effect on smolt migration. Release of comparatively larger smolts, and release during elevated stream flows reflects a more rapid migration. Fall chinook smolts released at 57 fish/pound during 8,000 gpm flows migrated three times faster than smolts released at 69 fish/pound. Smolts released at 77 fish/pound during 15,000 gpm migrated at the same rate as the 57 fish/pound smolts during 8,000 gpm flows. Coho migration was monitored, with results demonstrating that smaller smolts (16.3 fish/pound) migrated predominately during darkness irrespective of flows; the larger smolts (9.5 fish/pound) generally moved when flows increased irrespective of daylight conditions. Coho 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 1/2 times when released at 13.5 fish/pound.

The CEDC Fisheries Project has been rearing and releasing salmon smolts since 1977, with a cumulative production through 1988 of over 30 million coho, chinook, and chum salmon.

The CEDC project has two large earthen rearing ponds used for coho production. In one pond it has been determined that a density of 16.5 pounds/gallon/minute flow should not be exceeded, and in the other a density of 25 pounds/gallon/minute flow should not be exceeded. This correlates to 0.08 pounds/ft^3, and 0.17 pounds/ft^3 respectively.

Fish reared and released by the CEDC Fisheries Project are harvested in the various sport and commercial fisheries from California to Alaska. In conjunction with the Oregon Department of Fish and Wildlife's relatively large releases, enough adult salmon are produced to justify an extensive terminal fishery in Youngs Bay. The harvest opportunity is generally open from the middle of August to the first of November. The direct value of this fishery has ranged from $72,000 in 1983 to over $1,500,000 in 1988.

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 coho 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 loss 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 Bonneville Power Administration-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 since 1983, with the activities and information of the six-year project reported herein.

In 1983 when the project "Evaluation of a Low-Cost Salmon Production Facility" was implemented, program measure 704(j)(1) of the Power Planning Council's fish and wildlife program was addressed. The measure stated, "Bonneville shall provide funds to develop low-cost, small-scale salmon production facilities. This effort shall consist of adapting the low-capital salmon production concept to Columbia River Basin locales and developing engineering designs, supplier lists, and operation manuals. Several prototype facilities shall be constructed and operated for experimental purposes." Since 1983, the Council's Fish and Wildlife Program has been revised with program measure 703(g)(1) relating to low-capital propagation facilities.

The CEDC Fisheries Project is an <u>existing</u> low-cost community oriented facility that makes annual releases of fall chinook and coho into Youngs Bay in Clatsop County, Oregon. The Project operates through direct coordination and assistance from the Oregon Department of Fish and Wildlife (ODFW). The Project uses a low-cost approach to salmon rearing with emphasis on community support and local contributions. CEDC contracted with BPA to assist the Council with fulfillment of its program measure, and through the following objectives the CEDC Fisheries Project was evaluated.

Study 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

The CEDC Fisheries Project maintains and operates three earthen, gravity-fed rearing ponds in the Youngs Bay drainage (Figure 1). Ponds #1 and #2 are located on the Tucker Creek tributary, while pond #3 and an incubation facility are incorporated on the South Fork Klaskanine River.

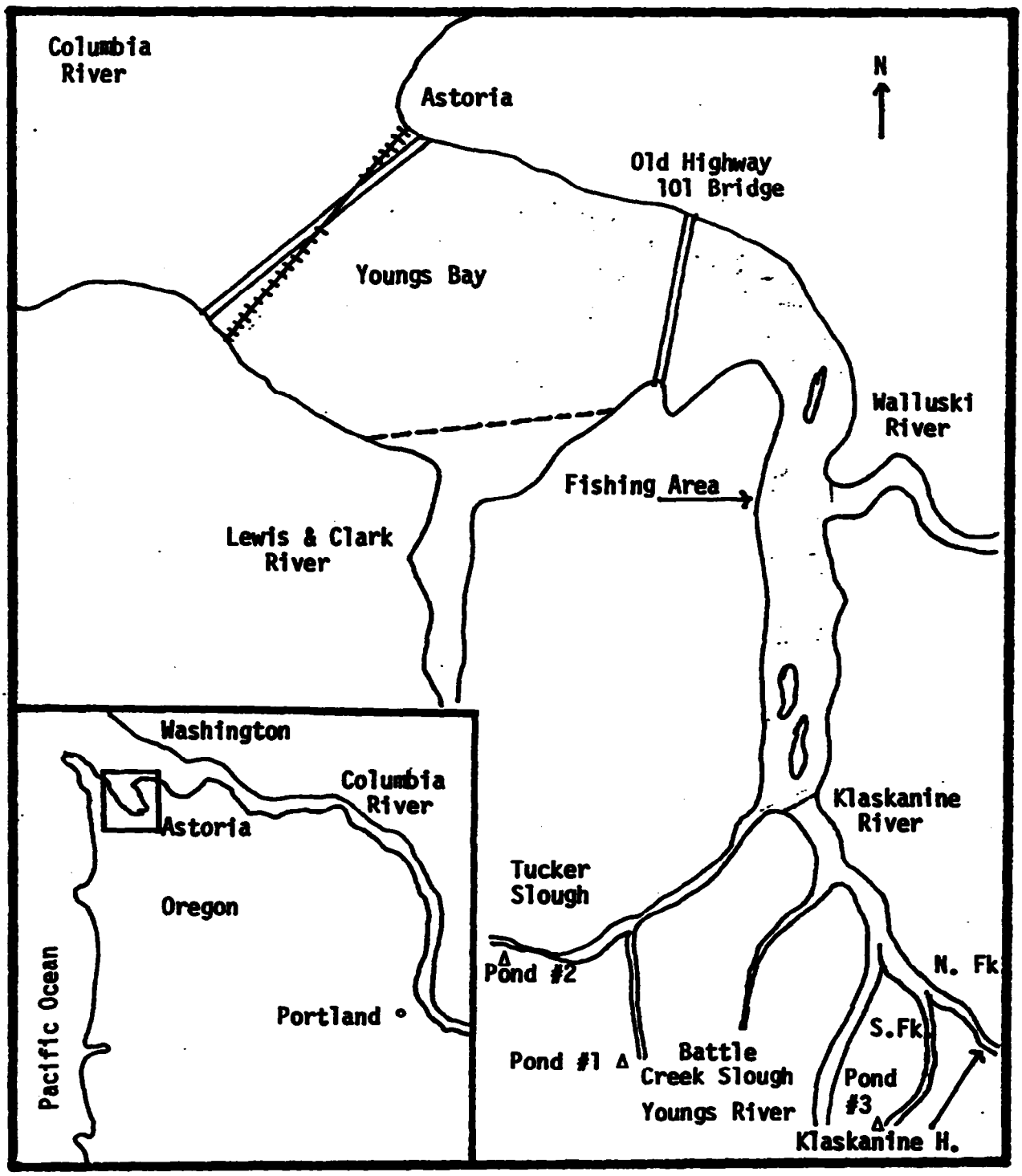


Figure 1. Vicinity Map of Pond Sites for CEDC Facilities

METHODS AND MATERIALS

Investigate the Potential for Community Involvement

The CEDC Fisheries Project relies on the support of the local community for various aspects of the overall rearing and release of salmon in the Youngs Bay system. Community involvement is important for daily operation and maintenance and also for various construction activities.

Contributions of cash, labor, materials, and in-kind support were documented each year from 1983 to 1988. Community involvement during various construction activities was also documented over the six-year period, as well as during pond construction prior to 1983. All three rearing ponds were constructed prior to 1983.

Evaluate Natural Outmigration of Smolts from Earthen Rearing Ponds

CEDC utilizes the volitional smolt release strategy where the retaining screens are removed and pond levels maintained at or near full capacity allowing outmigration to occur when such activity is naturally triggered.

In 1984 coho from Tucker Creek ponds #1 and #2 were released beginning on April 1. Retaining screens were removed while maintaining full pond levels. Daily feeding continued throughout the migration period. Release sizes were 9.5 fish/pound and 16.3 fish/pound from ponds #1 and #2 respectively. 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 and compared to length frequencies from trap samples. Environmental parameters monitored were flow and water temperatures.

In 1984 monitoring of the fall chinook outmigration began on May 7 when pond #3 screens were removed. Pond level was slowly lowered and drained, releasing all the fish over a 7-day period. Daily seining in the South Fork Klaskanine River was done at a single selected site four miles below the pond and 1/4 mile above the tidewater influence. Pre-release and seine sample length frequency measurements were taken. Pre-release coded-wire tagging occurred with a Petersen method population estimate conducted (Ricker, 1958). The seining and monitoring continued in 1985, 1986, 1987, and 1988.

The 1985 coho release from the Tucker Creek ponds also began on April 1. Fish were released at 13.4 fish/pound and 16.3 fish/pound from ponds #1 and #2 respectively. In 1986 the smolt size at release was the same at 12.5 fish/pound in each pond. In 1987 the pond #1 fish were 9.2 fish/pound and pond #2 fish were 10.8 fish/pound. In 1988 there were no fish released from pond #2, and the fish from pond #1 were released at 9.2 fish/pound. The close proximity of these two ponds allowed for comparative releases of different size smolts, and upon return of adults survival will be evaluated.

The 1985 fall chinook release followed the same regime as in 1984, however in 1986 a release strategy was initiated to determine if the period during which these fish were migrating from the release site to the lower estuary had an impact on subsequent survival levels. An assumption was made that during this time the predator mortality to juveniles was significant. A group of 25,000 smolts was coded-wire tagged and transported by truck to lower Youngs Bay for release. The returns of this group will be compared to coded-wire tagged fish released normally from the rearing site. This same comparative release regime was repeated in 1987 and 1988. In 1987 and 1988 a third group reared and released in Youngs Bay net pens will be compared to the normal hatchery release, and the truck release.

Cumulative Production of Quality Salmon

The CEDC Fisheries Project continues annual releases of coho and chinook salmon. Occasionally other species such as chum salmon are released. The Project receives eggs and/or fry from nearby hatcheries operated by the Oregon Department of Fish & Wildlife (ODFW). The Youngs Bay terminal gillnet fishery, with a substantial harvest of returning adults, does not allow adequate escapement to fulfill annual 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 smolt size at release, and examination of fall chinook stock transfers.

Starting in 1985 and continuing through 1988, the activities and time involved with each activity for the overall CEDC Fisheries Project was documented and categorized. To accomplish this, Project personnel completed a detailed time sheet with daily activities representing 27 categories. In combining the monthly time sheets of all personnel, an annual breakdown of time spent in each category was generated.

Development of Optimum Density Levels in Earthen Ponds

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. Since 1983 CEDC has been attempting to determine the optimum rearing densities for its two coho rearing ponds. Annual production levels of CEDC's ponds were documented. Pond volumes were determined by CEDC personnel using flow rate and time taken to fill each pond. To help check the accuracy of these determinations CEDC solicited the help of the Clatsop County surveyor and compared his results with the flow-determined results at the South Fork Klaskanine pond #3.

Prior to 1985 the production from each of the coho rearing ponds was approximately 100,000 smolts and 200,000 smolts in ponds #1 and #2 respectively. In 1986 pond loading was increased to 140,000 in #1 and 263,000 in #2. At a size of 10 smolts/pound, this correlates to 11,200 and 21,040 pounds respectively.

The fall chinook production since 1981 has been about 3 million smolts annually. In 1987 production was reduced because of financial constraints.

Augmentation of a Unique Known Stock Fishery

In conjunction with ODFW's comparatively large smolt production, enough fish return to Youngs Bay to justify an extensive terminal fishery. Fish harvested in Youngs Bay are sampled at the processing plants and coded-wire tags are recovered.

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 dead fish containing coded-wire tags, and caudal severing of all fish examined to prevent counting again on subsequent surveys.

Coded-wire tag recoveries from ocean harvests will provide information on stock and species distribution. Coded-wire tag data will be collected from Alaska to California.

RESULTS AND DISCUSSION

Investigate the Potential for Community Involvement

Community involvement with the CEDC Fisheries Project has been substantial in regards to both construction activities and daily operation and maintenance support.

(Construction)

The construction cost estimates of the three rearing ponds are shown in Tables 1, 2, and 3, with corresponding schematic diagrams of each pond shown in Figures 2, 3, and 4. Pond #1 was an existing farm pond owned by a private landowner. An area of approximately two acres including the pond, is leased to the Fisheries Project at no cost. Prior to salmon rearing activities the pond needed renovation to bring into being a functional rearing and release site. The major improvements needed were intake and outlet retaining screens, an outlet "monk" to allow pond draining, an overflow system, and some major dike improvement. The overall cost estimate was $3,035 and the resultant pond was CEDC's first rearing pond. Local community support of $2,210 represents 73% of the total. Since 1977 when the first group of 50,000 coho were released from this pond, approximately 1,002,000 coho and nearly 3 million fall chinook have been released.

The second rearing pond (pond #2) was constructed approximately 1/2 mile from pond #1 on property of the same owners. The site was unprepared and preliminary surveying and engineering was provided by the Oregon Department of Fish and Wildlife. Fisheries Project personnel completed initial clearing which included tree and brush removal. Community support for this project provided 89% of the total $9,650. Since the completion of this pond in 1979 nearly 5 million coho, fall chinook, and chum salmon smolts have been released.

