NOAA Technical Memorandum NMFS F/NWR-25

FISH TRANSPORTATION OVERSIGHT TEAM ANNUAL REPORT-FY 1988

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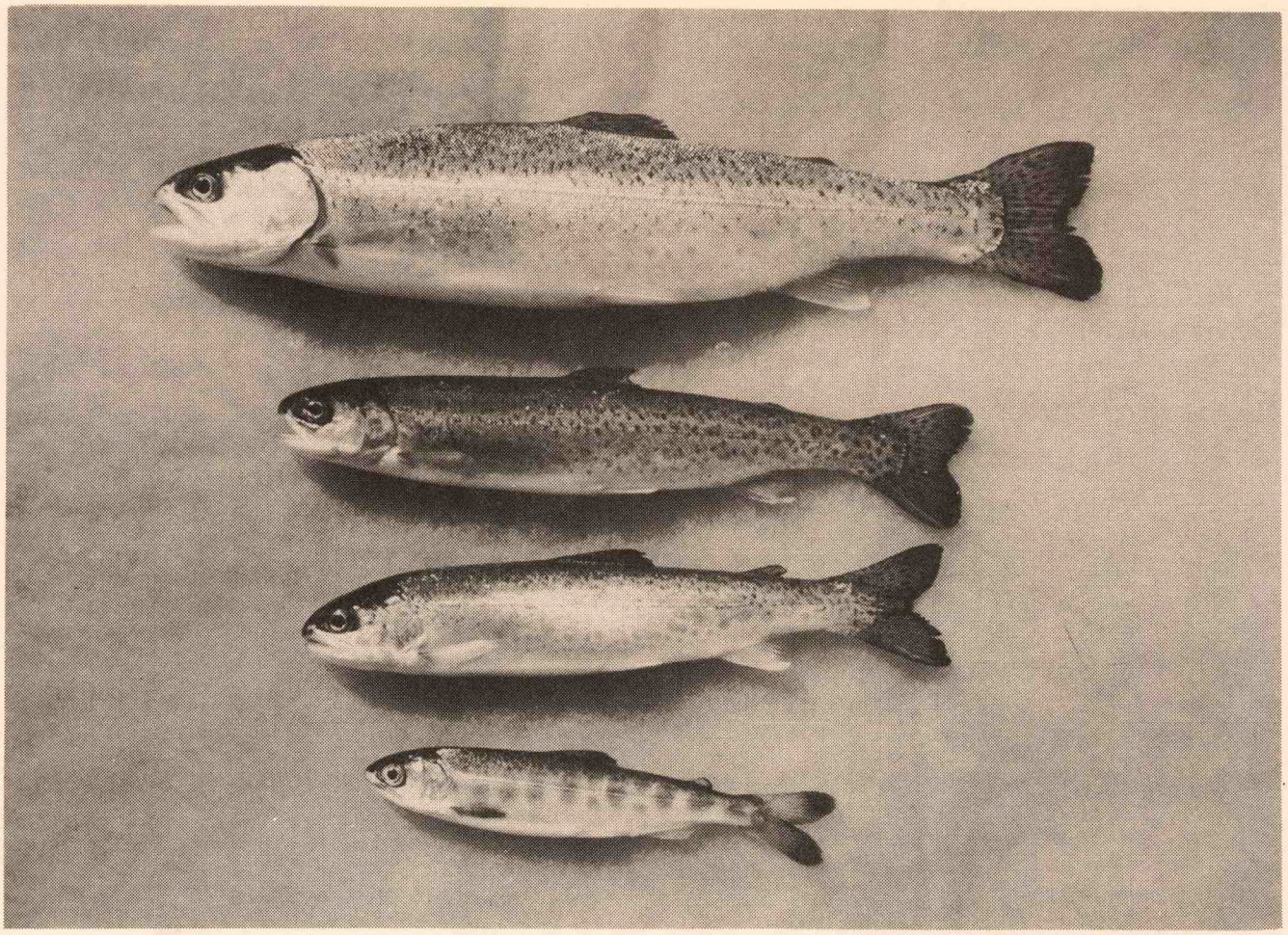
MARCH 1989



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA Technical Memorandum NMFS F/NWR-25

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MARCH 1989

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Lower Granite Dam:

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Bradford Dredge, Doug Young, IDFG

Little Goose Dam:

Rex D. Baxter, Daniel R. Kenney, NPW
William J. Knox, Mark T. Kirsch, ODFW

McNary Dam:

Brad Eby, Suzanne Knapp, NPW
Paul Wagner, WDF

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Cover Photo
Typical juvenile migrants collected during 1988 transport season at Lower Granite Dam. Top to bottom:
"Holdover" hatchery steelhead (1987 release),
Normal, yearling hatchery steelhead smolt,
Wild reared steelhead smolt,
Yearling chinook smolt.

(Photo by Steve Pettit)

TABLE OF CONTENTS

SUMMARY

The 1988 transport season began March 25 and ended September 21, A total of 20,404,524 juvenile salmonids was collected, including 7,534,218 at Lower Granite, 1,726,771 at Little Goose, and 11,143,535 at McNary. A total of 20,033,853 fish were transported, 98.1% of those collected. Of those transported, 1,972,762 (9.6%) were by truck and 18,061,103 (88.5%) were by barge.

No fish were bypassed back to the river at Lower Granite or Little Goose dams. Marked juvenile fish (135,006) were released back to the river at McNary as controls for transport evaluation.

Continued drought conditions resulted in low flows throughout the transport season. Snake River flows peaked at 89,500 cfs on May 7. The lowest flow (13,200 cfs) occurred on July 13. Columbia River flows at McNary Dam peaked at 240,800 cfs on May 14. The lowest flow (68,600 cfs) occurred on August 22.

Lower Granite and Little Goose seasonal collection mortality was 0.35% and 1.06% respectively. This compares with 0.72 and 1.14 in 1987. Seasonal collection mortality was 1.66% at the McNary facility compared to 2.64% in 1987.

INTRODUCTION

Juvenile salmonids were collected and transported from the Snake River at Lower Granite (River Mile (RM) 107.5) and Little Goose (RM 70.3) dams, and from the Columbia River at McNary Dam (RM 292.0). The Snake, a major tributary, joins the Columbia at RM 324.3. Collected juveniles were transported via truck or barge and released below Bonneville Dam (RM 146.1). Transported juveniles bypassed 4 to 8 dams and 146 to 280 miles of impounded river (Figure 1).

The Fish Transportation Oversight Team (FTOT) continued to manage the transport program and provided coordination between Walla Walla District, Corps of Engineers (NPW), fishery agencies, and tribes. The FTOT is composed of biologists from the National Marine Fisheries Service (NMFS), Idaho Department of Fish and Game (IDFG), and NPW. The NMFS member was team chairman. Line of authority and responsibilities for transporting salmonids is displayed in Figure 2.

The FTOT's goal is to maximize survival of Snake and Columbia River salmonids by improving collection, transport, and bypass conditions for juvenile migrants. Responsibilities include coordination, program oversight, developing an annual work plan, inspecting collection and transport facilities prior to, during, and after the season, and producing an annual report summarizing transport activities. A meeting is hosted by FTOT each summer for program participants and other interested individuals to discuss current season operation and recommend program and facility modifications for the following year.

Additional biological oversight is provided through cooperative agreements between NPW and the states of Idaho, Oregon, and Washington. Under these agreements NPW funds state fishery biologists at each collector project. Idaho's representatives were assigned to Lower Granite, Oregon's to Little Goose, and Washington's to McNary. Work loads were shared by State and NPW project biologists.

Figure 1. Locations of fish collection facilities, transportation route, and release site.

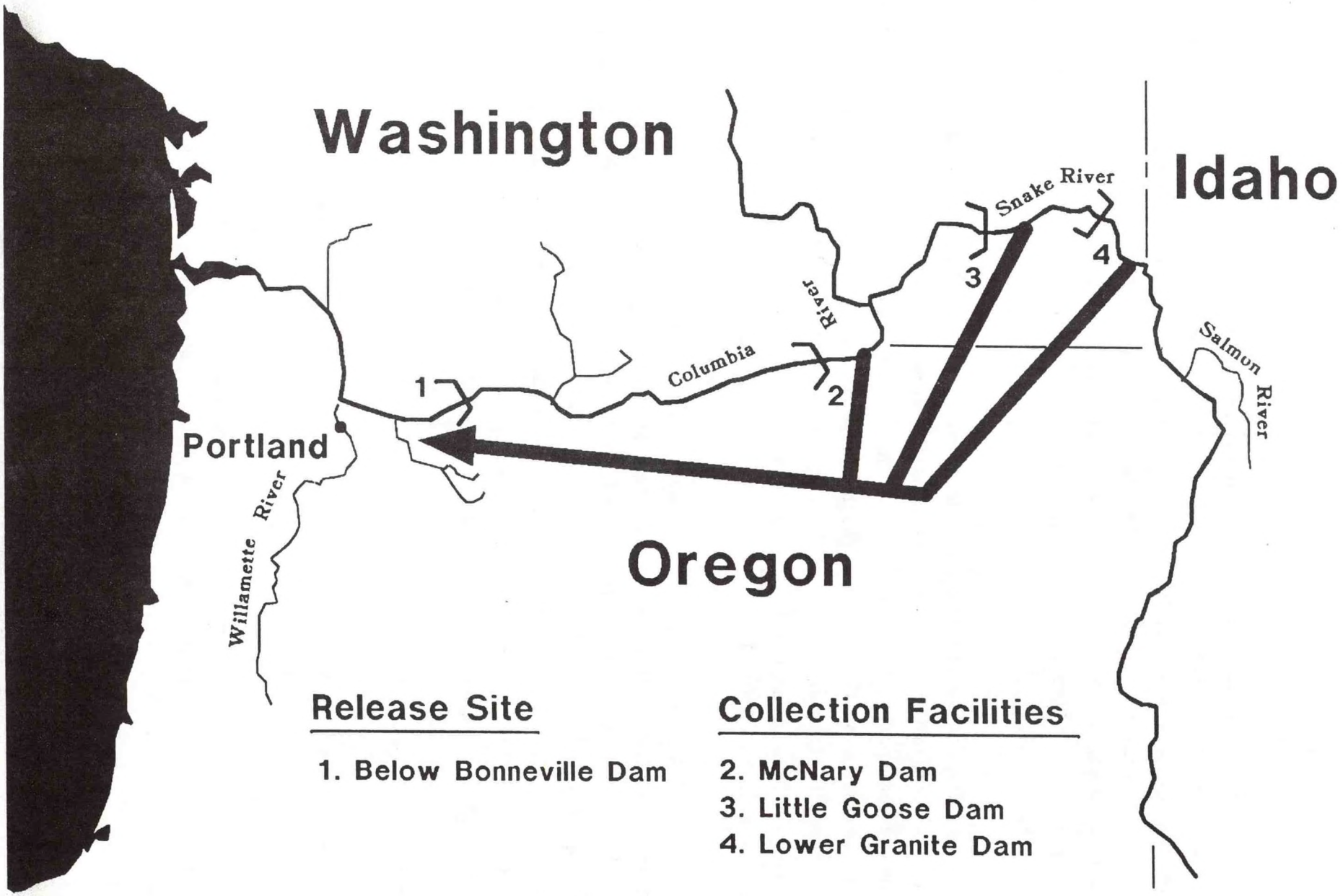
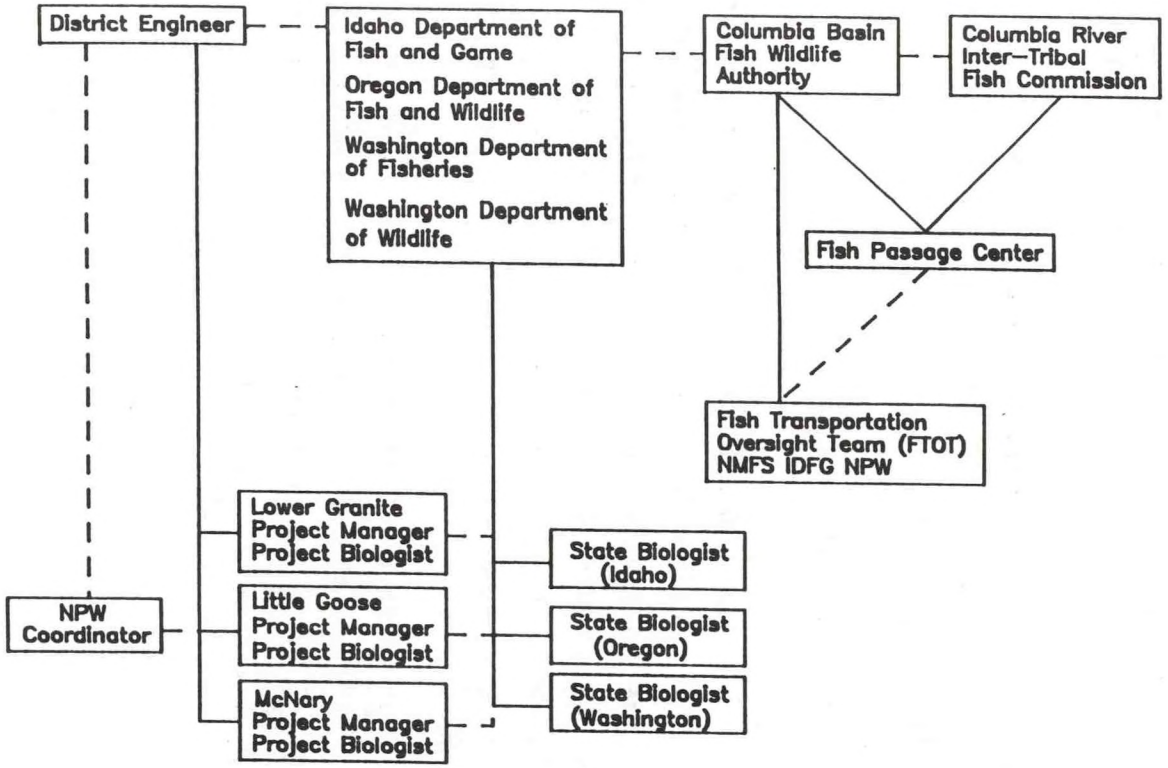


Figure 2. -- Line of authority and responsibilities for collection and transportation of juvenile salmon and steelhead trout from Lower Granite, Little Goose, and McNary Lock and Dam projects to release sites below Bonneville Lock and Dam. Dotted line denote line of communication and solid line is supervision.



Responsibilities

Maintenance of transportation, collection, bypass, holding facilities and equipment.

Operate and monitor collection and transportation equipment and facilities

Contract tug and tractor rental.

Administer cooperative agreements and task orders for State biologist

Responsibilities

Inspection and quality control of collection and transportation equipment and facilities

Monitor fish sampling and handling

Monitor water quality and fish condition.

Compile data and write progress reports.

Responsibilities

Transport coordination and program oversight.

Prepare annual work plan.

Inspection and oversight of collection and transportation facilities and quality control.

Identify and recommend changes needed in facilities and equipment or their operation.

Assimilate data and write annual report.

A typical collection/bypass system consists of submersible traveling screens (STS), gatewell orifices, and a flume or pipe transport conduit (Figure 3). Fish are collected after they pass through trash racks and encounter a STS that intercepts and deflects them into a gatewell, away from the turbine. Fish then exit gatewells via 10- or 12-inch orifices into a transport conduit that carries them to a collection facility or to the tailrace.

This report summarizes 1988 transport operations including numbers of salmonids transported or bypassed by species, overall fish condition, river and flow conditions, and facility and equipment operations.

RIVER CONDITIONS

The drought that began in 1987 continued through 1988. Low snow packs throughout the Columbia River basin caused low flows and delayed downstream migrations. Although flows were relatively low, the runoff extended through mid-June. Water temperatures were higher than normal but remained below critical levels through June. Water temperatures exceeded 70 degrees beginning about mid-July continuing through the first part of September.

The observed January - July Columbia River runoff at the The Dalles were 68% (73.7 million acre feet [MAF]) of the 25 year (1961-1985), average, Grand Coulee 75% (48.4 MAF), and the Snake River at Lower Granite 53% (16.4 MAF). Flows at Lower Granite and McNary dams are compared with the juvenile outmigration in Figures 4 and 5.

Snake River

The observed April - August Snake River runoff measured at Lower Granite for 1988 was 13.1 MAF, 54% of the 1961-1985 average. The water year ranked 51 in the 63 year average (1926-1988). [1]

Spring flows ranged from 22.7 kcfs (April 2) to a peak flow of 89.5 kcfs (May 7). By June 15 flows had fallen to 50.4 kcfs and continued to decline for the remainder of the season to a low of 13.2 kcfs (July 13). From July 13 to the end of the transport season (July 25) flows ranged from 13.2 kcfs to 21.4 kcfs. The Snake River peaked at 89.5 kcfs on May 7 compared to 1987 peak of 100.1 kcfs on April 30.

Flows exceeded 85 kcfs only one day (Figure 6) compared to 9 days in 1987 and 83 days in 1986. Flows did not meet FTOT criteria (100 kcfs) for bypassing chinook. The low flows and expected low survival of marked control fish precluded the scheduled transport evaluation studies. Consequently, all fish collected were transported.

Columbia River

The observed Columbia River runoff at The Dalles for the 1988 water year (October-September) was 92.9 MAF, 66% of the 1961-1985 average. The water year ranked 58th in the 63-year average as measured at The Dalles. 1/

A peak flow of 240.8 kcfs occurred at McNary Dam on May 14, 1988 compared with 291.6 kcfs on May 15, 1987 and 395 kcfs on June 1, 1986. There was no spill at McNary Dam in 1988.

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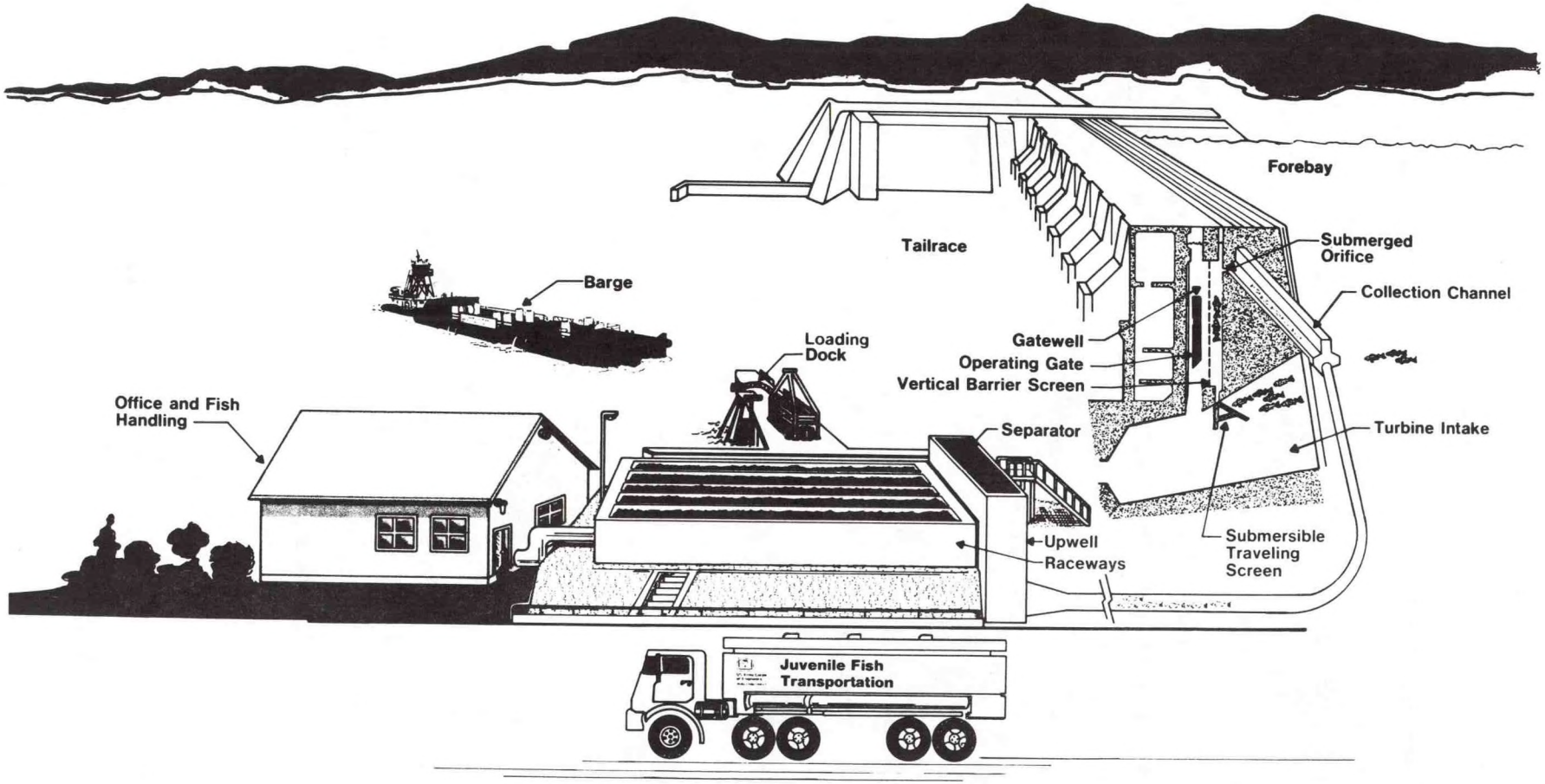
[1] Columbia River Water Management Group, Meeting No. 386, October 13, 1988.