The third pond (pond #3) was constructed on land owned by Crown Zellerbach Corporation and utilizes water from the South Fork Klaskanine River approximately 4 miles above the tidal influence of Youngs Bay (Figure 1). Major components of construction included excavation, construction of diversion dam and intake structure, pipeline ditching and installation, and outlet structure fabrication and installation. The diversion dam on the South Fork Klaskanine River 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 Pacific Northwest Regional Commission (PNRC). The grant provided materials for dam and intake construction, 1,200 feet of 30" steel pipeline, and personnel to oversee and coordinate the construction phases. The local Job Corps center provided extensive assistance during dam construction. Students from the center enrolled in such courses as woodworking and concrete construction, and under their instructor's supervision, built the dam. The value of $9,000 was a substantial portion of the overall project. Approximately 35% of the project cost was provided by the

Table 1. Community Contributions to CEDC Fisheries Project. 1983

Contributor	Contribution	In-Kind	Cash
Astoria Seafood Co.	Poundage Assessment Match		$697.32
Bank of Astoria	Printing of Checks	$22.95	
Big Creek Hatchery	Technical Support	$120.00	
Bioproducts, Inc.	Cash Donation		$3,000.00
Bornstein Seafood	Poundage Assessment Match		$1,904.09
Clatsop County	Payroll, Admin., Legal	$2,500.00	
Crown Zellerbach	Land Lease	$225.00	
Goat Creek Hatchery	Technical Support	$25.00	
Jim Imlah	Cat work (moving time)	$150.00	
Klaskanine Hatchery	Technical Support/Freezer Space	$1,650.00	
Eldon Korpela	Nets	$150.00	
Lou Larson	Legal Services	$125.00	
Lovell, McCall Tire Service	Use of special tires	$75.00	
National Marine Fisheries	Survey assist. and materials	$700.00	
Ocean Foods	Cash Donation		$250.00
OSU Extension - Jim Bergeron	Technical Assistance	$250.00	
OSU Seafood Laboratory	Office, freezer space, office/lab equipment	$3,597.00	
Otter Trawl Commission	Copy machine use/supplies	$150.00	
Joan Pratt	Accounting Counsel	$50.00	
United Food & Comm. Worker Union	Cash Donation		$50.00
Vanderveldt Family	Land Lease	$200.00	
Youngs Bay Fishermen	Poundage Assessment		$2,601.41
	Subtotal	$9,989.95	$8,502.82
	TOTAL		$18,492.77

Table 2. Community Contributions to CEDC Fisheries Project. 1984

Contributor	Contribution	In-Kind	Cash
Advanced Hydrolyzing Systems	Totes, glassware, net	$375.00	
Big Creek Hatchery	Technical Support	$180.00	
Bioproducts, Inc.	Cash Donation		$1,059.30
Bonneville Hatchery	Aluminum Pipe	$500.00	
Bornstein Seafood	Poundage Assessment Match		$9,801.40
Clatsop Community College	Dock Space Rental	$30.00	
Clatsop County	Payroll, Admin., Legal	$1,292.00	
Crown Zellerbach	Land Lease	$225.00	
Dale Curry	Consultation	$80.00	
Gnat Creek Hatchery	Technical Support	$25.00	
Donald Hill	Cedar Posts, equipment rental	$160.00	
Jim Hill	Firewood, skylight	$150.00	
Klaskanine Hatchery	Technical Support/Freezer Space	$825.00	
Eldon Korpela	Nets	$40.00	
MacDick's Drive Inn	Buckets	$16.00	
Maring's Pacific NW fish Co.	Poundage Assessment Match		$272.08
National Marine Fisheries	Circular Tanks	$300.00	
Jim Nichols	Cash Donation		$5.00
ODFW	Technical Assistance	$250.00	
OSU Extension - Jim Bergeron	Technical Assistance	$250.00	
OSU Seafood 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	
Jean Pratt	Accounting Counsel	$50.00	
Fenton Stokald	Buckets	$10.00	
Dr. & Mrs. P.B. van Wool	Cash Donation		$10.00
Vanderveldt Family	Land Lease	$200.00	
Youngs Bay Fishermen	Poundage Assessment		$17,789.52
	Subtotal	$13,393.00	$28,937.30
	TOTAL		$42,330.30

Table 3. Community Contributions to CEDC Fisheries Project. 1985

Contributor	Contribution	In-Kind	Cash
Astoria Thunderbird Charter	Cash Donation		$100.00
Bank of Astoria	Printing of Checks	$34.69	
Big Creek Hatchery	Technical Support	$120.00	
Bioproducts, Inc.	Price Discounts & Feed	$1.187.00	
Bornstein Seafoods	Fish Carcasses	$78.60	
Bornstein Seafood	Poundage Assessment Match		$12.479.08
Clatsop County	Payroll/Admin./Legal	$84.00	
Dave Crawford	Computer Accessory	$250.00	
Crown Zellerbach	Land Lease	$225.00	
Dale Curry	Office Equip. Acquisition	$20.00	
Fishhawk Fisheries	Poundage Assessment Match		$134.98
Lesa Hill	Contract Labor (YB Flags)	$10.00	
Stan Kahn	Net	$75.00	
Klaskanine Hatchery	Technical Support/Freezer Space	$366.67	
Lou Larson	Legal Services	$80.00	
Duncan Law	Admin. Assist./ Grant Award	$220.00	
Ocean Foods of Astoria	Cash Donation		$250.00
ODFW	Technical Assistance	$249.96	
OSU Extension(J. Bergeron)	Technical Support	$249.96	
OSU Seafoods Laboratory	Office/Lab Equipment and Office/Lab/Freezer Space	$7.590.00	
Otter Trawl Commission	Xerox Copier Use/Supplies	$350.04	
Point Adams Packing Co.	Poundage Assessment Match		$7.168.89
Joan Pratt	Accounting Counsel	$80.00	
RCA Service Co.	Office Desk	$150.00	
Fenton Stokeld	Buckets	$40.00	
Dr. & Mrs. P.B. van Weel	Cash Donation		$10.00
Vanderveldt Family	Land Lease	$200.00	
Youngs Bay Fishermen	Poundage Assessment		$21.442.77
	Subtotal	$11.660.92	$41.585.72
	TOTAL		$53.246.64

Table 4. Community Contributions to CEDC Fisheries Project, 1986

Contributor	Contribution	In-Kind	Cash
AMCCO	Metal Supports and labor	$58.35	
Big Creek Hatchery	Technical Support	$120.00	
Bioproducts, Inc.	Feed Price Discounts	$640.00	
Bornstein Seafoods	Poundage Assessment Match		$10,013.37
Cavenham Forest Industries, Inc.	Six Piling	$500.00	
Clatsop County	Payroll/Admin./Legal	$1,104.40	
Crown Zellerbach	Land Lease	$112.50	
Fishhawk Fisheries	Poundage Assessment Match		$954.94
Duane Jue	Truck Rental	$100.00	
Stan Kahn	Nets	$100.00	
Klaskanine River Hatchery	Tech. Support/Freezer Space	$1,450.02	
Knappton Corporation	Light Piling	$500.00	
Eldon Korpela	Towing Expense	$250.00	
Ivan Larsen	Towing Expense	$150.00	
Ocean Foods of Astoria	Poundage Assessment Match		$161.82
ODFW	Technical Assistance	$249.96	
OSU Extension(J. Bergeron)	Technical Support	$187.47	
OSU Seafoods Laboratory	Office/Lab Equipment and Office/Lab/Freezer Space	$7,590.00	
Otter Trawl Commission	Xerox Copier Use/Supplies	$350.04	
Pacific Power & Light	Scrap Bolts	$150.00	
Point Adams Packing Co.	Poundage Assessment Match		$9,825.83
Point Adams Packing Co.	Cash Contribution		$584.00
Port of Astoria	Floats, lumber, hardware	$2,200.00	
Port of Astoria	Heavy Equipment - Dirt Work	$2,500.00	
Joan Pratt	Accounting Counsel	$40.00	
R. William Tynkila	Mink Cages	$100.00	
Vanderveldt Family	Land Lease	$200.00	
Western Fab - Richard North	Welder Rental	$100.00	
Youngs Bay Fishermen	Poundage Assessment		$21,621.75
	Subtotal	$18,752.74	$43,161.71
	TOTAL		$61,914.45

Table 5. 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	$260.00	
Bioproducts, Inc.	Feed Price Discounts	$368.40	
Roy Bjork	Rock Hauling	$100.00	
Bornstein Seafood	Poundage Assessment Match		$10,314.01
Clatsop County	Payroll/Admin./Legal	$84.00	
Comforts of Home Sewing Center	Labor	$30.00	
Fishhawk Fisheries	Poundage Assessment Match		$2,717.65
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	
Ivan Larsen	Poundage Assessment Match		$91.05
Jessie's Ilwaco Fish Co.	Poundage Assessment Match		$1,567.48
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		$13,663.06
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		$28,353.28
	Subtotal	$18,229.39	$57,417.59
	TOTAL		$75,646.98

Table 6. Community Contributions to CEDC Fisheries Project. 1988

Contributor	Contribution	Cash
AMCCO	Pipe	
Astoria Seafood Co., Inc.	Poundage Assessment Match	$4.138.14
Jim Bergeron	Technical Assistance	
Big Creek Hatchery	Technical Support/Rogue Assistance	
Bioproducts, Inc.	Cash Contribution	$500.00
Bornstein Seafoods	Poundage Assessment Match	$36.392.41
Jack Cartwright & David Kelly	Insulated Tank	
Clatsop County	Payroll/Admin./Legal	
Representative Tom Hanlon	Cash Donation	$64.00
Jessie's Ilwaco Fish Company	Poundage Assessment Match	$43.43
Klaskanine River Hatchery	Tech. Support/Freezer Space	
Ivan Larsen	Dock Easement and Parking	
Ivan Larsen	Cash Donation	$1.000.00
National Guard - John Postlewaite	Generator Repair	
Northwest Natural Gas	Plastic Pipe	
ODFW	Technical Assistance - Egg Source	
OSU Seafoods Laboratory	Office/Lab Equipment and Office/Lab/Freezer Space	
Otter Trawl Commission	Xerox Copier Use/Supplies	
Jimmy Parker	Pit Rock	
Point Adams Packing Co.	Poundage Assessment Match	$31.267.21
Point Adams Packing Co.	Cash Donation	$370.00
Joan Pratt	Accounting Council	
Fenton Stokeld	Buckets	
Keith & Debbie Warren	Cash Donation	$37.50
Youngs Bay Fishermen	Poundage Assessment	$36.948.48
	TOTAL	$110.761.17