Figure 3. Juvenile salmonid collection and transportation system.



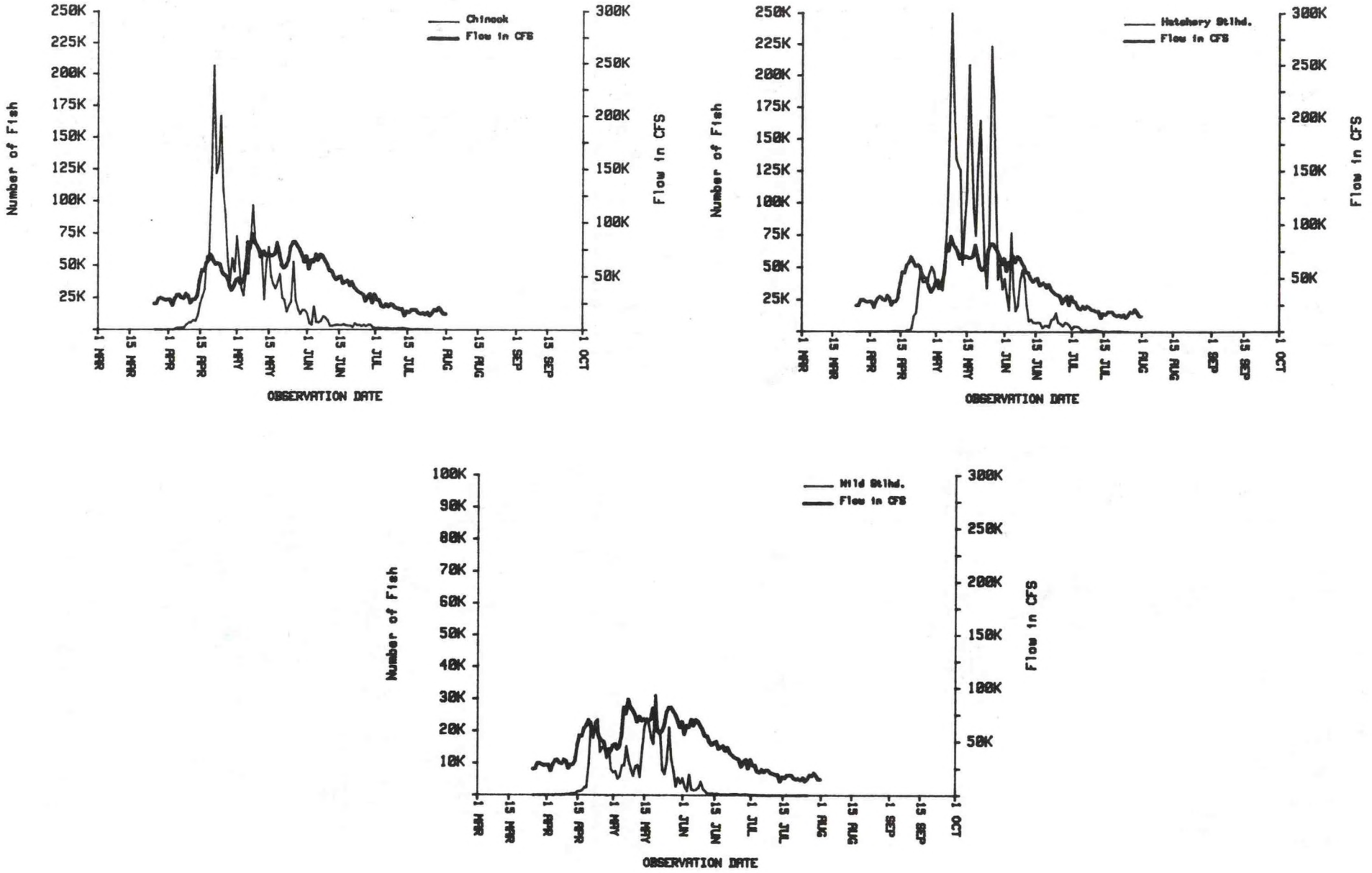
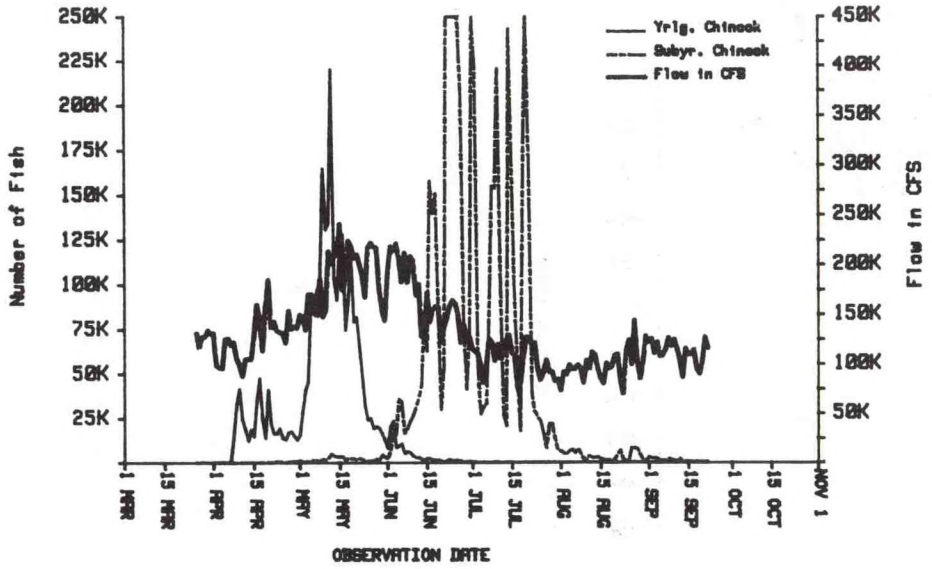
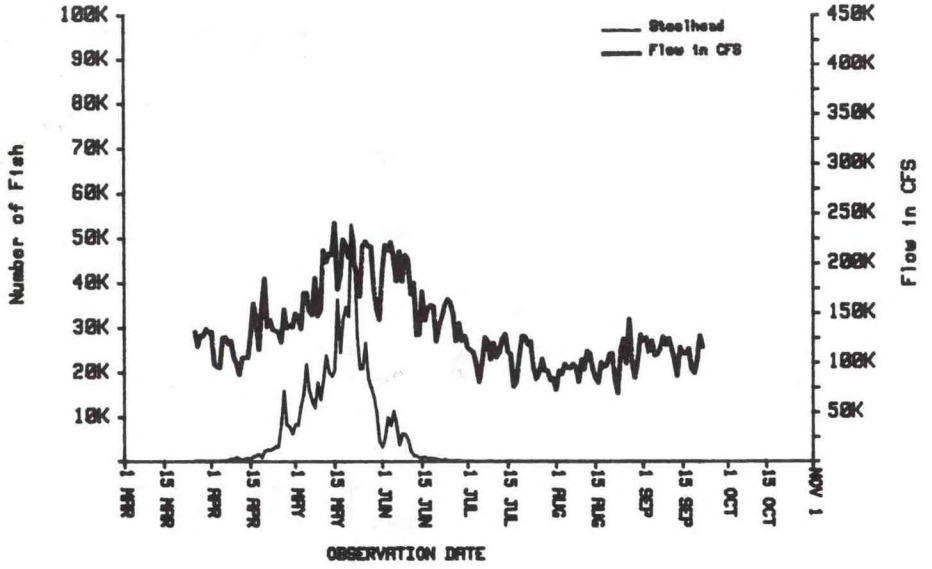
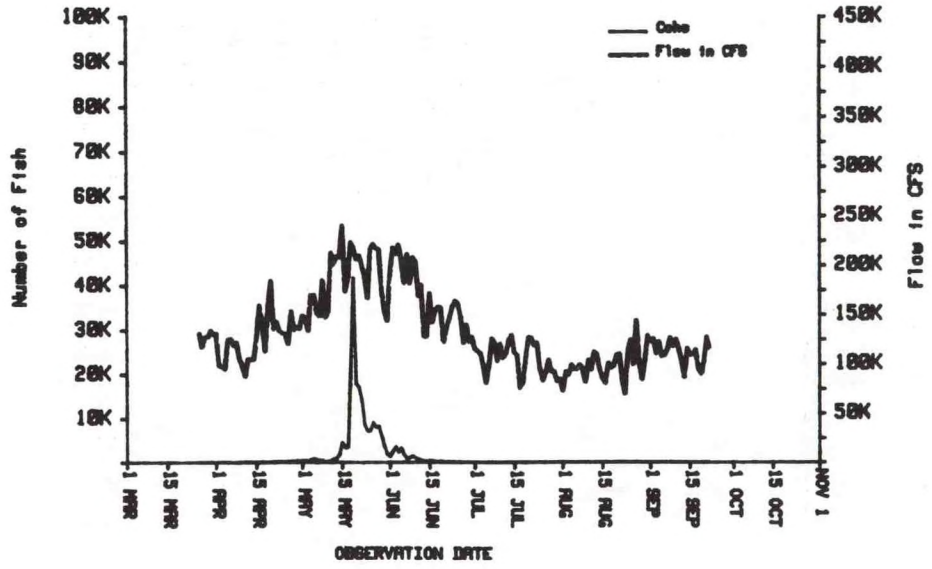


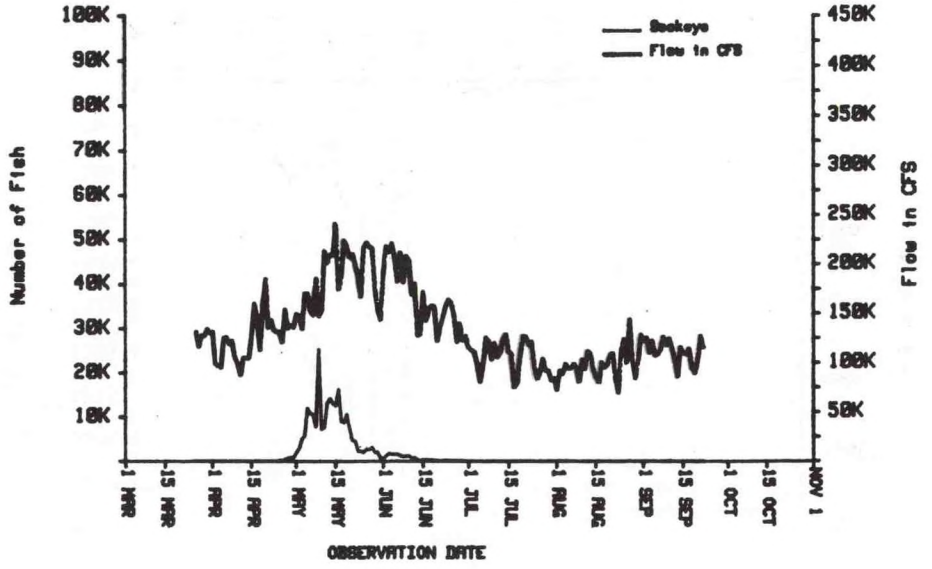
Figure 4. Snake River flows versus daily counts of chinook, wild and hatchery steelhead during 1988 at Lower Granite Dam.

Figure 5. Columbia River flows versus daily counts of yearling chinook, subyearling chinook, steelhead and sockeye during 1988 at McNary Dam.









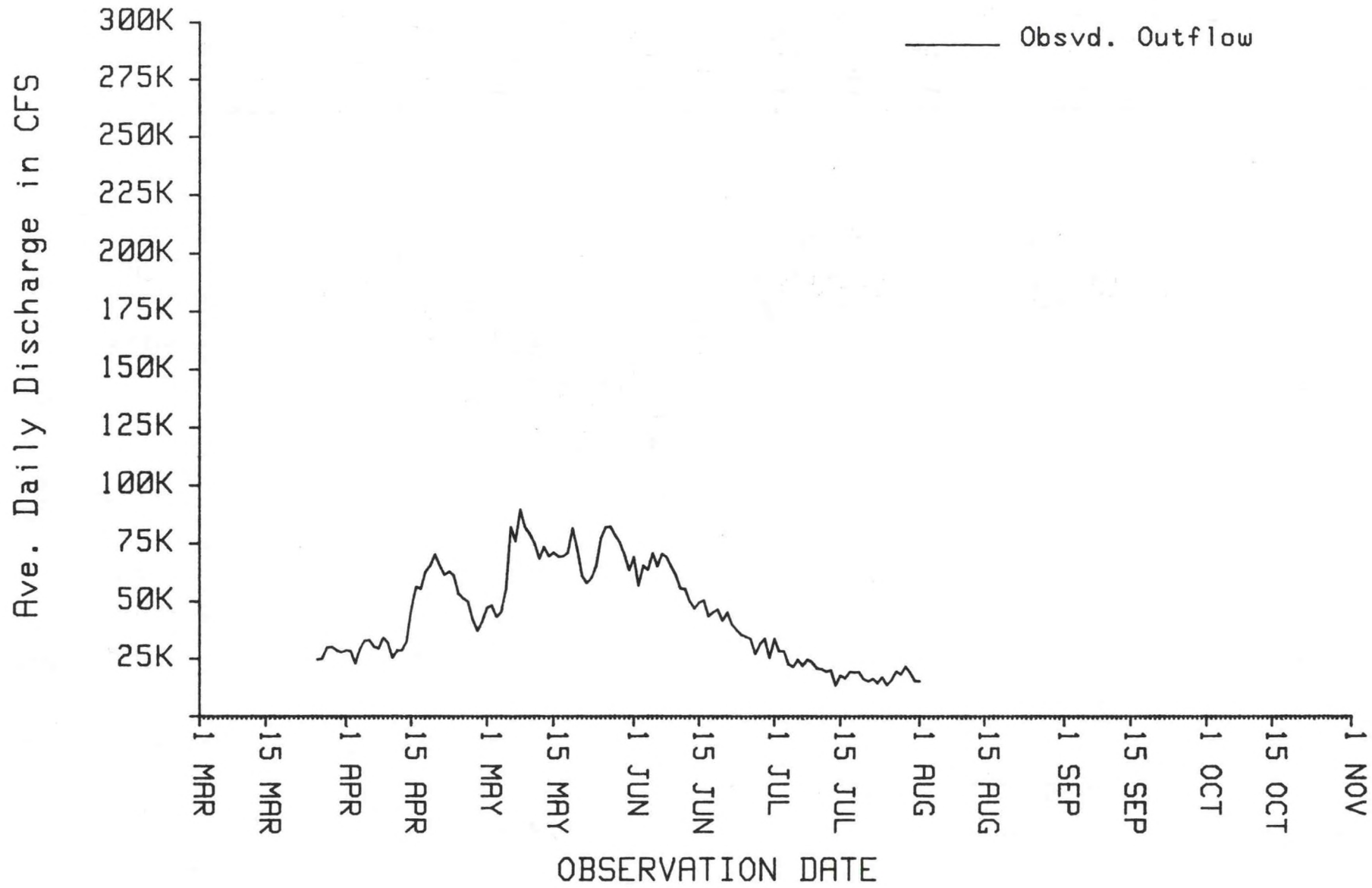
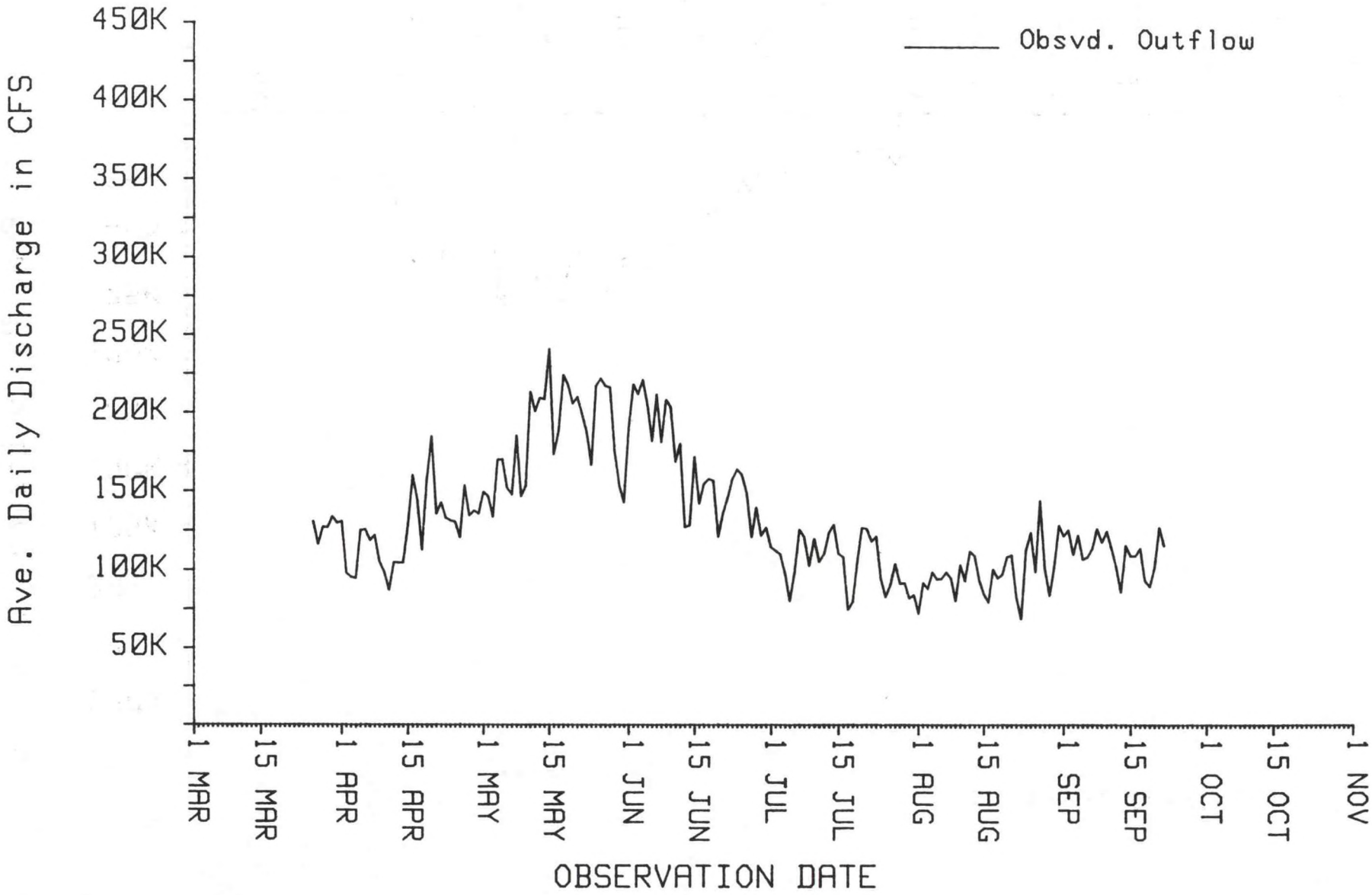


Figure 6. Observed flows at Lower Granite Dam, 1988.

Figure 7. Observed flows at McNary Dam, 1988.



The Columbia River flows at McNary exceeded the 220 kcfs trigger for bypassing yearling chinook as specified in the FTOT annual Work Plan (anonymous 1988) only 3 days compared to 20 days in 1987 and 77 days in 1986. Consequently no fish were bypassed at McNary Dam in 1988 except for marked fish for control of the transport evaluation studies.

Water temperatures remained relatively low through mid-July when temperatures approached and exceeded 70° (21° C). Special unit operations, as described in the 1988 FTOT Annual Work Plan were implemented at McNary to alleviate water temperatures problems.

EQUIPMENT

Facility Raceways

Maximum raceway holding capacity is 0.5 lbs. of fish per gallon of water. Inflow to raceways is approximately 1200 gpm at Snake River projects and 1000 gpm at McNary. Individual raceway volume is approximately 12,000 gallons of water at Snake River dams. Lower Granite has 10 raceways and Little Goose has five. Individual raceway capacity at McNary Dam is 5,000 gallons in seven permanent raceways and 7,400 gallons in two temporary raceways.

Transport Vehicles

Five fish-hauling trucks were used prior to and after the peak outmigration period (Figure 8). Rated capacity is 3500 gallons of water per tanker and, at the present hauling criterion of 0.5 pounds of fish per gallon, a fully-loaded tanker contains approximately 1,750 pounds of fish. Driving time varies with distance traveled: An average trip to Bonneville from Lower Granite takes about 8.0 hours, from Little Goose 6.5 hours, and from McNary 3.5 hours.

Four fish barges were on line at various times from April 11 thru

July 27 (Figure 8). These periods corresponded to the peak spring and summer migration periods. Two older barges, #2127 and #2817, have a capacity of 85,000 gallons of water and inflow of 5,200 gallons per minute (gpm). Two newer barges, #4382 and #4394, have a capacity of 100,000 gallons and inflow of 10,000 gpm. The holding criterion for barge transportation is 5 pounds of fish per gpm inflow. This allows a maximum 26,000 and 50,000 pounds of fish for each of the two older and two newer barges, respectively. Over the past several years, emphasis has shifted to a larger proportion of the total fish being barged rather than trucked (Figure 9).

Water temperatures in the fish trucks are kept within 3°F of ambient river temperature at the release site. Chillers are used to cool water if necessary during truck transport. Fish barges normally use a flow-through water supply system providing an ambient river temperature throughout the trip.