* All of 1988 poundage assessment receipts have not been submitted yet

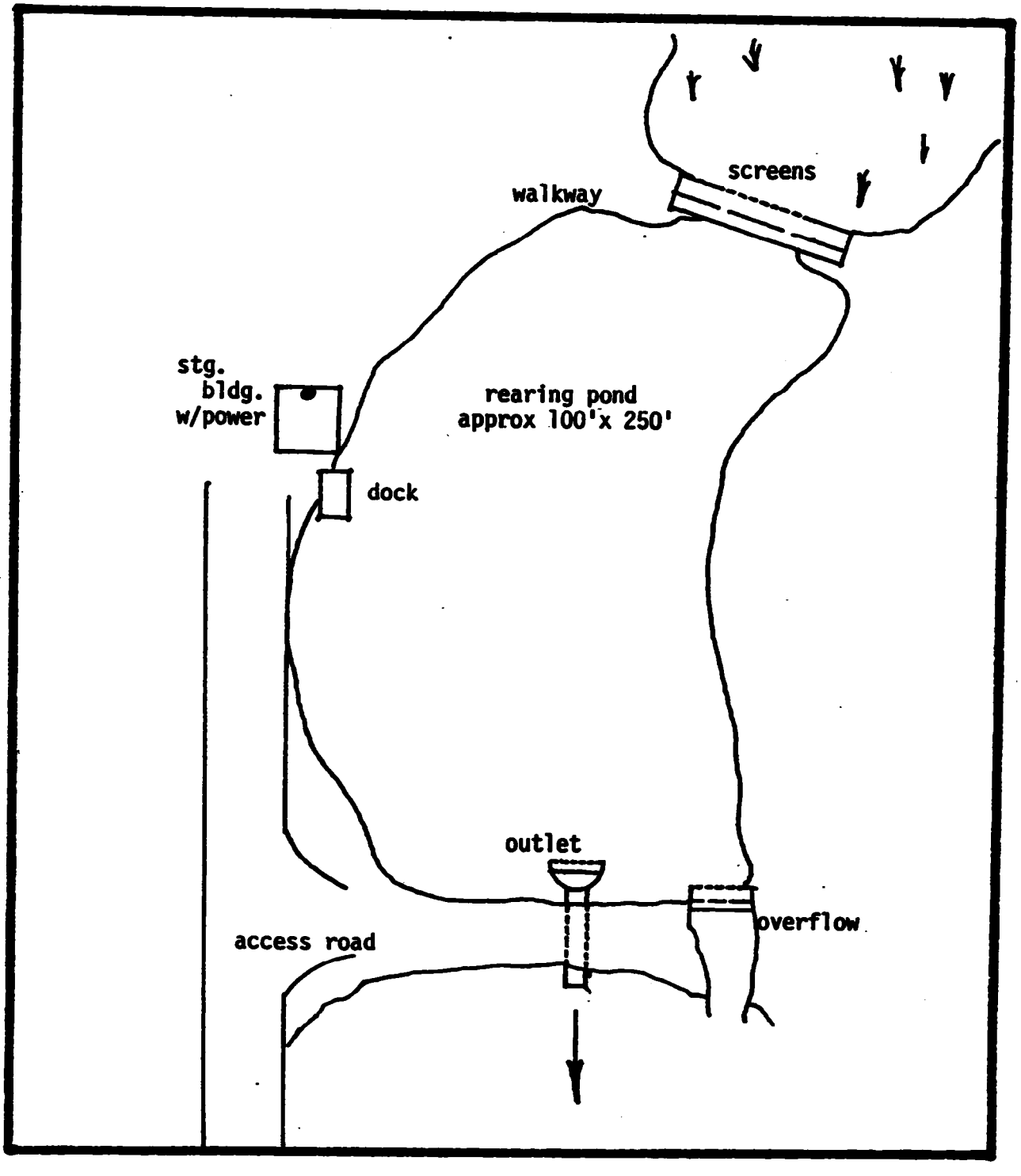


Figure 2. Schematic of Coho Rearing Pond; Pond #1 of CEDC Facilities

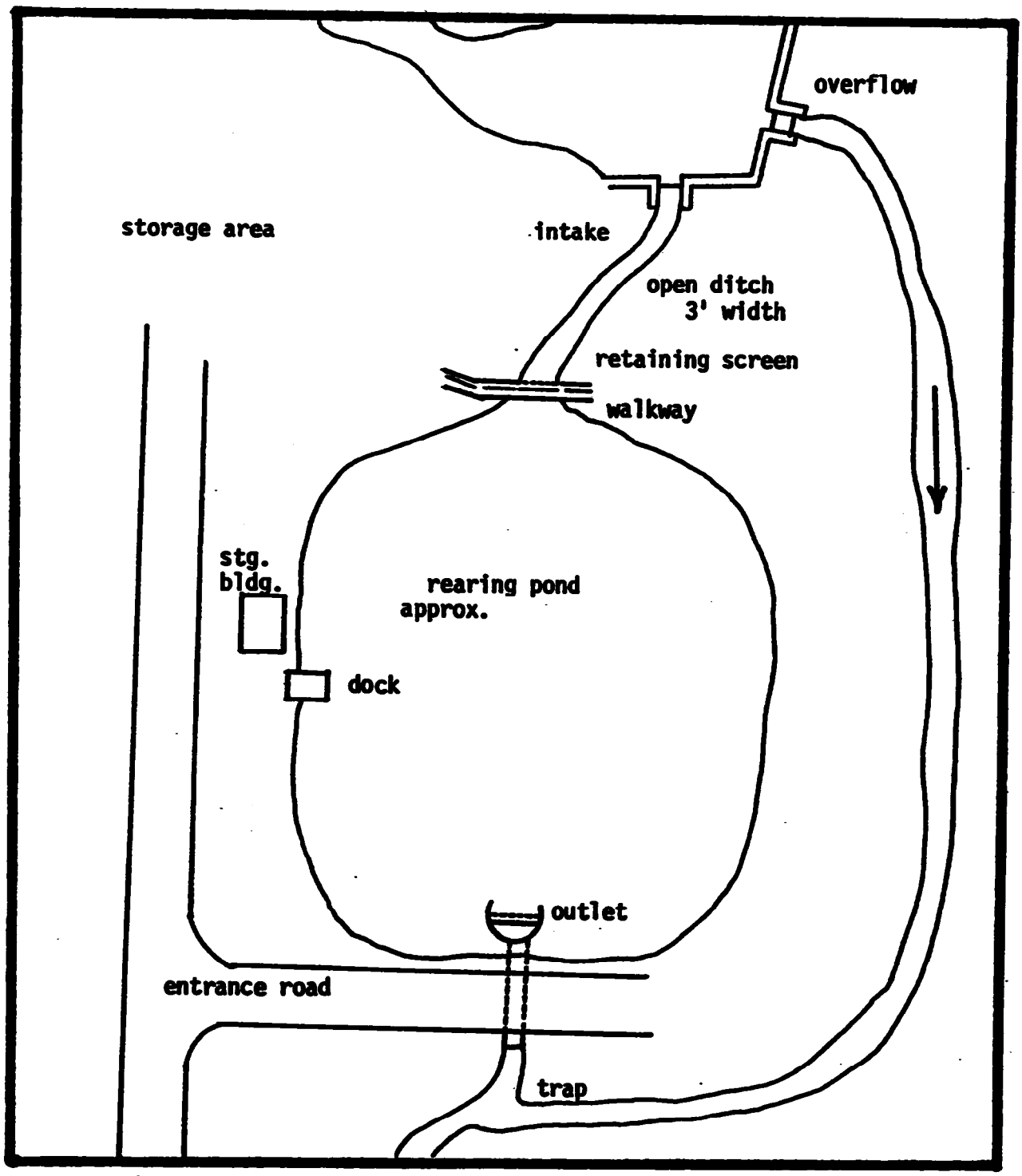


Figure 3. Schematic of Coho Rearing Pond; Pond #2 of CEDC Facilities

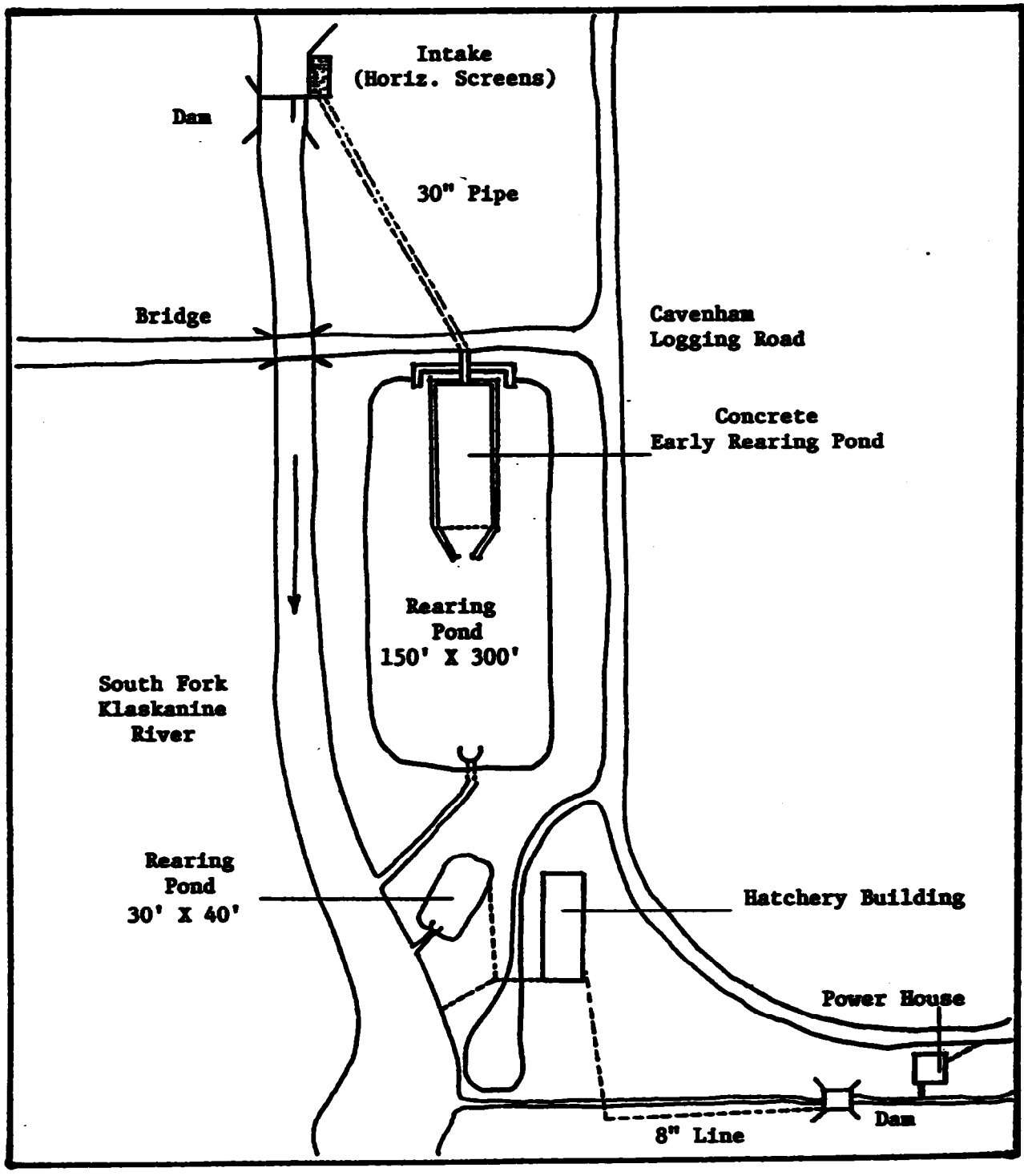


Figure 4. Schematic of CEDC's South Fork Klaskanine Pond #3 Incubation and Rearing Facility, 1988

local community. Since completion of this pond in 1981 over 20 million coho and chinook smolts have been released.

In 1984 egg incubation and early rearing capabilities were added to the project with the aid of a $48,000 Economic Development grant. Egg incubation and plumbing supplies were purchased and installed that provided for an egg hatching capacity of 1.3 million. A 100' X 20' X 4' deep early rearing concrete raceway was constructed, and a small (30' X 40') rearing pond was excavated and are shown in Figure 4. The early rearing pond was constructed within the large #3 rearing pond.

In 1985 there was no major construction, but in 1986 the CEDC Fisheries Project was awarded a $92,000 grant from the Federal Economic Development Administration (EDA) for the construction of a hatchery/storage building, the installation of a small hydroelectric system, and for various research equipment and supplies. The project was matched with $23,000 from local funds for a total $115,000 project and was essential in receiving the grant. Community participation in conjunction with this activity was substantial. The Clatsop County surveyor provided preconstruction services through property line determinations and construction site layout. His service was valued at $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 provided assistance in site preparation, which required extensive excavation to level the area for the 30' X 100' 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 power house was built over an embankment of a Cavenham Forest Industries, Inc. logging road, and a hoist truck was needed to lift the generator over the bank and place it on the preconstructed concrete pad. Pacific Power and Light Company (PP & L) 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 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 4 shows the schematic layout of the generator and new hatchery building in relation to the existing water intake for the hatchery building. This small tributary of the South Fork Klaskanine River supplies water for both the hydrogenerator and the hatchery building, so if the powerhouse would have been built below the intake dam, adequate water would not have been available to operate the hatchery building. Approximately 2,500' of 8" PVC pipe supplies water to the generator.

Community involvement with regard to the mentioned construction activities demonstrates the willingness of local individuals and organizations to help. The community appears to be more responsive to the smaller scale projects which may reflect its compatible capabilities. In larger and more sophisticated projects which require extensive material and service costs, the community efforts are still substantial but the percentage of the total project value is lower than for smaller ones.

(Operation and Maintenance)

The local community also provides assistance in the form of in-kind, cash, and material contributions for general operation and maintenance support. The annual contributions for the period 1983 - 1988 are listed in Tables 1 through 6, and the comparative values from 1977 - 1988 are shown in Figure 5. The fluctuations from year to year may be reflective of large construction projects or of a successful fishing season. 1981, for example, was the year of construction for the South Fork #3 pond and that was a large expensive project. In 1988 local fishermen had a successful season in the Youngs Bay fishery. There were plenty of fish and the price was favorable. These statistics reflect a value to the Fisheries Project, because in 1981 the fishermen initiated a voluntary poundage assessment program where they contribute 5% of their poundage value from fish harvested in Youngs Bay to the Project (Figure 6). This assessment is then matched by the processors that buy the fish, so in actuality if all fishermen participated, 10% of the total Youngs Bay fishery value would be forwarded to the Fisheries Project. The Youngs Bay assessment contributions shown in Figure 7 can be correlated to the Youngs Bay catch value (Figure 8), and as can be seen, the contributions approach the 10% level of the total catch value. In early years of the assessment program this does not hold true because the percentage of fishermen participating was less than the nearly 100% since 1985.

In-kind contributions are difficult to put a value on but most were based on the value that the contributor determined. Freezer and office space values were determined by using local rental rates. 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. In 1988 no value was placed on various contributions except for the cash because of the inconsistencies. For example, ODFW assistance has been undervalued because such aspects as fish hauling, provision of salmon eggs, various consultations, fish health examinations, and numerous other means of assistance are difficult to include. It needs to be mentioned that local ODFW personnel provide assistance to the Fisheries Project whenever feasible, whereas private hatcheries must foot the bill for such activities.

Natural Outmigration of Smolts

At the three earthen rearing ponds, CEDC utilizes the volitional smolt release strategy where the retaining screens are removed and pond levels maintained at or near full capacity allowing outmigration to occur when such activity is naturally triggered. In the net-pen confinements, however, this release strategy is not possible and fish are released by simple dumping from the net enclosure.

With the two coho rearing ponds on Tucker Creek in such close proximity to each other, CEDC utilized the opportunity to evaluate and compare size at release from the two sites. Prior to 1984 coho were released at approximately 15 fish/pound. In 1984 the variable release