Overheating of a barge pump engine on July 9 caused the engine to shut off resulting in the loss of aerated water to the fish holds. This resulted in the loss of an unknown number of fish. This event occurred because the alarm switch was inadvertently turned off so when the engine automatically shut off no alarm was sounded. The following emergency corrective actions were taken:

1. Cleaned and flushed radiators;

2. Modifications to aid engine room cooling;

3. Engine shut off was modified so the alarm system is engaged before the engine is started.

In addition the following actions will be taken before the 1989 transport season:

1. Barge engine warning systems will be readily observable from the tow boat wheelhouse;

Figure 8. Operational dates for barge and truck transportation in 1988

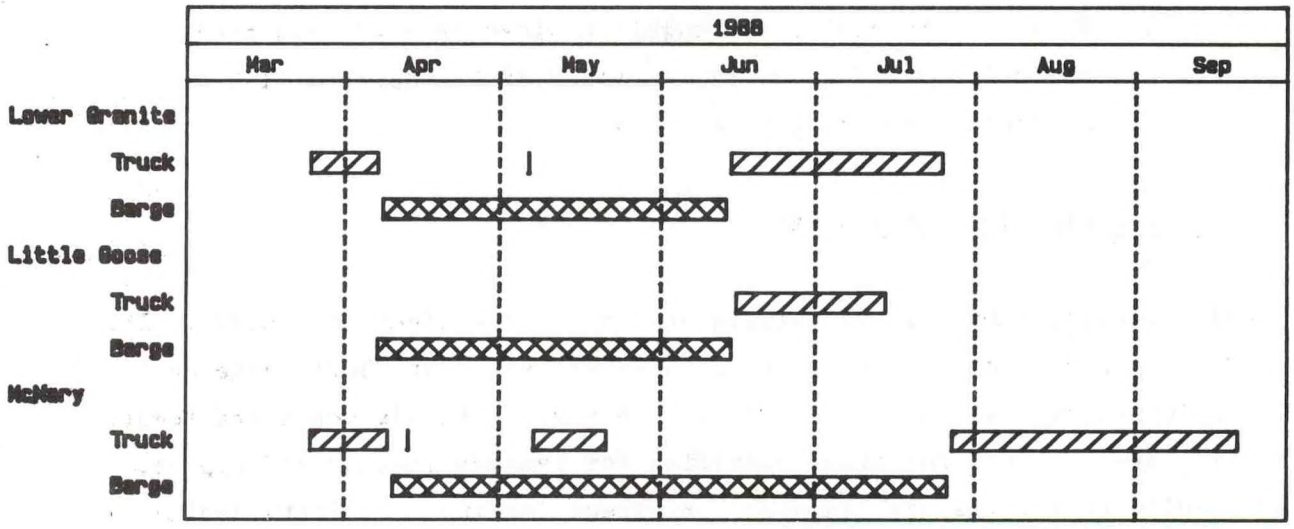
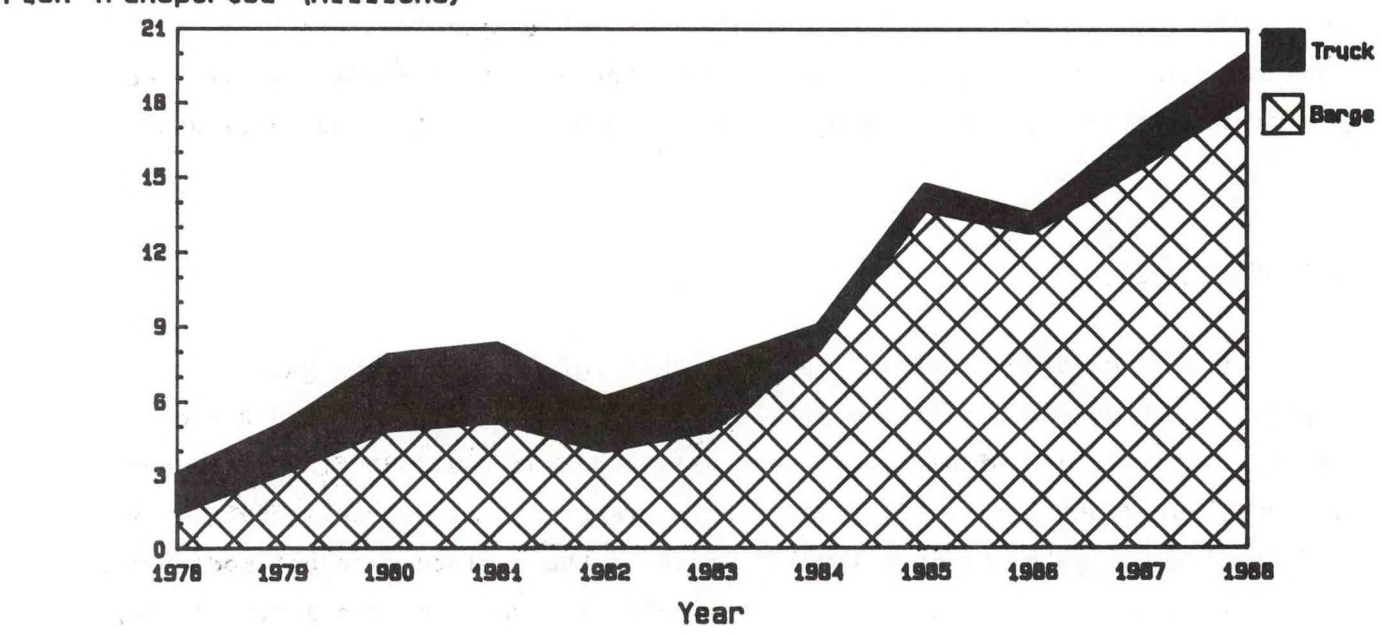


Figure 9. Transport summary of juvenile fish trucked or barged from Lower Granite, Little Goose, and McNary Dams, 1978 through 1988



2. Tow boat personnel will be given more responsibility for barge engine operation and maintenance;

3. Barge riders will be throughly trained in barge equipment operation, biological requirements of transported fish, and emergency reporting procedures.

Wet Separators/Distribution Systems

All collector dams have wet separators in their collection systems. The Lower Granite separator is not equipped to separately distribute large and small smolts to raceways or for bypass to the river. Little Goose and McNary facilities are equipped for size separation for raceway loading and bypass. Lower Granite facilities are equipped for direct loading. Facility design and barge loading schedules preclude direct loading at Little Goose and McNary.

Submersible Traveling Screens

All STSs were installed and operating by March 23 at Lower Granite and Little Goose, and by March 26 at McNary. No major screen-related problems were reported for McNary or the Snake River projects. Video inspection of STSs continued according to FTOT guidelines until temperature problems developed in July. Screen inspection was suspended or frequency was reduced to minimize starting and stopping turbines which exacerbated the temperature problems.

Operating Gates

Because research studies have shown that raising operating gates improves fish guidance efficiency, all operating gates in the A and B slots at Lower Granite and Little Goose were raised during the 1988 fish transport season (Ledgerwood 1988). This was done by removing the hydraulic cylinders and dogging the gates at deck level. Gates in the C slots were not modified. In an emergency, the A and B slot gates would be lowered by the gantry crane,

and the C slot gate by the hydraulic cylinder. This was the first year of operating the gates in this configuration.

JUVENILE OUTMIGRATION

The 1988 transport season began March 27 and ended September 21. Total juvenile collection at all projects was 20,404,524 of which 20,033,853 (97%) were transported (Tables 1-3). Although fishery agencies and tribes had not changed the policy of bypassing the majority of yearling chinook back to the river, no fish were bypassed because of the continuing drought related low flows. All fish collected at transport projects were hauled except for those bypassed as control fish for transport evaluation at McNary. No fish were bypassed at Snake River projects because of low flows.

Generally the outmigration appeared near typical of previous years in contrast to 1987 which was more compressed.

Fish Release Sites

Trucked fish were released during the spring at the Bradford Island site. When flows were low, releases were made at the boat ramp on Hamilton Island on the Washington shore. The release site for barged fish was approximately five miles below Bonneville Dam near the Skamania light buoy.

Sampling Techniques

A daily random sample was taken. By varying the sample time, the sample was set not to exceed the lesser of either 3% of the estimated weekly outmigration or 10% of the weekly total of yearlings collected and/or bypassed. These fish were counted and examined for species composition, mortality, and marks. A random subsample of 100 fish of each species was taken to determine percent descaling and average length and weight.

Table 1. Juvenile fish transportation summary and dates of operation, 1988.

	Trucked	Barged	Total
Lower Granite			
March 25-July 31			
Chinook	85,308	2,689,974	2,775,282
Wild steelhead	6,337	586,994	593,331
Hatchery steelhead	148,807	3,985,553	4,134,360
Sockeye	277	1,610	1,887
Coho	0	0	0
Total	240,729	7,264,131	7,504,860
Little Goose			
April 7-July 15			
Chinook	14,706	801,955	816,661
Wild steelhead	1,315	132,136	133,451
Hatchery steelhead	36,001	719,896	755,897
Sockeye	262	2,142	2,404
Coho	0	0	0
Total	52,272	1,656,129	1,708,413
McNary			
March 25-September 21			
Yearling chinook	1,010,910	1,842,043	2,852,953
Subyearling chinook	318,666	6,377,598	6,696,264
Wild steelhead	38,547	122,595	161,142
Hatchery steelhead	163,655	490,919	654,574
Sockeye	84,101	159,393	243,494
Coho	63,870	148,295	212,165
Total	1,679,749	9,140,843	10,820,592
Grand Total	1,972,750	18,061,103	20,033,865

Table 2. Summary by dam of juvenile fish transported, 1978 - 1988.

	Lower Granite	Little Goose	McNary	Total
1978	1,980,600	996,285	82,211	3,059,096
1979	2,367,446	1,453,615	1,247,120	5,068,181
1980	3,830,747	2,282,987	1,740,545	7,854,279
1981	2,730,866	1,464,991	4,112,993	8,308,850
1982	1,851,616	1,234,110	3,003,853	6,089,579
1983	2,368,049	868,937	4,326,013	7,562,999
1984	2,046,020	2,274,307	4,708,632	9,028,959
1985	4,459,438	2,008,980	8,319,074	14,787,592
1986	4,683,260	2,052,153	6,760,421	13,495,834
1987	5,470,665	1,910,026	9,655,789	17,036,566
1988	7,504,860	1,708,413	10,820,592	20,033,865

Table 3. Summary of juvenile fish trucked or barged from Lower Granite, Little Goose, and McNary Dams, 1978 - 1988.

	Trucked	Barged	Total
1978	1,580,724	1,478,372	3,059,096
1979	2,031,212	3,036,969	5,068,181
1980	3,019,232	4,835,047	7,854,279
1981	3,145,980	5,162,860	8,308,850
1982	2,152,901	3,936,678	6,089,579
1983	2,780,487	4,782,512	7,562,999
1984	1,030,026	7,998,933	9,028,959
1985	549,175	14,238,417	14,787,592
1986	776,607	12,719,227	13,495,834
1987	1,681,436	15,355,130	17,036,480
1988	1,972,762	18,061,103	20,033,865

Exception to the daily random sample criteria was permitted by the Columbia Basin Fish and Wildlife Authority in 1988 for collecting additional fish to mark for transport evaluation. Exceptions are provided for in Appendix 2 of the FTOT Annual Work Plan and are intended to be implemented only during years that high numbers of fish are needed for experimental purposes.

Descaling

Information on descaling was collected daily throughout the transportation season according to FTOT guidelines and criteria. This information was used as an indicator of fish facility condition. Use of this data for other purposes should be done cautiously, recognizing the original purpose.

The descaling criteria were revised in 1988 to clarify and simplify the categories so all workers could maintain uniformity and comparability in reported data. Figure 10 shows the descaling criteria as revised in 1988.

The category "9" was implemented in 1985 in an attempt to isolate a certain descaling pattern that did not fit in any other category. After 3 years it was decided that category "9" was a significant portion of descaling and the criteria was rewritten to include "9" within the "descaled" category and the "9" designation was dropped. Previously, the "9" was added to the descaled category when descaling was summarized and the revised criteria should not result in a higher daily descaling.

DESCALING CRITERIA

Sections of the fish:

Revised 4-14-88

Sample size: A one hundred fish minimum combined sample, or no less than 50 fish per species must be used. Always report percent descaled along with the number of fish sampled.

Examination: All areas of the fish are examined for scale loss except the ventral surface from the pectoral fins to the vent (the shaded area in above figures) and scale loss is recorded as follows:

"OK" - If scale loss is 3% or less per section, record as (L.

"6" - If individual scales are lost in a scattered or diffuse pattern and greater than 3% per section but a cumulative scale loss equivalent to less than 40% of two sections, record as (L6) or (R6) as appropriate.

"6P" - If scale loss is in localized areas or patches and more than 3% per section but a cumulative scale loss equivalent to less than 40% of two sections record as (L6P) or (R6P).

"Descaled" - If cumulative scale loss equals or exceeds 40% of two body sections record as (DR or DL).

NOTE: Cumulative scale loss = The sum of the area of all patterns of scale loss (narrow band, patch, sectional, etc.) on one side of a fish. If regeneration of scales is obvious, then those sections with regenerating scales shall not be considered scale loss.

"7" - If the fish has an eye or a head injury record a (L7) or (R7).

"8" - If the body of the fish shows visible cuts or bruises, record as (R8) or (L8).

Suggested Optional Descaling Criteria - To be used at the discretion of onsite personnel to provide detailed descaling information as needed for onsite use.

"7*" - Designates folded or torn operculums.

"8B" - Designates bird marks.

"8M" - Designates mammalian predator marks.

"8P" - Designates external parasites.

"8F" - Designates external fungal infection.

Figure 10. Descaling criteria revised in 1988.

TRANSPORT OPERATIONS - LOWER GRANITE DAM, 1988

FACILITY MODIFICATIONS

No major modifications were made to the Lower Granite's fish collection facility prior to or during the 1988 transport season. However, fish guidance efficiency (FGE) was improved by raising the operating gates (Figure 11) in the A and B slots to deck level creating a more desirable flow pattern for fish attraction. Tests in 1986 and 1987 at Lower Granite and Little Goose dams showed increased FGE with operating gates raised. (Ledgerwood, 1988).

Fish transport barges #2127 and 2817 each received two new diesel engines. The original engines were worn and unreliable and replacement parts for were difficult to obtain.

Minor additional modifications were accomplished prior to the 1988 field season to ease facility operations and increase worker safety which included:

1. Coaxial cables to the fish counting tunnels were upgraded and electronic fish counters were adjusted for greater sensitivity.

2. To increase worker safety, grating was placed above each gatewell and fish screen slot orifice exit in the bypass gallery. (Photo 1)

3. Johnson bar screen was used to replace water elimination plates at the entrance to the fish distribution flume. This eliminated flume vibration and accompanying low pitch hum.

4. A temporary patch was placed on the log sheer boom to reduce debris in the juvenile fish collection system.

5. Rubber extensions were added to raceway loading chutes to reduce the number of jumping fish.

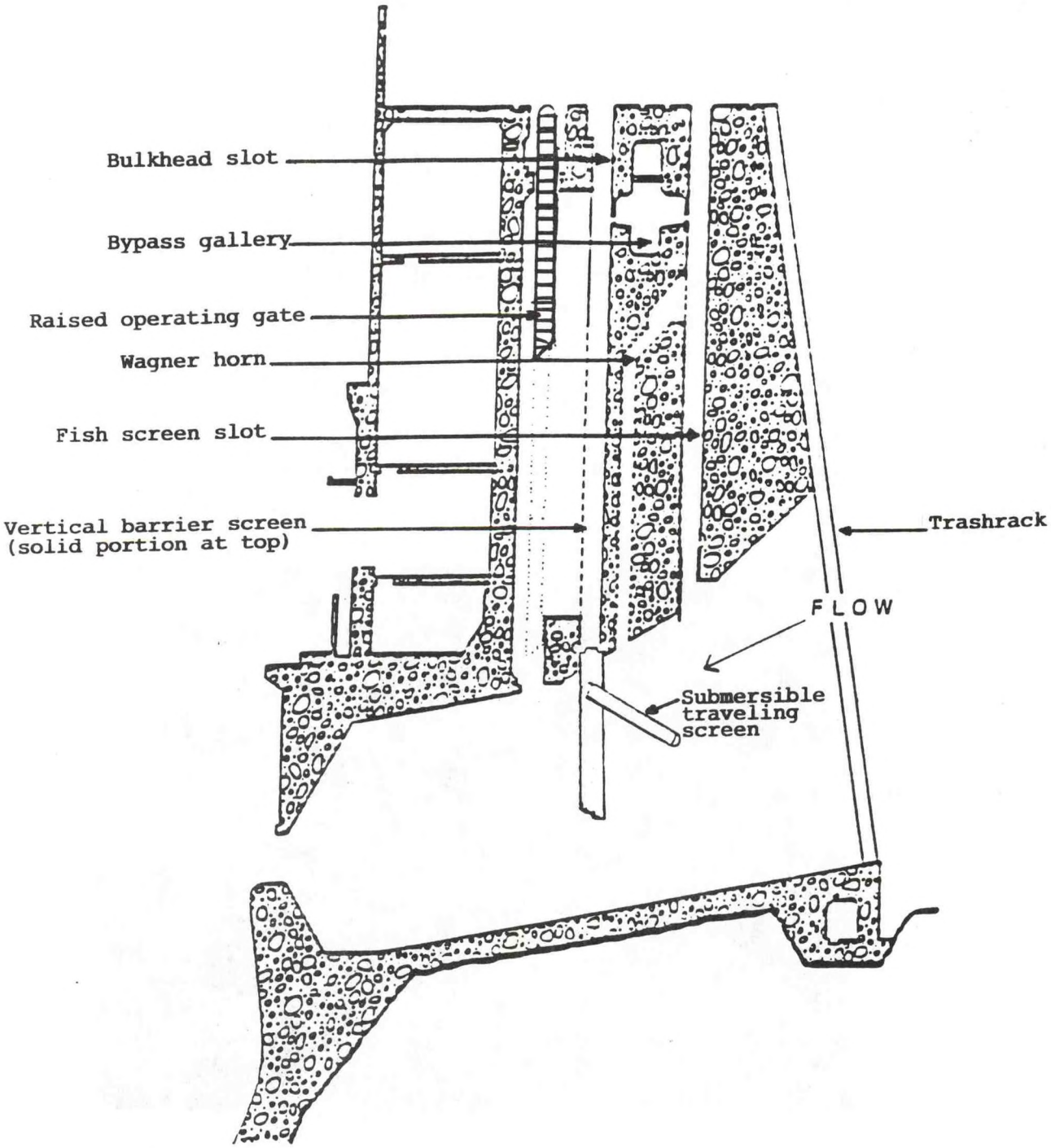


Figure 11. Cross section of Lower Granite Dam showing operating gate in the raised position.

6. New dissolved oxygen meters were purchased to replace older, worn equipment.

7. Raceway sidescreens were constructed to prevent fish from jumping out of the head end of raceways one through five.

8. A new cover was built over the sample recovery tank to improve accessibility. A walk ramp was also added next to the tank.

9. More lighting was added in the marking building to make it easier to see brands and identify species.

10. The juvenile fish descaling criteria were revised.

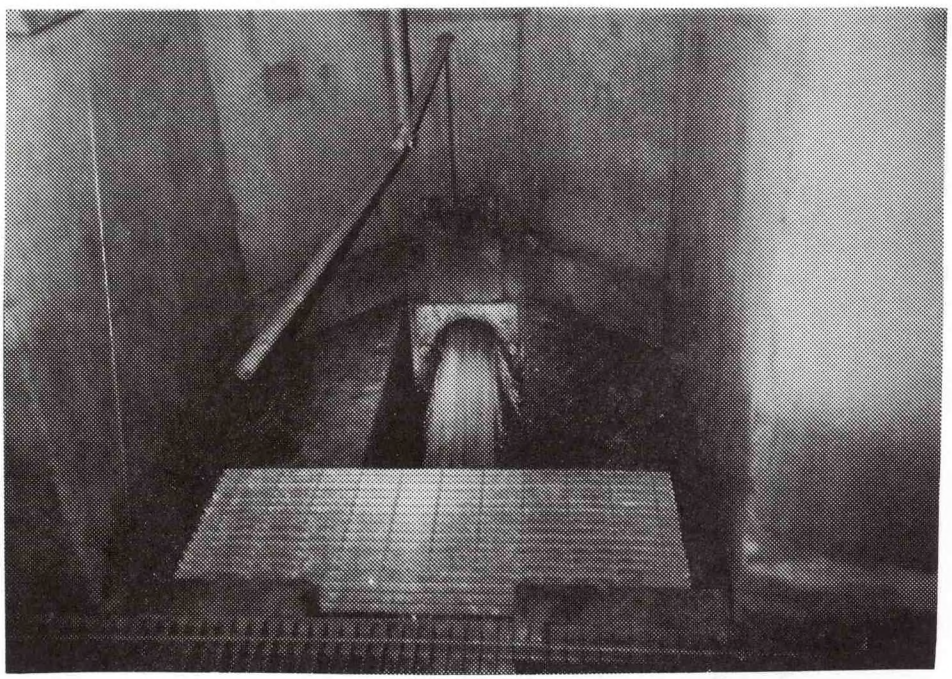


Photo 1. New Grating over orifice exit channel at Lower Granite Dam.