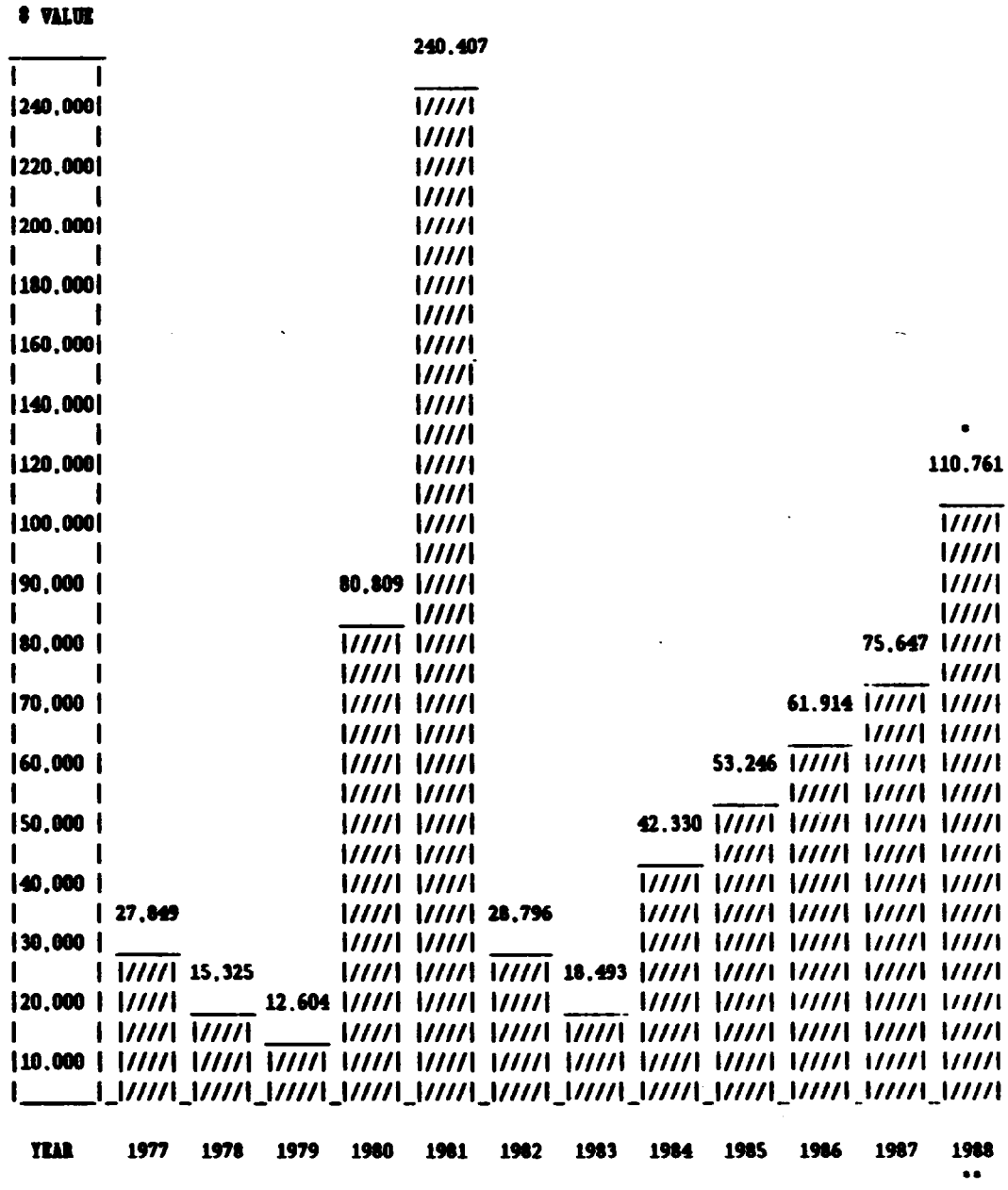


Figure 5. Annual Community Contributions to CEDC Fisheries Project

* All of 1988 poundage assessment receipts not submitted yet

** Value of cash contributions only beginning in 1988

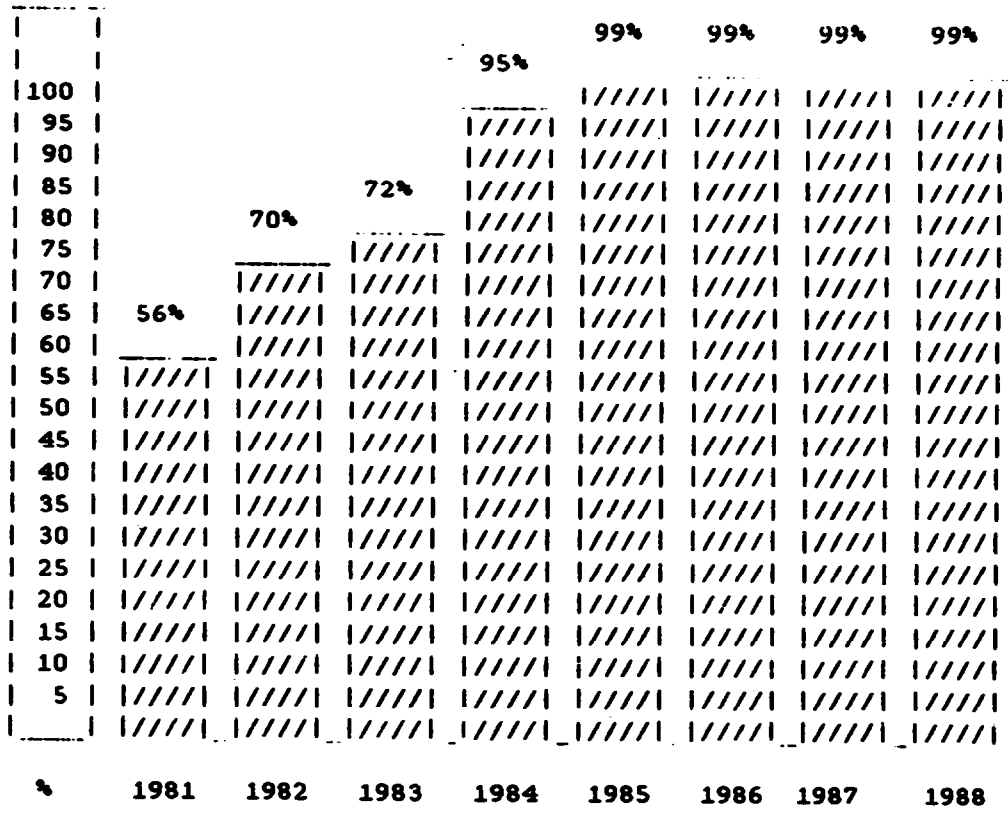


Figure 6. Youngs Bay Commercial Gillnet Voluntary Assessment Participation

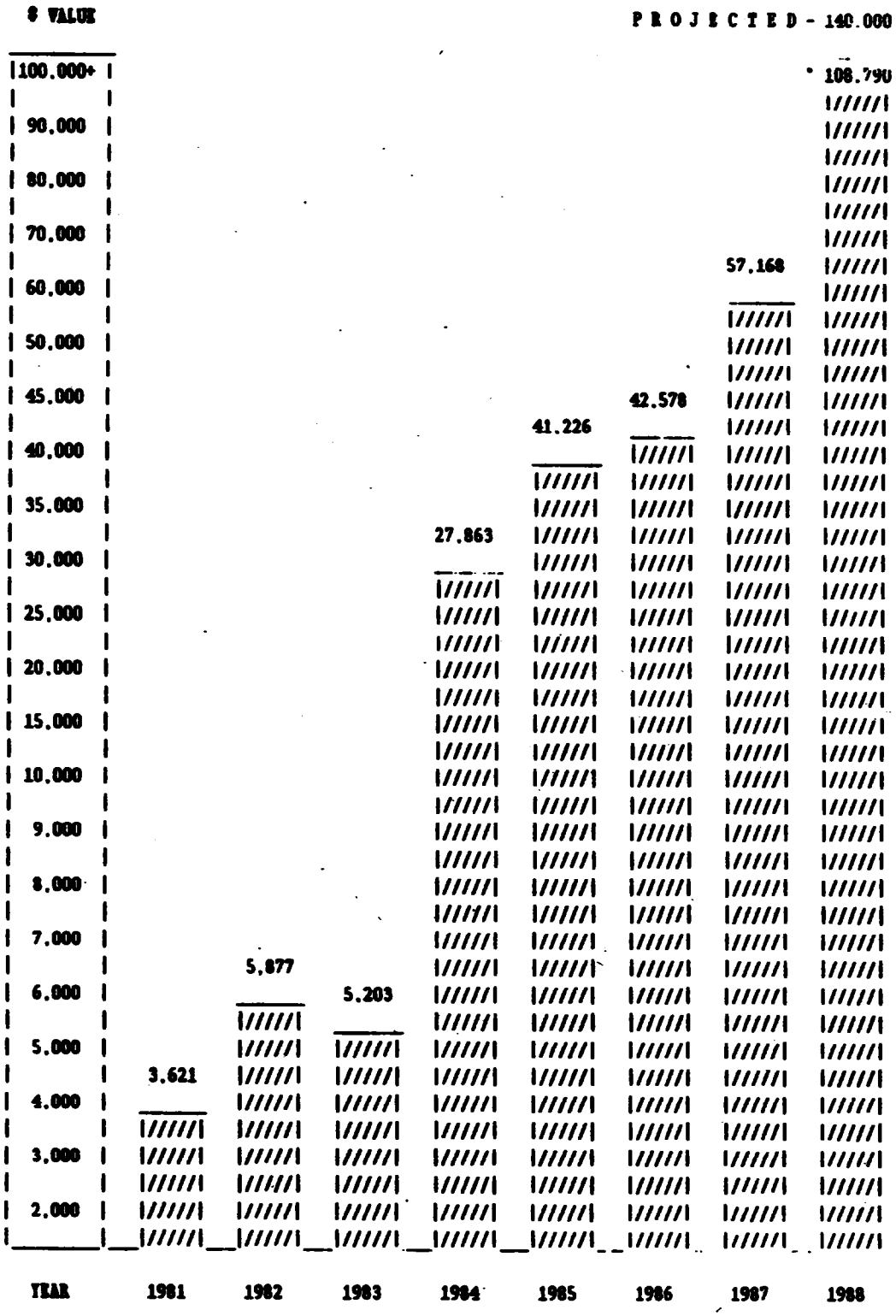


Figure 7. Youngs Bay Voluntary Poundage Assessment Contributions: 1981 - 1988

* All of 1988 assessment receipts have not been submitted yet

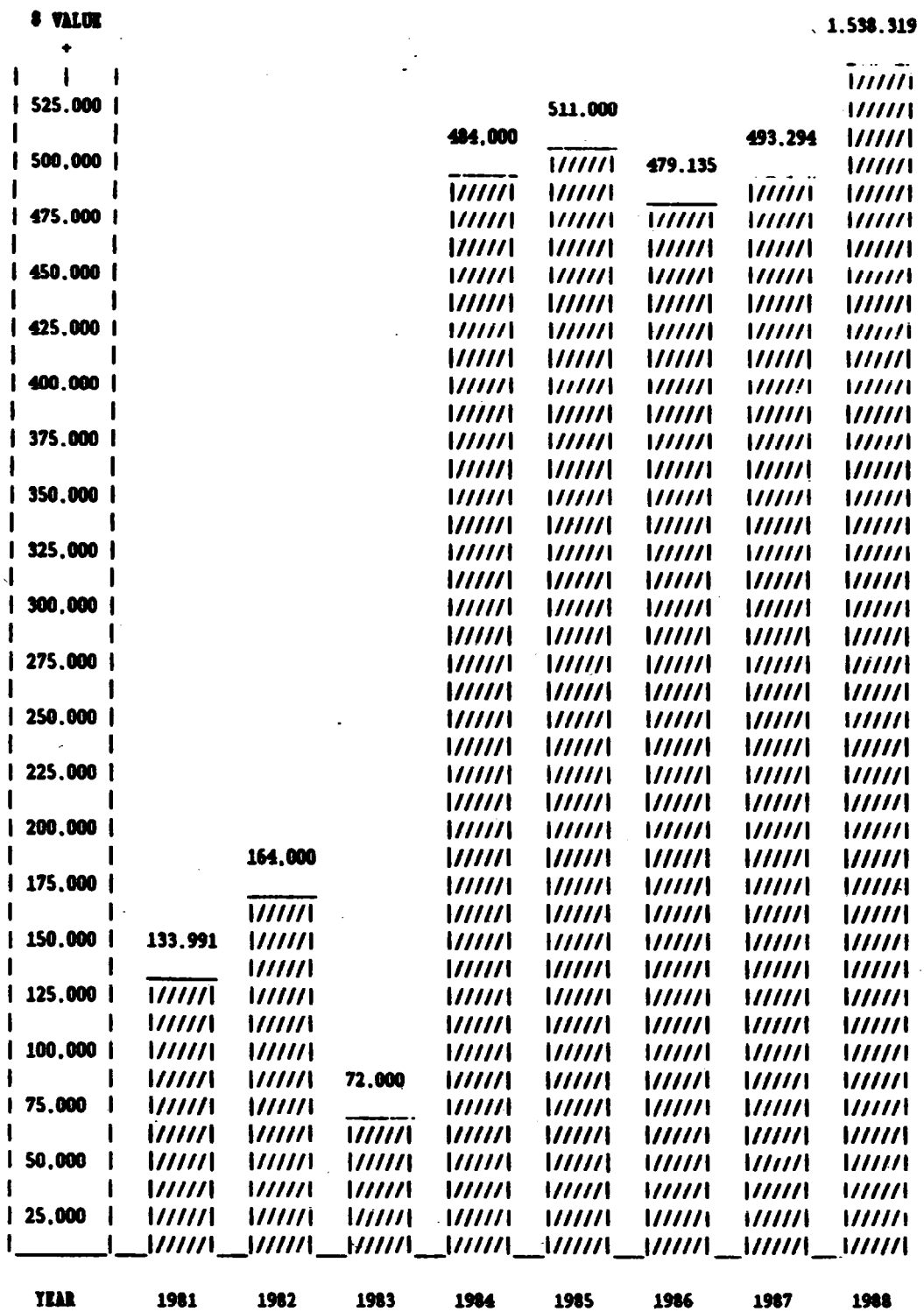


Figure 8. Youngs Bay Catch Value: 1981 - 1988

sizes were initiated, with pond #1 fish released at 9.5/pound and pond #2 fish at 16.3/pound. The outmigrant traps placed below each pond were monitored during daylight and dark, and during different stream flows with resultant data indicating that the smaller smolts (16.3/pound) migrated predominantly during darkness irrespective of flow. The larger smolts (9.5/pound) generally moved when flows increased, irrespective of daylight conditions. The comparative length frequency measurements indicate no differential migration with respect to fish size (Figure 9). The smolt size differentiation was repeated in 1985 with pond #1 released at 13.4 fish/pound and pond #2 at 16.3/pound. In 1986 the same smolt size was maintained at each pond. Each year 25,000 smolts from each of the two ponds were coded-wire tagged so survival comparisons could be analyzed. In Table 7 the 1982 brood released in 1984 and harvested in 1985, with the two coded-wire tag groups (code 7-31/41 and 7-31/42 from ponds #1 and #2 respectively) can be compared. The survivals with respect to smolt size are shown in Table 8. As might be expected, the results are demonstrating that the larger smolts survive better than the smaller smolts. The 1985 harvest shows that smolts released at 9.5 fish/pound survived by nearly ten times that of the smolts released at 16.3/pound. The 13.4 fish/pound smolts released in 1985 and harvested in 1986 fared better than the 16.3 fish/pound smolts by almost 5 1/2 times. However in 1986, with smolts released at equal sizes from the two ponds, pond #1 fish still survived by over two times that of pond #2. There is still a much larger margin than this between the larger and smaller smolts.

The seining activity after the coho releases 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. At this point the fish enter a tide gate and are then in the tidal influence of Youngs Bay. In 1986, after the retaining screens at the two rearing ponds were removed, seining activity began each day in front of the tide gate. On the same day as release, five hours after the screens were removed, no fish were collected at the seining site. On the second day, 29 hours after release, fish from both ponds were collected. The fish within this size range, 9.5 - 16.5 fish/pound, have apparently all smolted and are ready to migrate to the ocean. How long the fish remain in the tidal estuary before actually entering the ocean is not known. Seining activity for determination of migration duration was not able to be completed, however visual observation of cormorants feeding on the smolts within Tucker Creek slough lasted for about three weeks.

The volitional release is also used for fall chinook releases. The seining activity for recapture of migrating smolts occurred at a point four miles below the release site and 1/4 mile above the tidewater influence of Youngs Bay. The results of this activity are shown in Table 9. Prior to 1986 the migration time was six days and the flow was 8,000 gpm. In 1986 the two-day migration time was correlated to an increase in flow; 15,000 gpm. However, in 1987 with the stream flow back down to 8,000 gpm, the migration was also two days. The other factor shown in Table 9 is the smolt size. This table shows the effect flow and smolt size can have on smolt migration. Release time