COLLECTION OF JUVENILES

Migration and Collection

Lower Granite total collection shattered all previous season records during 1988. An estimated 7,534,218 juvenile salmonids were collected and diverted for transport (Table 4). This compares to total collections of 5,512,434 and 4,774,026 in 1987 and 1986, respectively. Although chinook collection (2,790,395) was at an all-time high, they comprised only 37.0% of the total, compared to 45.3% in 1987. Chinook collection was expected to be somewhat higher because hatchery production was about the same as last year and FGE was significantly improved by the raised gate configuration. Passage indices at Lower Granite for yearling chinook increased steadily during early April, but appeared delayed compared to passage index of previous years.

Natural runoff improved in mid-April, but dropped below 50 kcfs during the last week of the month. However, the brief increase in Snake River discharge during the 10-day period beginning on April 15, resulted in the peak chinook collection period (Appendix Table 1) when approximately 40.0% (1,111,540) of the season's total were collected. Idaho's early smolt release program allowed these migrants to take advantage of the flow increase. This program was developed to artificially separate chinook and steelhead collection peaks and to ensure that hatchery stocks had migrated far enough (Lower Granite reservoir) to benefit from augmented flow regimes. Chinook collection peaked on April 20, when 206,539 were collected (Figure 12). Approximately 10% of the season's total chinook collection occurred by April 19, and 90% by May 24 (Figure 13).

The prolonged period of low flows in late April and early May led to the Water Budget request by the FPC. Drafting of Brownlee and Dworshak reservoirs began on May 3 and flows at Lower Granite increased from 45 kcfs to a high of 90 kcfs on May 7 (averaging 68 kcfs during the Water Budget period).

Steelhead migrants reacted immediately to the flow increase and became the dominant species from then on. A combined total of 4,741,920 wild and hatchery steelhead were collected compared to 3,013,986 in 1987. Steelhead comprised 63.0% of the 1988 collection total and the wild and hatchery components were 12.5% and 87.5% respectively. Wild steelhead peaked on May 19, but several other collection spikes occurred during the migration (Figure 12). Even though the wild steelhead collection total of 593,464 was the highest since stocks were accounted for separately, their percentage was the lowest of the four-year period. This most likely resulted from increased hatchery production. Hatchery steelhead collection experienced three strong peaks. The initial and seasonal collection peak (254,419) on May 7 resulted from the Water Budget operation and the final peak on May 25 also occurred during an increase in natural runoff. The 10% and 90% collection estimates for wild and hatchery steelhead are illustrated in Figure 13.

Even though new collection records were established again in 1988, it should be pointed out that the combined totals from both Lower Granite and Little Goose only accounted for 9,260,989 migrants from a total of 23 to 25 million smolts estimated to have begun their seaward journey in 1988 (DeHart and Karr, 1988) It appears that smolt losses, prior to reaching Lower Granite, approached 50% due to drought runoff conditions.

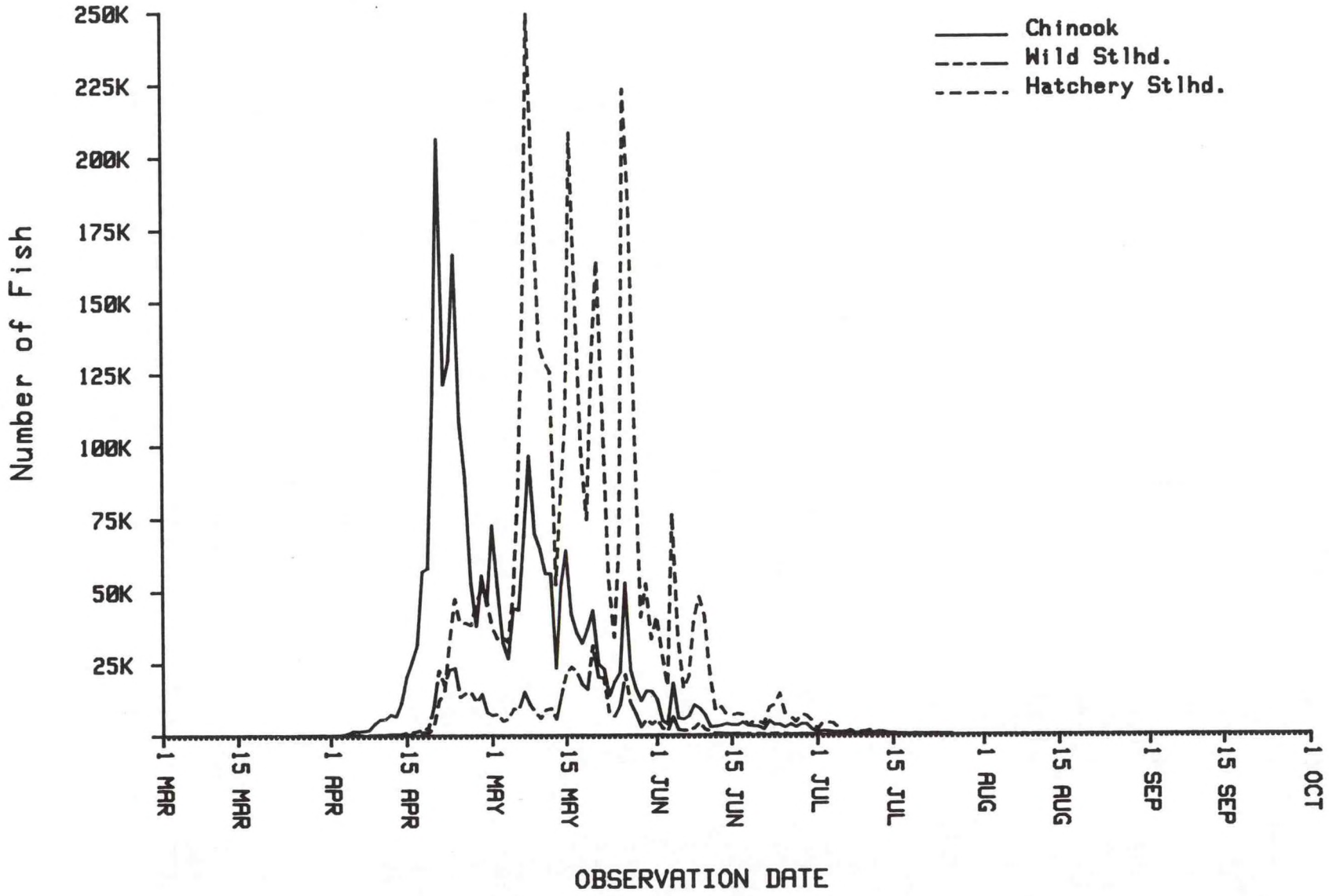
An estimated 1,903 sockeye/kokanee migrants were collected in 1988, up from 791 juveniles estimated during the previous season. The reduced numbers collected the past two seasons most likely reflects low discharge levels from Dworshak Reservoir because of the drought, and a corresponding decrease in kokanee discharged from the reservoir.

Workers counted 7,913 adult steelhead (predominately kelts) crossing the separator compared to 6,947 and 8,309 adults in 1987 and 1986, respectively. A total of 129 adult chinook were also counted.

Table 4. Annual collection, bypass, and transport at Lower Granite, 1981-1988

Year	Chinook	Steelhead		Coho	Sockeye	Total
		Hatchery	Wild			
Collection						
1981	904,181	1,901,173		602	6,529	2,812,485
1982	471,736	1,458,060		240	11,993	1,942,029
1983	1,140,114	1,326,091		8	5,354	2,471,567
1984	925,971	1,114,740		256	11,152	2,052,119
1985	1,786,252	2,234,958	454,621	35	6,467	4,482,333
1986	1,676,980	2,547,549	542,002	85	7,410	4,774,026
1987	2,497,635	2,463,039	550,947	22	791	5,512,434
1988	2,790,395	4,148,456	593,464	0	1,903	7,534,218
Bypass						
1981						0
1982						0
1983						0
1984						0
1985	7,600	4,742	903	0	0	13,245
1986	48,645	20,813	11,502	0	3	80,963
1987						0
1988						0
Truck						
1981	232,543	156,246		0	0	388,789
1982	162,587	235,353		85	5,642	403,667
1983	518,984	62,624		3	645	582,256
1984	135,630	39,157		43	2,713	177,543
1985	73,962	25,351	2,946	0	1,057	103,316
1986	77,990	44,005	6,331	0	309	128,635
1987	56,931	201,496	23,430	0	34	281,891
1988	85,308	148,807	6,337	0	277	240,729
Barge						
1981	642,323	1,699,744		0	0	2,342,077
1982	304,780	1,137,959		128	5,082	1,447,949
1983	578,432	1,202,659		5	4,697	1,785,793
1984	785,759	1,074,518		213	7,987	1,868,477
1985	1,699,035	2,201,103	450,590	35	5,359	4,356,122
1986	1,544,853	2,478,633	524,022	84	7,033	4,683,260
1987	2,409,664	2,251,160	527,176	22	752	5,188,774
1988	2,689,974	3,985,553	586,994	0	1,610	7,264,131

Figure 12. Daily counts of juvenile yearling, wild and hatchery steelhead collected during 1988 at Lower Granite Dam.