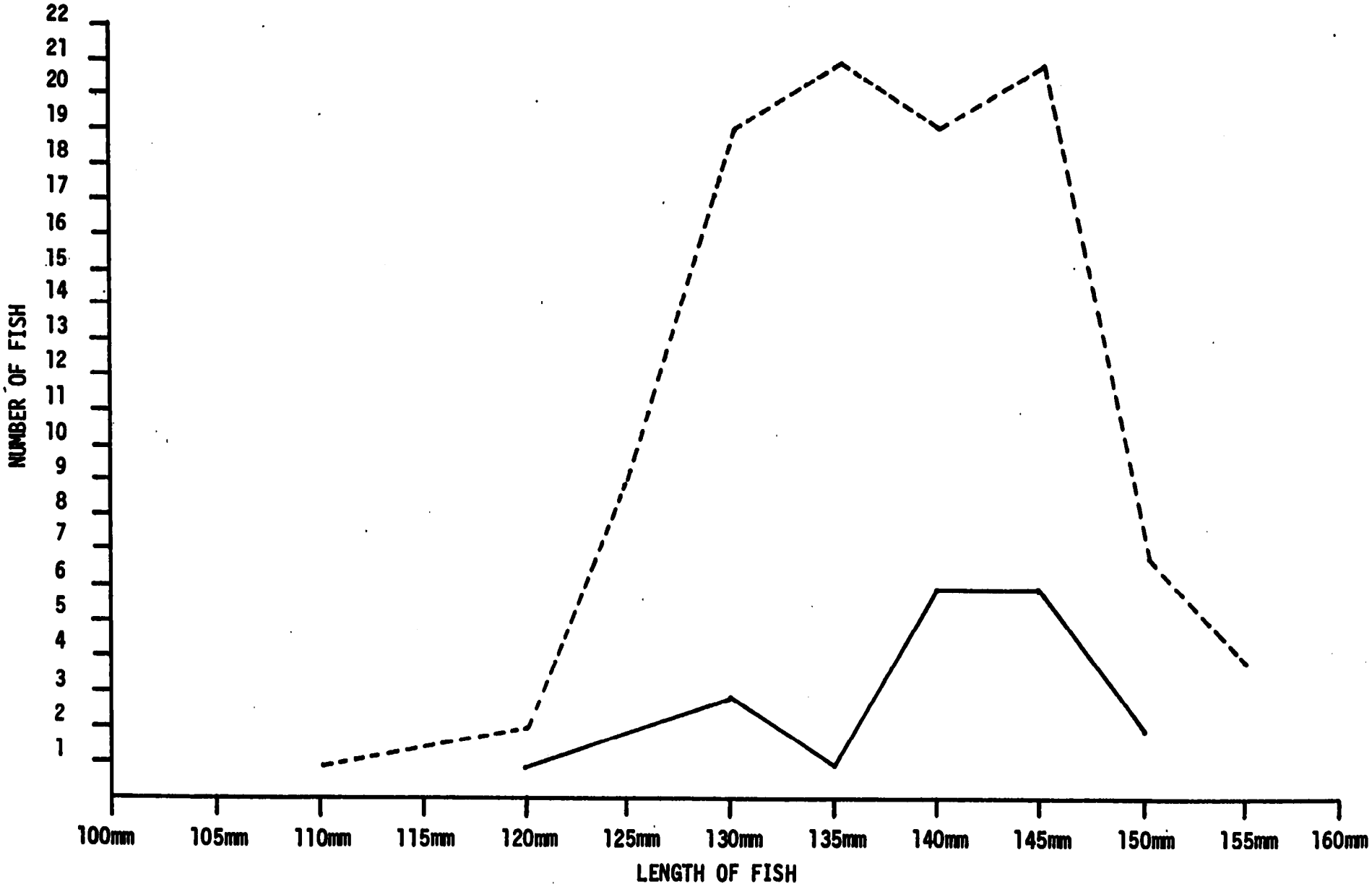


Figure 9. Comparative Length-Frequencies of Coho Sampled in Tucker Creek Pond Before Release (Dotted Line) and From Downstream Migrant Trap (Solid Line), April 1984

Table 7. Harvest and Survival Summary of CEDC Released Coho: 1980. 1981. and 1982 Broods

TAG CODE	[7-21/44]		[7-24/51]		[7-31/42]		[7-31/41]	
BROOD	80		81		82		82	
			NUMBER OF FISH					
YEAR OF CATCH	1982	1983	1983	1984	1984	1985	1984	1985
CATCH REGION								
BC NW Troll								
BC SW Troll				126		8		11
BC Net				71				4
Columbia River Test				8		47		
WA Sport				95		55		256
OR Troll		1,663		24		94		217
OR Sport	11	974		924		211		515
Youngs Bay Gillnet	174	655		3,002		491	189	2,627
Columbia River Gillnet			39	2,007		149	11	511
OR Buoy 10 - Sport				972		39		123
CA Troll		291		766				28
CA Sport		129		355				18
Hatchery Returns				118	8		68	
TOTAL	185	3,712	39	8,468	8	1,094	268	4,310
BROOD SURVIVAL PERCENTAGE	.06	1.25	.02	3.91	.004	.53	.29	4.6
BROOD SURVIVAL BY ALL AGE CLASSES -	1.3		3.9		.5		4.9	

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 #1	9.5 f/lb	1985	4.9
	Pond #2	16.3 f/lb		.5
1985	Pond #1	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		.6
* 1987	Pond #1	10.3 f/lb	1988	
	Pond #2	10.3 f/lb		

* No CWT

Table 9. Migration Rate of Fall Chinook Smolts Released from CEDC's South Fork Pond to the Tidal Influence of Youngs Bay (4.5 miles), 1984 - 1988

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
1988	60.6	12,000	1

since 1984 has been mid-May for the fall chinook (Table 11). Comparative length frequencies of smolts sampled in the South Fork pond before release, and from the seine sample, show that all fish migrate at the same rate (Figure 10).

In 1986 a release strategy 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. Coded-wire tag recoveries begin to provide cursory results of the comparative release strategies (Table 12). Recoveries from the 1988 releases are expected in the 1989 fisheries and are not included in the table. Until all age classes have been recovered the results cannot be analyzed, but interesting data from the first couple years of recovery should be noted. The 1986 releases show that the trucked release was harvested at about the same level as the volitional pond release. However, the trucked release was 113 fish/pound, whereas the pond releases were 77 fish/pound. The substantially smaller fish did as well as the larger fish, and it may be attributed to the trucking for the purpose of avoiding predation. Of the 49 fish harvest only three were jacks and the rest were three-year olds. The 1987 release had nearly twice as many fish tagged in each group and may reflect the additional jack recoveries, but there were no recoveries from the trucked release. Subsequent recoveries and the inclusion of the 1988 release and recapture data may provide valuable information in regard to the comparative release strategies. Even though trucking is stressful on fish and is costly, benefits may outweigh the expenses and provide a release option to be considered at this and other Columbia basin facilities.

Cumulative Production of Quality Salmon

The CEDC Fisheries Project has been releasing coho and chinook salmon in the Youngs Bay drainage since 1977. Total production the first year was 50,000 coho smolts. Present production levels include coho and chinook, with numbers in excess of 3 million smolts released annually. Since 1977 total production from CEDC's program has exceeded 30 million coho, chinook, and chum salmon smolts (Tables 10 & 11).

Production levels of the CEDC project are at or near capacity. For substantial production increases to be realized, additional rearing space must be utilized. CEDC personnel began 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 nearly 42,000 fall chinook was reared and released at the site. Observations of this first group showed an accelerated growth rate over the South Fork pond fish and exhibited little stress due to the fluctuating salinity levels (Figure 11). A small level of the disease vibrio anguillarum occurred and the fish were treated with terramycin (TM-50) in the food to help curb disease mortality. Fish were released at a healthy 45.4 fish/pound. At release the rearing density was 0.65 pounds of fish per cubic foot of water (lbs/ft^3) and it has been suggested that .75 to 1.0 lbs/ft^3 be maintained as a reasonably safe level (Conrad Mahnken, National Marine Fisheries

Table 10. Summary of 1977 - 1984 Releases from CEDC Fisheries Project Facilities

Date	Tag Code	Release Site	Species	Release Numbers Total	# Tagged	% Tagged
11/22/77	---	#1	coho	50.000	---	---
5/3/78	---	#1	CHF	800.000	---	---
11/7/78	---	#1	CHF	50.000	---	---
5/30/79	---	#1 & #2	CHF	1.400.000	---	---
4/11/80	7-21/55	#1	coho	203.000	45.000	22
5/19/80	---	#1 & #2	CHF	2.016.000	---	---
7/10/80	7-22/08	#2	coho	93.734	29.612	32
4/9/81	---	#1	chum	520.000	---	---
5/15/81	7-21/58	#3	CHF	1.800.915	73.242	4
5/22/81	7-21/59	#1 & #2	CHF	1.357.693	48.898	4
4/1/82	7-21/44	#1 & #2	coho	298.000	52.985	18
5/28/82	7-24/12	#3	CHF	1.918.862	79.695	4
5/28/82	7-24/13	#3	CHF	822.366	33.857	4
4/5/83	---	#1	coho	98.278	---	---
4/5/83	7-24/51	#2	coho	216.490	27.404	13
5/15/83	7-28/35	#3	CHF	2.480.354	105.139	4
8/4/83	7-28/57	#3	RCHF	32.095	28.758	90
8/4/83	7-28/58	#3	RCHF	18.053	16.176	90
4/13/84	7-31/41	#1	coho	93.431	26.631	29
4/13/84	7-31/42	#2	coho	207.943	26.609	13
5/15/84	7-31/43	#3	CHF	2.867.097	106.911	4
6/22/84	---	Youngs Bay	chum	10.000	---	---
8/24/84	LV clip	#3	RCHF	12.638	---	---

CHF - fall chinook

RCHF - Rogue stock fall chinook

Table 11. Summary of 1985 - 1988 Releases from CEDC Fisheries Project Facilities

Date	Tag Code	Release Site	Species	Release Numbers Total	# Tagged	% Tagged
4/1-30/85	7-33/44	#1	coho	98.543	25.574	26
4/1-6/85	7-33/43	#2	coho	203,683	24.690	12
5/20-6/1/85	7-33/45	#3	CHF	2.994.772	101.415	3
5/6/85	---	#2	chum	953.420	---	---
8/1-2/85	7-32/34	#3	RCHF	17.324	10.568	61
"	7-32/35	"	"	16.449	10.034	"
"	7-32/36	"	"	16.808	10.254	"
"	7-32/37	"	"	14.858	9.064	"
"	7-32/38	"	"	16.418	10.016	"
"	LV clip	"	"	31.057	---	---
4/1-15/86	7-38/50	#1	coho	47.338	9.304	20
"	7-38/51	"	"	46.913	9.220	"
"	7-38/52	"	"	46.400	9.119	"
"	7-38/47	#2	"	86.550	10.845	12
"	7-38/48	"	"	77.725	9.744	"
"	7-38/49	"	"	84.450	10.593	"
"	7-38/43	"	"	4.779	4,779	100
"	7-38/44	"	"	5,012	5,012	"
"	7-38/45	"	"	4.610	4.610	"
5/5-30/86	7-29/32	#3	CHF	904.445	24.479	2
"	7-29/33	"	"	990.374	24.574	"
"	7-29/34	"	"	1.008.315	25.052	"
5/12/86	7-29/35	#3	"	26.442	24.938	94
7/20/86	7-29/36	#3	RCHF	208.705	24.955	12
"	7-38/46	"	"	42.735	5.114	12
4/1-12/87	---	#1	coho	80.448	---	---
4/1-12/87	---	#2	coho	219.076	---	---
5/19/87	7-42/51	#3	CHF	49.738	46.724	94
5/20/87	7-42/48	#3	CHF	1.249.820	47.382	4
5/20/87	7-42/53	IB Net Pen	CHF	42.903	41.869	98
7/13/87	7-42/46	#3	RCHF	20.000	2.760	14
4/4/88	---	SF Circulars	coho	65.000	---	---
4/4/88	7-45/51	#1	coho	138.981	25.223	18
5/16/88	7-40/06	#3	CHF	2.774.357	44.529	2
5/19/88	7-40/07	IB Net Pen	CHF	253.053	47.255	19
5/19/88	7-40/08	Youngs Bay	CHF	52.040	47.876	92
8/2-5/88	7-42/45	#3	RCHF	79.770	26.481	33

CHF = fall chinook

RCHF = Rogue stock fall chinook

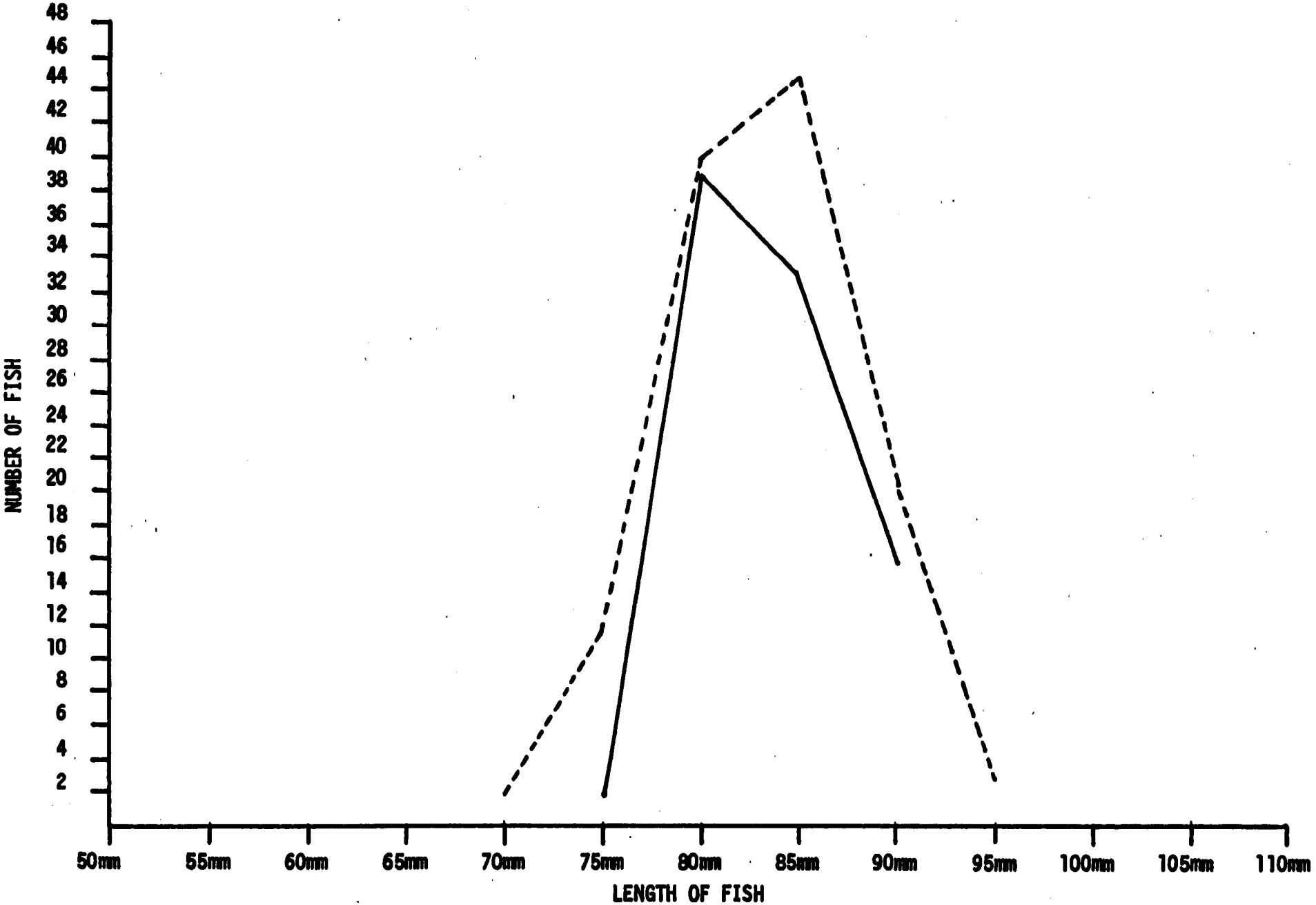
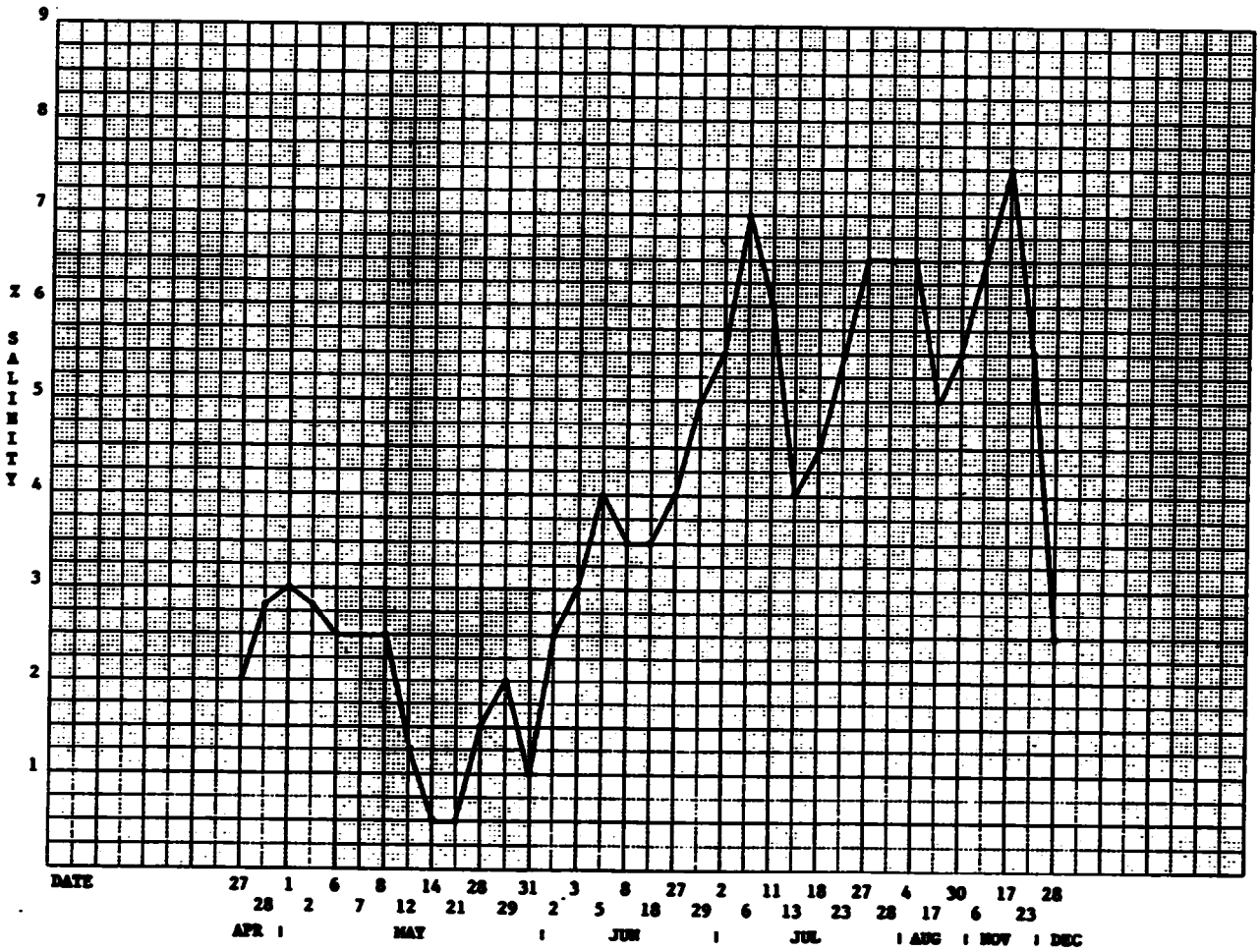


Figure 10. Comparative Length-Frequencies of Fall Chinook Sampled in SF Klaskanine Pond Before Release (Dotted Line) and From Seine Sample 4 Miles Downstream of Release (Solid Line), May 1984

Table 12. Coded-wire tag recoveries of CEDC's 1986 and 1987 fall chinook releases, comparing three release strategies; trucked release, volitional release, and net-pen release.

RELEASE DATE	BROOD	RELEASE STRATEGY	# TAGGED	CODED-WIRE TAG RECOVERIES (EXPANDED)	
5/12/86	'85	Trucked release to Youngs Bay at 113/lb	24,938	[1988]	14 - Washington Troll
					8 - British Columbia Troll
					22 Total
5/5-30/86	'85	SF Klaskanine Volitional at 77/lb	24,479	[1987]	3 - British Columbia Net
				[1988]	8 - Columbia River Net
					4 - Oregon Sport
					3 - Washington Sport
					2 - Washington Troll
					4 - British Columbia Troll
					24 Total
5/5-30/86	'85	SF Klaskanine Volitional at 77/lb	24,574		No Recoveries
5/5-30/86	'85	SF Klaskanine Volitional at 77/lb	25,052	[1988]	9 - Columbia River Net
					3 - Puget Sound Sport
					2 - Washington Troll
					4 - British Columbia Troll
					18 Total
5/20/87	'86	SF Klaskanine Volitional at 57.5/lb	47,382	[1988]	4 - Oregon Sport
5/19/87	'86	Trucked release to Youngs Bay at 57.5/lb	46,724		No Recoveries
5/20/87	'86	Youngs Bay net-pen reared and released at 45.4/lb	41,869	[1988]	3 - Columbia River Net
					4 - Oregon Sport
					7 Total

Figure 11. Salinity Levels at Youngs Bay Net-Pen Site, April - December, 1987



Service, personal communication, 1987). For fall chinook at 100 fish/pound, a rearing density of 0.25 to 0.4 lbs/ft^3 has been suggested (Senn, et al. 1984). In 1988 CEDC's net-pen fall chinook were reared at .75 lbs/ft^3 with no visible stress. Prior to introduction to the estuarine rearing pens the 250,000 - 1987 brood chinook were vaccinated for protection against vibrio disease. During the rearing period a normal loss was experienced and no disease outbreak occurred. Salinity levels during the 1988 rearing period were not taken due to a malfunction in the salinity/conductivity/temperature (SCT) meter. Also, as in 1987, the pen-reared fish grew to a larger size than the pond #3 fish.

Approximately 150,000 coho were put in the net-pen confinements in 1988 and are scheduled for a 1989 release. At release, rearing density is anticipated to be about .75 lbs/ft^3.

In efforts to improve the quality of salmon harvested in Youngs Bay, CEDC continues releases of Rogue River fall chinook in the Youngs Bay drainage. Since 1983 a cooperative effort by ODFW and CEDC to evaluate the introduction of the Rogue River stock chinook has been occurring. Releases have ranged from 12,000 to 250,000 (Table 10 & 11). As anticipated, the value of the Rogue stock at harvest surpasses that of the tule stock. The price paid to fishermen for the tule stock fluctuates around $0.50/pound, whereas the Rogue stock value exceeds $1.50/pound and has reached $2.50/pound. Because of the added value and the survival rate (Table 13) as compared to the tule survival rate (Table 14), CEDC hopes to continually increase the production levels of the Rogue River stock fall chinook.

The failure of the tule fall chinook program to perform as well as the Rogue chinook or coho (Table 15) reflects CEDC's desire to discontinue the tule fall chinook program in favor of production increases of coho and/or Rogue fall chinook. In 1989 production of coho is expected to be approximately 800,000 smolts; 500,000 more than the annual production in previous years. This will replace the tule chinook production, and rearing will take place in the South Fork pond #3. Coupled with the release of larger sized smolts (10 fish/pound release size) this production increase will provide for substantial economic benefits during subsequent harvest opportunities.

To fulfill the production goals three field biologists, an administrator, and a secretary/administrative assistant are employed. Starting in 1985 Project personnel started completing a monthly time sheet (Figure 12) with 27 categories reflecting the various activities. These time sheets were combined to provide an annual time summary with total hours and percentage of total time spent in each activity (Tables 17, 19, 21, & 23). The activities were combined into five generalized categories, and the relationship of each of these categories to the overall project is shown in Tables 16, 18, 20, & 22. Category 'A' represents the travel time; category 'B' represents the actual field activity; category 'C' is the time involved with assisting at other facilities and small-scale contract obligations; category 'D' represents the secretarial, administrative, and public relation aspects; category 'E' represents stand-by time. Stand-by is

Table 13. Harvest and Survival Summary of CEDC/ODFW Released Rogue Stock Chinook: 1982 - 1985 Broods

BROOD YEAR	1982		1983 *		1984		1985	
	NUMBER OF FISH							
YEAR OF CATCH	1985	1986	1986	1987	1987	** 1988	** 1988	1989
SE Alaska Troll					3			
BC N Troll		8						
BC S Troll	33	47			23	59		
BC Net	2				8			
BC Sport					5			
WA Troll	20				28	114		
WA Sport	95				192	160		
OR Troll	1,330	283			1,796	917	743	
OR Sport	153	12			64	25	33	
YOUNGS BAY Gillnet	838	233			311	606	363	
Columbia River Gillnet		149			229	275	162	
OR Buoy 10 - Sport	22	25			54	53	33	
CA Troll	135	159			395	354	33	
CA Sport	51	7			18	10	25	
Hatchery Returns	50	23			1	46	**	
Stream Surveys						12	**	
TOTAL	2,729	946			3,127	2,631	1,392	
BROOD SURVIVAL PERCENTAGE	5.44	1.89	*	*	3.82	3.21	.55	
BROOD SURVIVAL BY ALL AGE CLASSES -	7.33				7.03			

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

** Preliminary (Final data not yet available)

Table 14. Harvest and Survival Summary of CEDC Released Tule Chinook: 1980 - 1985 Broods

BROOD YEAR	1980		1981		1982		1983		1984		1985	
	NUMBER OF FISH											
YEAR OF CATCH	1983	1984	1984	1985	1985	1986	1986	1987	1987	1988 *	1988 *	1989
Alaska Net									29			
Alaska Troll										29		
BC N Troll				240		100			265			
BC S Troll				288	258	225	642		10765	4.010	329	
BC Net					47				559			
BC Sport									206	264		
WA Troll					165		428		3.391	1.415	174	
WA Sport					94				2.181	382	240	
Puget Sound Net									59	117		
OR Troll	80	53	72				54		1.976	766		
OR Sport									117			
YOUNGS BAY Gillnet	734	604	216	289	282	189	214		3.482	4.650	523	
Columbia River Gillnet	293	187				540	483		2.712	4.170	160	
OR Buoy 10 - Sport									324		160	
CA Troll												
CA Sport					94							
Hatchery Returns			48			1	80	54	411	324	40	
Stream Surveys										206		
TOTAL	1.107	844	336	817	940	1.055	1.901	54	26477	16333	1.626	
BROOD SURVIVAL PERCENTAGE	.05	.03	.01	.03	.03	.04	.07	.002	.88	.55	.05	
BROOD SURVIVAL BY ALL AGE CLASSES -	.06		.04		.08		.07		1.43			

* Preliminary

Table 15. Harvest and Survival Summary of CEDC Released Coho Adults: 1980 - 1985 Broods

BROOD YEAR	1980	1981	1982	1983	1984	1985 **
			NUMBER OF FISH			
YEAR OF CATCH	1983 *	1984	1985	1986	1987	1988
BC N Troll						
BC S Troll		126	75	205	151	
BC Net		71	13			
WA Troll			46	70	71	
WA Sport		95	444	440	245	
OR Troll	1663	24	294	967	1.004	
OR Sport	974	924	711	679	686	
YOUNGS BAY Gillnet	655	3.002	3.118	2.181	745	
Columbia River Gillnet		2.015	524	2.716	855	
OR Buoy 10 - Sport		972	73	259	79	
CA Troll	291	766	28	231	46	
CA Sport	129	355	20	40	72	
Hatchery Returns		118	7	349	5	
TOTAL	3.712	8.468	5.353	8.137	3.959	
BROOD SURVIVAL PERCENTAGE		2.69	1.78	2.69	.98	
BROOD SURVIVAL BY ALL AGE CLASSES -		2.69	1.78	2.69	.98	

* Complete information unavailable

** No coho tagged this year

Figure 12. Fisheries Project Time Sheet

FOR MONTH OF _____ 19 __
EMPLOYEE _____

CEDC FISHERIES PROJECT
MONTHLY TIME/TRAVEL RECORD

AS OF _____
VAC _____ COMP _____ SICK _____

PERSONAL DAY _____

JOB #	DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
01	TRAVEL																																
02	POND MAINTENANCE																																
03	GR/BLDG MAINTENANCE																																
04	FEEDING																																
05	FEED PREPARATION																																
06	DATA COLLECTION																																
07	EARLY REARING																																
08	CONTRACT OBLIGATIONS																																
08A	Stream Surveys																																
08B	Sampling																																
08C	Coded-Wire Tagging																																
08D	Hatchery Assist.																																
09	CONSTRUCTION																																
10	WATER CONTROL																																
11	RESEARCH/DEVELOPMENT																																
12	PUBLIC RELATIONS																																
13	CONFERENCES/MEETINGS																																
14	ADMINISTRATIVE																																
15	REPORTS																																
16	CLERICAL																																
17	BOOKKEEPING																																
18	IN-KIND SERVICES																																
19	*** STAND-BY ***																																
20	VACATION																																
21	COMP TIME																																
22	SICK LEAVE																																
23	HOLIDAY																																
	TOTAL																																

APPROVED BY: Supervisor

Employee Signature

Table 16. CEDC Fisheries Project Personnel Labor Breakdown, 1985

Category	[A]	[B]	[C]	[D]	[E]
	Travel	Pond Maintenance Gr/Bldg. Maintenance Feeding Food 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	869.50	3,570.50	902.50	3,068.50	29.75
% OF TOTAL	10.30%	42.30%	10.70%	36.35%	.35%

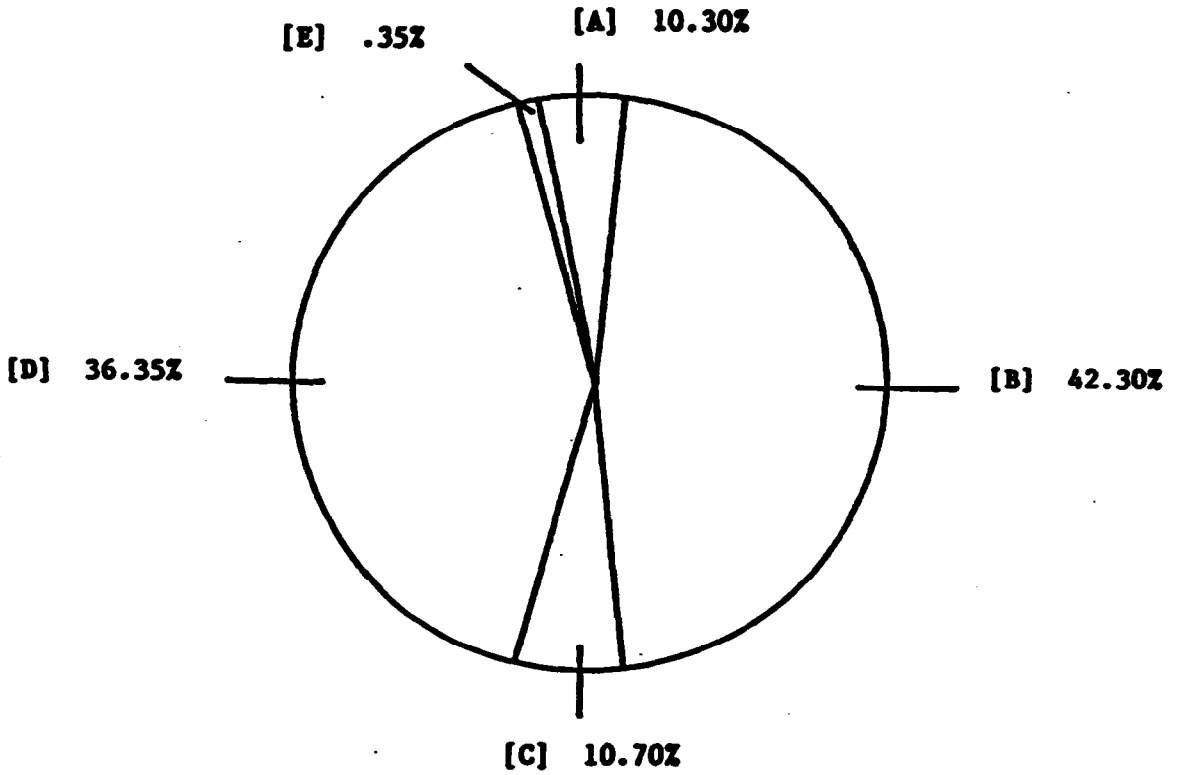


Table 17. Project Annual Time Summary, 1985

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 18. CEDC Fisheries Project Personnel Labor Breakdown, 1986

Category	[A]	[B]	[C]	[D]	[E]
	Travel	Pond Maintenance Gr/Bldg. Maintenance Feeding Food 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	951.50	3,528.00	626.50	2,874.75	264.83
% OF TOTAL	11.54%	42.79%	7.6%	34.86%	3.21%

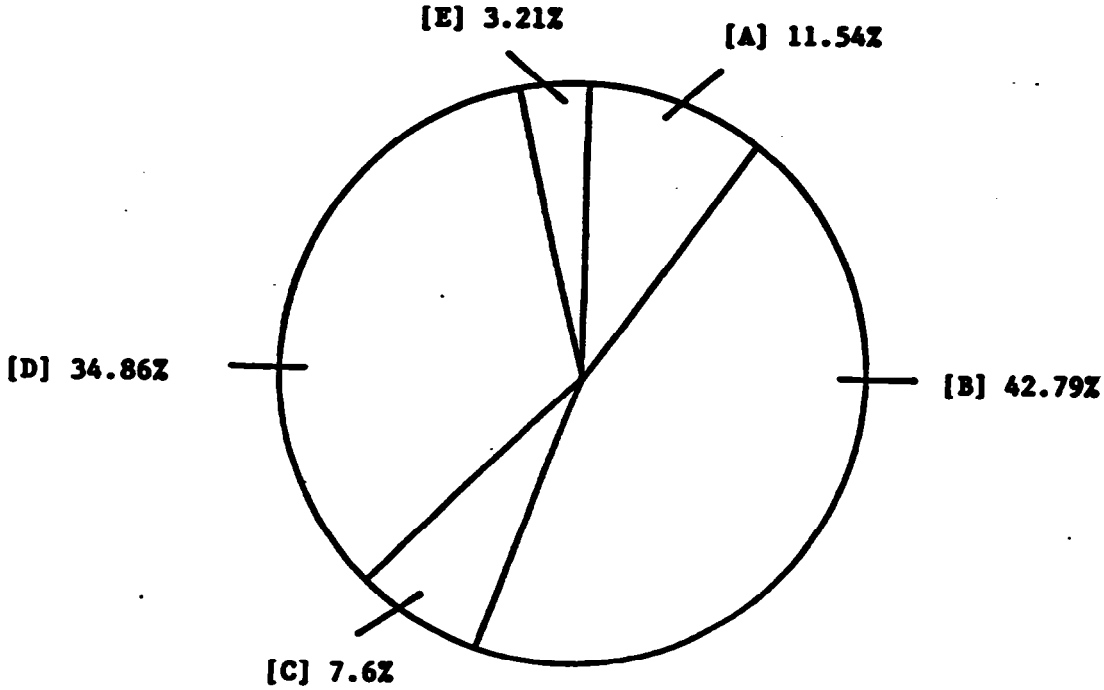


Table 19. Project Annual Time Summary, 1986

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%
Food 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 20. CEDC Fisheries Project Personnel Labor Breakdown, 1987

Category	[A]	[B]	[C]	[D]	[E]
	Travel	Pond Maintenance Gr/Bldg. Maintenance Feeding Food 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	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%

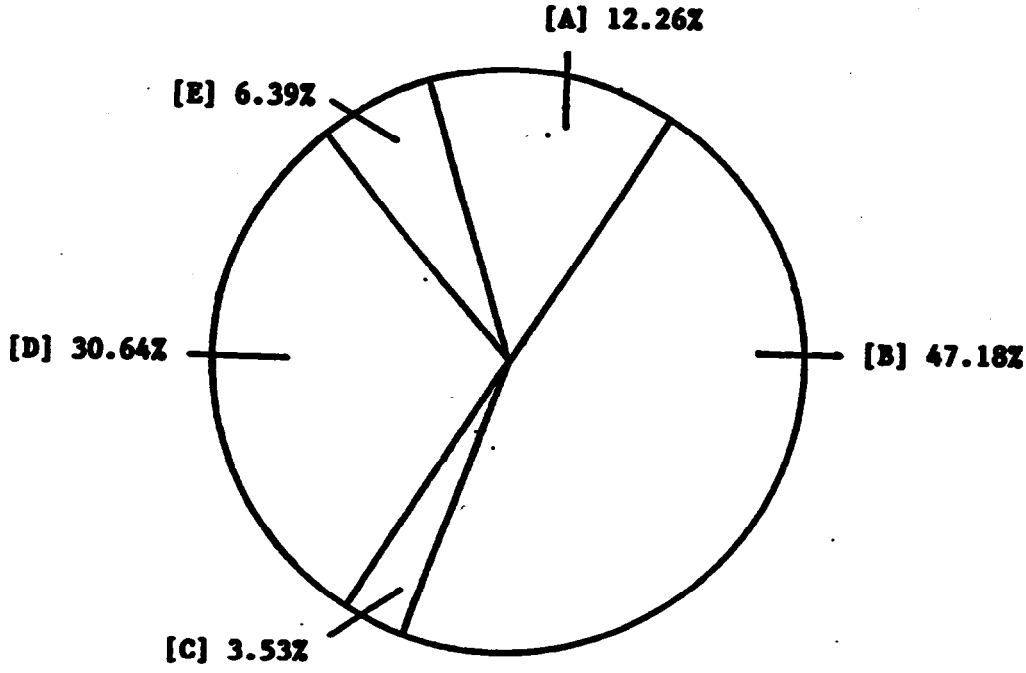


Table 21. Project Annual Time Summary, 1987

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%
Food 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%

Table 22. CRBC Fisheries Project Personnel Labor Breakdown, 1988

Category	[A]	[B]	[C]	[D]	[E]
	Travel	Pond Maintenance Gr/Bldg. Maintenance Feeding Feed Preparation Data Collection Early Rearing Construction Water Control Net Pens	Contract Obligation Stream Surveys Sampling Coded-Wire Tag Hatchery Assist.	Pub. Relations Conf./Meetings Administrative Reports Clerical Bookkeeping	Stand-by
TOTAL HOURS	981.25	3,965.00	277.00	2,807.50	240.50
% OF TOTAL	11.86%	47.94%	3.35%	33.94%	2.91%

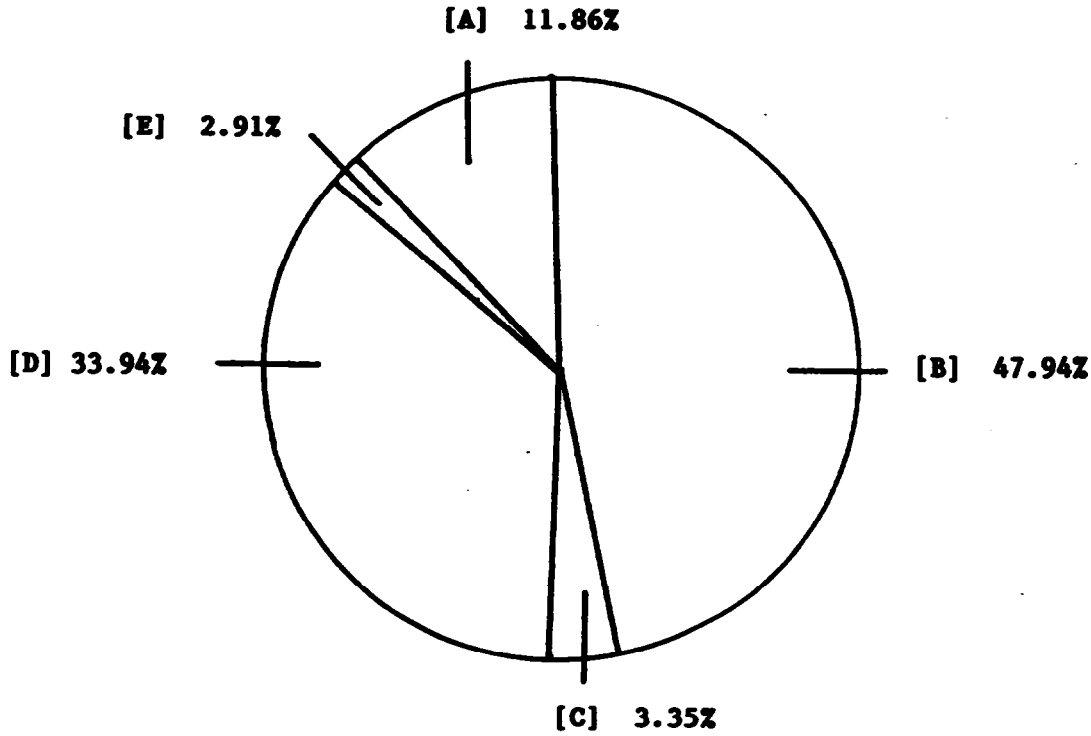


Table 23. Project Annual Time Summary, 1988

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	248.50	11.42%	236.00	11.84%	244.75	12.53%	252.00	12.22%	981.25	11.99%
Pond Maintenance	77.50	3.56%	96.00	4.81%	78.25	4.01%	66.50	3.23%	318.25	3.89%
Ground/Bldg. Maintenance	175.50	8.07%	180.50	9.05%	137.25	7.03%	127.00	6.16%	620.25	7.58%
Feeding	212.50	9.77%	280.50	14.07%	83.25	4.26%	81.00	3.93%	657.25	8.03%
Food Preparation	22.50	1.03%	63.00	3.16%	23.50	1.20%	7.50	.36%	116.50	1.42%
Data Collection	35.00	1.61%	36.50	1.83%	19.00	.97%	19.50	.95%	110.00	1.34%
Early Rearing	228.50	10.50%	109.50	5.49%	92.00	4.71%	472.50	22.92%	902.50	11.03%
Contract Obligations	45.50	2.09%	111.00	5.57%	80.50	4.12%	25.50	1.24%	262.50	3.21%
Stream Surveys	0.00	0.00%	0.00	0.00%	91.00	4.66%	18.50	.90%	109.50	1.34%
Sampling	0.00	0.00%	0.00	0.00%	28.00	1.43%	4.00	.19%	32.00	.39%
Coded-Wire Tagging	76.50	3.52%	50.00	2.51%	0.00	0.00%	0.00	0.00%	126.50	1.55%
Hatchery Assistance	2.50	.11%	2.00	.10%	1.50	.08%	3.00	.15%	9.00	.11%
Construction	232.00	10.66%	138.50	6.95%	390.25	19.98%	99.00	4.80%	859.75	10.50%
Water Control	37.50	1.72%	8.50	.43%	32.50	1.66%	39.50	1.92%	118.00	1.44%
Research/Development	1.00	.05%	3.50	.18%	47.75	2.44%	19.50	.95%	71.75	.88%
Public Relations	44.50	2.05%	39.00	1.96%	80.50	4.12%	36.00	1.75%	200.00	2.44%
Conferences/Meetings	76.50	3.52%	65.50	3.28%	44.00	2.25%	162.00	7.86%	348.00	4.25%
Administrative	175.00	8.04%	122.00	6.12%	118.00	6.04%	212.00	10.28%	627.00	7.66%
Reports	77.50	3.56%	10.50	.53%	13.00	.67%	31.00	1.50%	132.00	1.61%
Clerical	303.50	13.95%	267.00	13.39%	259.50	13.29%	263.50	12.78%	1,093.50	13.36%
Bookkeeping	92.50	4.25%	129.00	6.47%	82.50	4.22%	103.00	5.00%	407.00	4.97%
In-Kind Services	11.50	.53%	45.50	2.28%	6.00	.31%	19.00	.92%	82.00	1.00%
TOTAL	2,176.00	100.00%	1,994.00	100.00%	1,953.00	100.00%	2,061.50	100.00%	8,184.50	100.00%
STAND-BY	33.50	1.54%	2.00	.10%	46.00	2.36%	159.00	7.71%	240.50	2.94%

the time that Project personnel spend on activities after normal work hours. These activities are usually during the night and entail actions that are responsive to adverse weather conditions, including water control and intake cleaning. Project personnel must be ready to respond at any time after normal work hours.

Comparisons of the labor breakdown percentages reflect only minor changes from year to year, with the field activities (category B) and the administrative and public relation aspects (category D) comprising the largest share of time. As might be expected with three of the five employees as field personnel, the largest portion of time is spent in this category. Each year approximately 40% of personnel time is devoted to the physical and biological aspects of production. The other major portion comprises the various administrative activities, and with only two people responsible for these duties, approximately 30% of the total is reflected.

The next largest category is travel and basically shows the time traveling to, from, and between rearing sites. The CEDC Fisheries Project office is in Astoria and the rearing sites are approximately 20 miles out of town. The Project vehicle is kept at the office and the daily work schedule begins at that point. Some travel time to and from meetings, conferences, etc. is included, but is minimal as compared to the daily travel. Each day a field employee works, approximately one hour of travel time is documented.

Development of Optimum Density Levels

The carrying capacities of rearing ponds depend to a large extent on conditions existing at various hatcheries. Capacities must be established at individual hatcheries to be of benefit in planning the program of each rearing site. Some of the influencing factors are: (1) species of fish, (2) size of fish, (3) water temperature, (4) water quality, (5) water volume, (6) rate of flow, (7) rate of change, (8) re-use of water, and (9) disease history. Production capacities of CEDC's rearing ponds with respect to some of these influencing factors are shown in Tables 24, 25, 26, and 27 for the years 1985, '86, '87, and '88 respectively.

Prior to 1985 the production from the coho rearing ponds was approximately 100,000 smolts and 200,000 smolts in pond #1 and pond #2 respectively. In 1986 pond loading was increased in each pond; 140,000 fish in pond #1 and 263,000 in pond #2. This poundage increase caused some problems in pond #1 where approximately 20,000 smolts were lost. The poundage increase in pond #2 had no detrimental effects. In 1987 and 1988 the production levels were reduced with no losses experienced. Based on information gained, the CEDC coho production will be maintained at 100,000 smolts and 250,000 smolts from pond #1 and pond #2 respectively. The numbers correlate to 10,000 pounds and 25,000 pounds at a smolt size of 10 fish/pound. As compared to rearing densities at traditional raceway-type facilities these densities are high with respect to water flow; however, when figured in terms of volume the densities are low. In large lake-type rearing confinements less flow is required and may be attributed to

Table 24. CEDC Fisheries Project Production Capacities, 1985

REARING SITE & SPECIES	Species and # fish	Rearing Time Period	Approx Size When Received Fish/lb	Approx Size When Released Fish/lb	Approx Pond Capacity Gal.	Ave. Pond Flows G.P.M.	Pond Water Turnover Rate Hours	Optional Flow Avail. G.P.M.	Minimum Flow Recorded G.P.M.	Fish Density When Received Fish/gal	Pond Loading When Received LB/GL/MN	Pond Loading When Released LB/GL/MN
Earthen Pond #1 Coho	100,000	12/1/84 to 4/1/85	24	10	1,000,000	600	27	0	150	.1	6.9	16.6
Earthen Pond #2 Coho	200,000	12/1/84 to 4/1/85	24	16	1,100,000	1,000	18	0	300	.18	8.3	12.5
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	NA	4	1.7	7.5
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	NA	2	.37	2.6
Earthen Pond #4 coho-VVT	17,936	6/1/85 to 12/31/85	122	14	60,000	250/300	4/3.3	0	NA	.3	.60	5.1

Table 25. 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-VVT												

Table 26. 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-VVI					60,000	250/300	4/3.3	0				

Table 27. CEDC Fisheries Project Production Capacities, 1988

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	139,000	12/17/87 to 4/8/88	19.5	9.2	1,000,000	600	27	0	.14	11.88	25.18	.02
Earthen Pond #2					1,100,000	1,000	18	0				
Earthen Pond #3 Tule chf	3,100,000	12/30/87 to 5/16/88	1,210	60.6	750,000	5,000	2.5	3,000	4.13	.51	10.23	.07
Concrete Raceway Inside Pond #3 Rogue chf	80,000	2/25/88 to 8/5/88	900	15.4	40,000	3,000	.25	3,000	2.0	.03	1.73	.13
Earthen Pond #4					60,000	250/300	4/3.3	0				

the large area of surface to air contact, hence maintaining adequate dissolved oxygen levels.

Fall chinook production has been maintained at about 3 million fish annually except in 1987. In 1987 production was reduced because of financial constraints. Maximum production from pond #3 has not been determined, but from the several years of rearing it appears that production could substantially be increased.

The early rearing concrete raceway is used for the initial ponding of fry directly from the incubators, and densities are quite low. Before densities get high the fish are moved to the larger rearing ponds for final rearing.

Augmentation of a Unique Known Stock Fishery

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 season is generally open from the middle of August through the first week of November. In 1988 the season opened on August 21 and closed on November 1.

In this terminal fishery the fish are predominantly of hatchery origin and escapement is generally adequate for hatchery production of coho. However, surplus eggs from hatcheries on the mainstem Columbia are available if escapement is not adequate because harvest opportunities of returning adults are restricted on the mainstem to protect endangered stocks. The fish returning to and harvested in Youngs Bay are not mixed with mainstem stocks, and hence are available for harvest. Coho are harvested in Youngs Bay at quite a high rate (Table 28) with ranges from 59 to 94 percent of the total run. The average harvest rate is 81 percent. The CEDC portion of the total run is depicted in Figure 13. Not only are the coho harvested in the Youngs Bay gillnet fishery but also along the coast from British Columbia to California (Table 15). The value of this fishery with respect to the individual species is shown in Table 29, and the combined value demonstrated in Figure 14.

The information gained from the harvest and survival summaries of CEDC releases reflects the desire of the Fisheries Project to reduce production of tule fall chinook and increase Rogue fall chinook and coho production. The low survival rate coupled with the minimal value of the tule fall chinook when harvested in Youngs Bay makes this an undesirable stock for continued releases in Youngs Bay. The Rogue River stock fall chinook survive at an outstanding rate and contribute heavily off the Oregon coast. Also, when harvested in Youngs Bay the value is nearly five times that of the tule chinook.

CEDC personnel are investigating options for production increases of coho and Rogue fall chinook. The net-pen concept has potential for substantial production increases, and CEDC has requested a permit from the Department of Environmental Quality to rear and release 500,000 pounds in the Youngs Bay estuary. This poundage would include coho and Rogue chinook.

Table 28. Minimum Run of Adult Coho Entering Youngs Bay and Maximum Percentage Harvested in the Youngs Bay Commercial Fishery, 1977-87 (ODFW Staff Report, 1988).

Year	Sport Catch	Hatchery Returns	Commercial Catch	Minimum Run	Maximum % Harvested in Commercial Fishery
1977	286	499	1,625	2,410	67
1978	361	1,942	3,353	5,656	59
1979	222	5,487	22,542	28,251	80
1980	110	1,127	12,526	13,763	91
1981	66	916	8,110	9,092	89
1982	122	1,771	12,258	14,151	87
1983	46	1,489	3,550	5,085	70
1984	348	4,465	40,620	45,433	89
1985	76	4,172	51,202	55,450	92
1986	100(est.)	19,809	55,579	75,488	74
1987	100(est.)	974	16,113	17,187	94

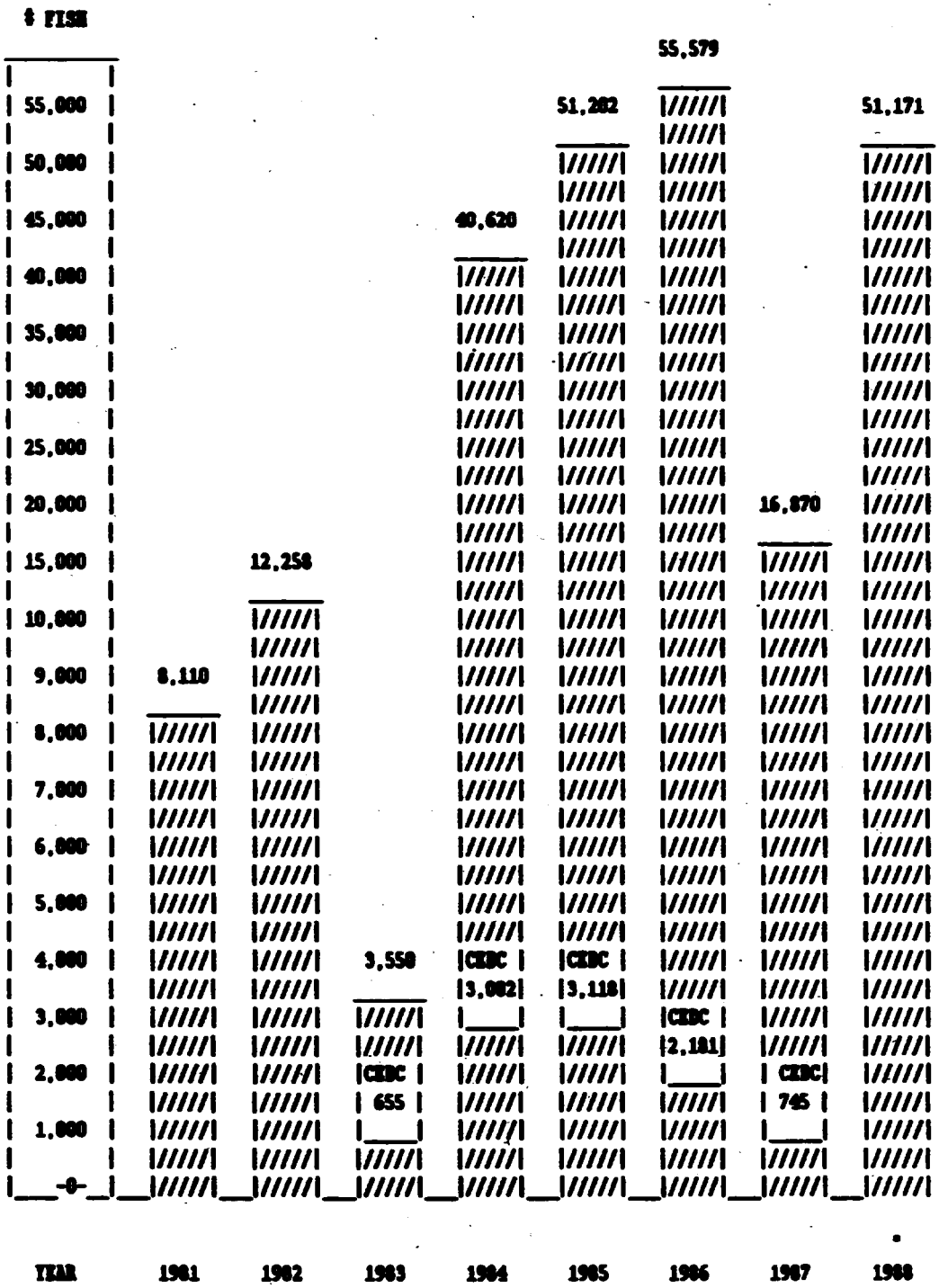


Figure 13. Youngs Bay Coho Harvest (Numbers): 1981 - 1988

* CEDC coho harvested in 1988 were not coded-wire tagged, therefore the numbers cannot be separated out

Table 29. Youngs Bay Catch Direct Poundage Value
1981 - 1988

	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	66,082	$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	114,480	$171,600	265	2,600	$3,900
1988	19,624	406,177	$686,006	51,171	382,903	$851,922	57	577	$391

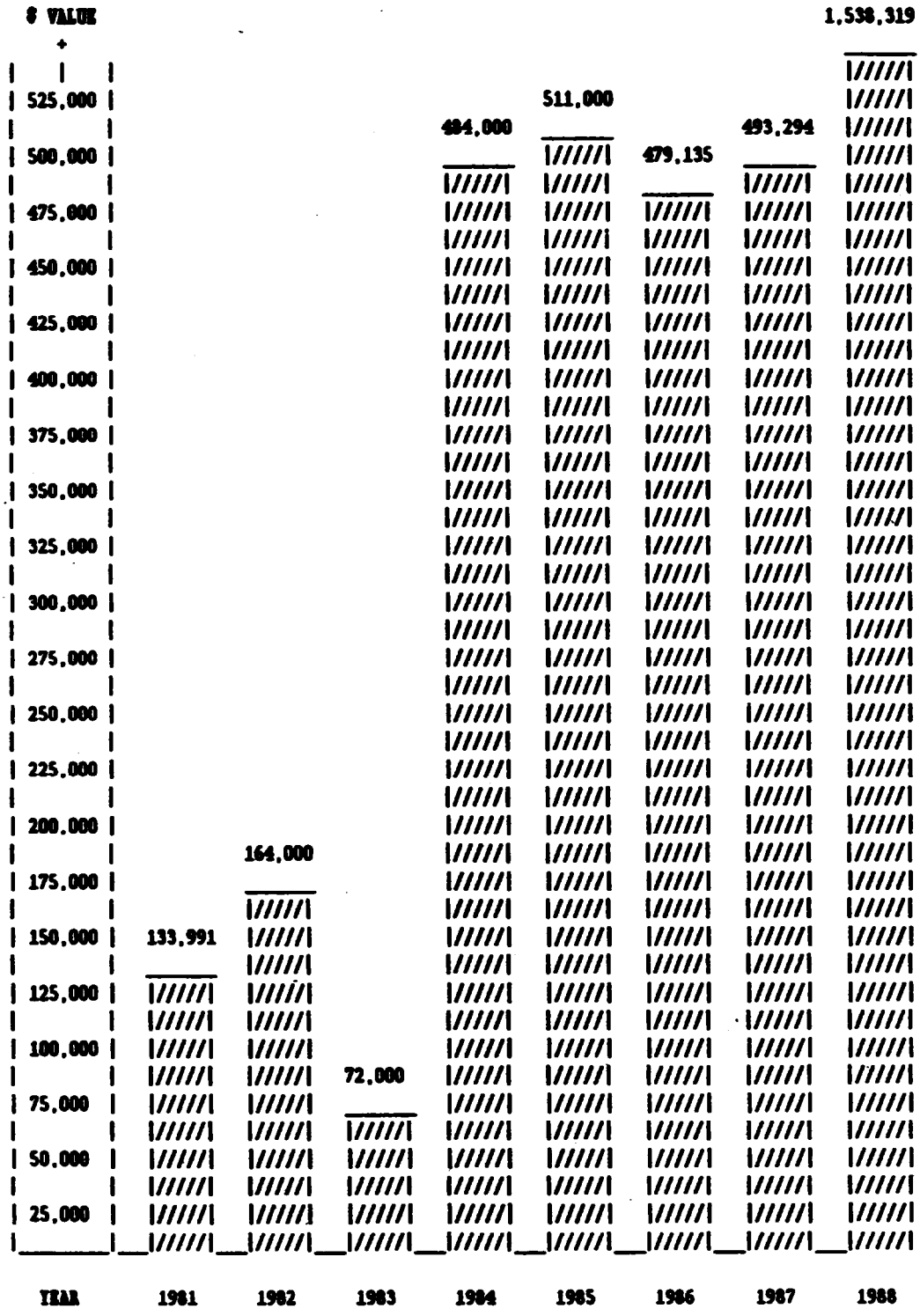


Figure 14. Youngs Bay Catch Value: 1981 - 1988

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SUMMARY OF BPA PROJECT EXPENDITURES, 1988

Personal Services:	
Wages	18,641.40
Benefits	9,681.42
Total Wages/Benefits	$28,322.82
Operations and Maintenance:	
Travel	1,874.19
Supplies	13,372.54
Contract Tagging	3,218.70
Total Operational	$18,465.43
Indirect Costs	7,169.11
TOTAL EXPENDITURES	$53,957.36