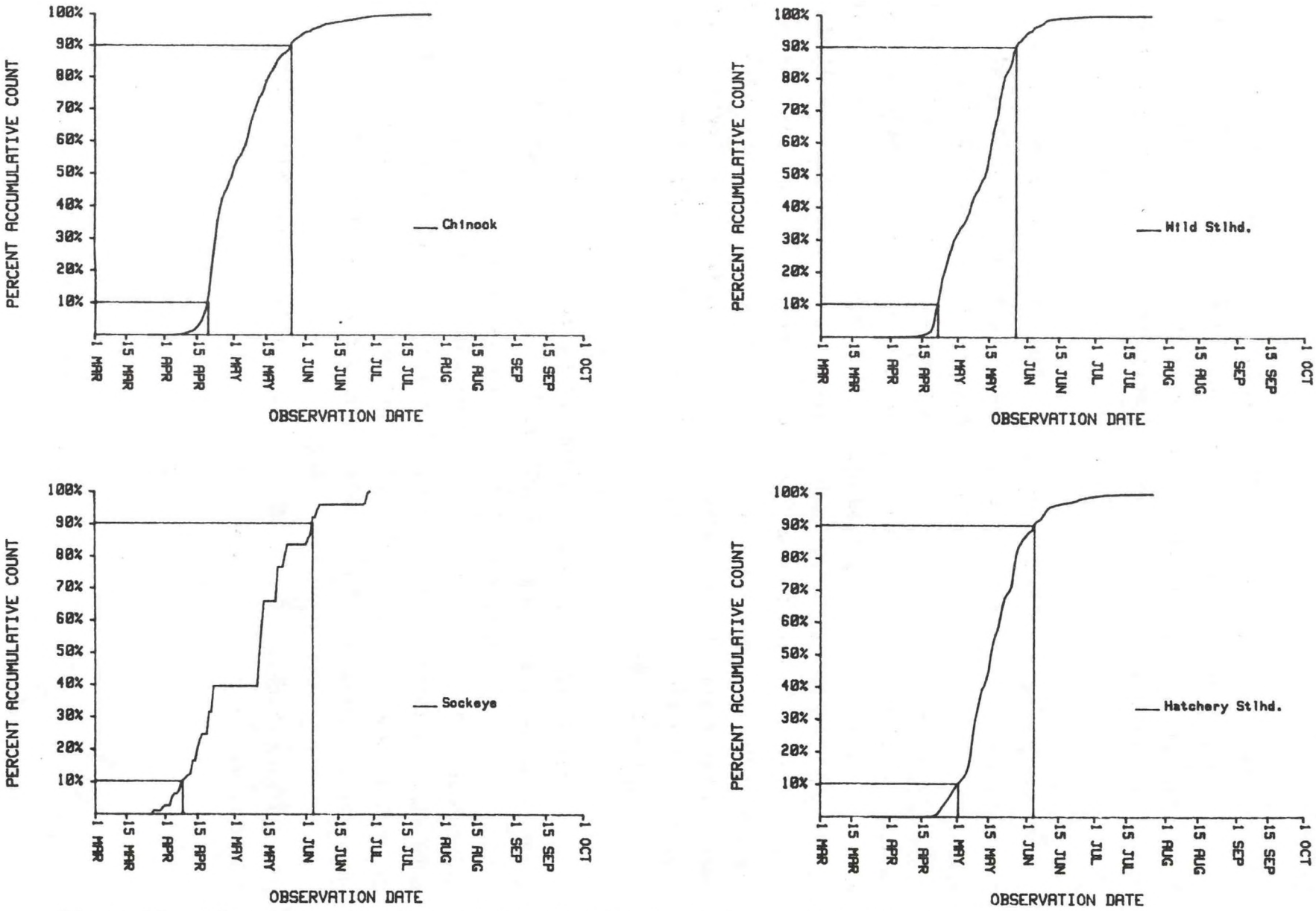


Figure 13. Time frame when 10% and 90% of chinook, sockeye, wild and hatchery steelhead were collected at Lower Granite Dam during 1988.

Transportation

An estimated 7,504,860 juvenile salmonids were transported. Of these, 240,729 (3.2%) were transported by truck and 7,264,131 (96.8%) were barged. Daily truck and barge summaries are listed in Appendix tables 2 and 3. No juveniles were marked for transport evaluation studies in 1988 due to low flow condition.

Truck transport started on March 28. Because collection numbers were extremely low, fish were held six days until the second truck departed on April 4. Alternate day trucking began on April 5 and continued until April 11. After the April 11 trip, juveniles were collected and held four days, at which time alternate day barging was initiated and continued until April 21. Daily barging began on April 22 and continued until June 3 (Figure 8). Alternate day barging resumed on June 4, continuing until June 14 when barging from the Snake River was concluded. Juveniles were transported by truck from June 15 to the end of the collection season, July 26. Collection peaks on May 7 and June 24 necessitated the use of two trucks because barge capacity was exceeded. Thirty truck trips and 53 barge trips were made from Lower Granite in 1988.

Approximately 13,736 migrants were transported during the early trucking phase, 0.42% of the chinook and 0.04% of the steelhead transported. During the late trucking phase, 226,993 juveniles were hauled. Of these, approximately 32.4% were chinook, 65.1% were hatchery steelhead, and 2.5% were wild steelhead. The late trucking phase accounted for 94.3% of the juveniles transported by truck, 2.7%, 3.6%, and 1.0% of total chinook, hatchery steelhead and wild steelhead transported, respectively.

Barging accounted for 96.9% of chinook, 96.4% of hatchery steelhead and 98.9% of wild steelhead transported.

Bypass

Because of the drought, no juveniles were bypassed in 1988. No major problems occurred to either the bypass/collection system or the separator equipment to warrant temporary periods of bypass. As previously mentioned, no marked fish were released to the river as controls for transport research. Pre-and post-season bypass operations occurred between March 15-25 and from July 24 and August 29.

FISH CONDITION

Descaling

Juvenile descaling rates were recorded daily at the facility. Descaling criteria were revised by FTOT early in the transport season (April 4). The "type-9" descaling category (Koski et al. 1986) was incorporated in the "descaling left and/or right side" designations. In addition, a descaling definition addressed "cumulative scale loss" as equivalent to or exceeding the 40% of two body sections. This description was recorded as "descaled". The cumulative scale loss was described as "the sum of the area of all patterns of scale loss (narrow band, patchy, sectional, etc.) on one side of the fish." Optional descriptions were also incorporated including descriptions for torn opercula, bird and mammal induced injuries, and external parasite fungus infections (Figure 10). Weekly descaling rates are summarized in Table 5.

Chinook descaling averaged 2.4%, hatchery steelhead 1.4% and wild steelhead 0.98% at Lower Granite's juvenile facility in 1988. Combined descaling for all species was 1.7%. Chinook descaling improved over last season (3.3%) and represented the second lowest rate yet recorded. Steelhead descaling, for both hatchery and wild migrants was identical to the levels recorded in 1987, the lowest rates recorded at the facility (Table 6).

Table 5. Percent weekly descaling rates for juveniles sampled at Lower Granite Dam, 1988.

Dates	Chinook	Steelhead	
		Hatchery	Wild
March 25-31	0.0[a]	0.0[a]	0.0[a]
April 1-7	1.0[a]	0.0[a]	0.0[a]
April 8-14	1.0	1.0[a]	0.0[a]
April 15-21	2.3	1.0[a]	1.0[a]
April 29-May 5	4.6	1.1	1.4
May 6-12	5.0	1.0	1.0
May 13-19	2.9	1.0	1.0
May 20-26	2.9	3.0	1.0
May 27-June 2	1.9	2.0	1.4
June 3-9	2.9	2.3	1.3
June 10-16	2.0	1.3	1.7[a]
June 17-23	1.6	1.3	NA
June 24-30	1.3	1.0	NA
July 1-7	2.2	1.0	NA
July 8-14	1.0	1.2[a]	NA
July 15-21	0.0[a]	1.0[a]	NA
July 22-26	0.0[a]	0.0[a]	NA

[a] Sample period had at least one day with less than 50 fish in sample.

Table 6. Average season percent descaling for juvenile chinook and steelhead sampled at Lower Granite Dam, 1981-1988.

Year	Chinook		Steelhead	
	Yearling	Subyearling	Hatchery	Wild
1981	15.5		16.8	
1982	8.8		10.8	
1983	3.0		4.1	
1984	3.0		2.3	
1985	1.9	2.1	4.2	1.1
1986	3.7	---	4.7	1.8
1987	3.3		1.4	1.0
1988	2.4		1.4	1.0

Mortality

Overall system mortality at Lower Granite was only 0.35% during the 1988 transport season compared to 0.72% in 1987. A combination of environmental

and operational factors helped reduce mortality normally associated with low flow migration conditions. Water temperatures remained unusually low during the peak of the migration and well into the latter part of the season. An important factor which can't be measured but most likely played a major role in lowering system mortality, was the spread of the peak collection period. Peak collection in 1988 was characterized by greater numbers of peak days, over a longer period of time, and resulted in lower holding and handling densities. In addition, project workers were able to increase the amount of direct barge loading and spread collected fish throughout a larger number of raceways. Workers also felt that system mortality decreased because of Idaho's hatchery practice of staggering releases to maximize the separation between spring/summer chinook and steelhead. This separation not only reduced the size of the collection peaks, but also lowered the chinook/steelhead ratio in the raceways, transport vehicles and sample tanks.

Chinook mortality dropped from 1.20% in 1987 to 0.46% in 1988 (Table 7). Peak collections days for chinook and hatchery steelhead were 17 days apart (Appendix Table 1), whereas peak collection for both species occurred on the same day in 1987. Mortality rates for hatchery steelhead was 0.33% while wild steelhead migrants only suffered 0.02%. Combined steelhead mortality was measured at 0.34%. Daily mortality rates increased near the end of the season, exacerbated most likely, by extreme drought conditions.

Table 7. Percent system mortality at Lower Granite Facility, 1981-1988.

Year	Chinook			Steelhead		
	Yearling		Subyearling	Hatchery		Wild
1981		0.7			0.1	
1982		0.8			0.1	
1983		0.7			0.2	
1984	0.4	0.5	0.7		0.1	
1985	0.3	0.3	2.3	0.2	0.2	0.1
1986	0.3	0.3	2.3	0.2	0.1	0.1
1987		1.2		0.4	0.4	0.1
1988		0.5		0.3	0.3	0.1

Mortality estimates at the facility do not include a barge loading incident which occurred during the evening of May 4. At approximately 2215

hours, a direct load line ruptured spilling fish onto the barge deck. Workers estimated that the spill lasted for 15 to 30 minutes resulting in a loss of 2,050 to 4,100 fish based on hourly counts. The biological technician on duty, reacting quickly, diverted loading back to the raceway mode and began removing fish off the barge deck. Aided by a tug deck hand, they were able to return 40% of the stranded fish to the nearest barge hold, and the remainder to the river.

The mortality rate in the marking/sample building increased for six days in early June due to a pre-anesthetizing incident associated with the daily fish sampling operations. Smolt monitoring personnel accidentally mixed tricane methanesulfonate (MS-22) with alcohol (a mixture of benzocaine and alcohol is normally used for this purpose). The mixture was used for several days before discovery, resulting in an estimated 5.0% mortality, 361 of 7,200 fish in the sample recovery tank. The effected fish showed severe signs of stress (total mucus layer loss) and probably suffered a high degree of delayed mortality during barge transport.

For the purpose of this report dead and moribund fish dipped from the barge holds within the first two hours after loading are reported as facility related mortalities. Adding these fish to the system mortality rate raises the percentages to 0.85% for chinook and 0.31% for combined steelhead. It should be pointed out that juvenile fish mortality estimates for the facilities raceways are probably underestimated because of unobserved dead fish on the raceway's floor. There are no means at this time to count these individuals without causing additional stress to healthy fish within the raceways.

FACILITY OPERATIONS AND MAINTENANCE

Debris/Trash Racks

The drought and extremely low snow pack resulted in minimal trash accumulation in Lower Granite's forebay. Project personnel dipped trash from

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1982		0.8			0.1	
1983		0.7			0.2	
1984	0.4	0.5	0.7		0.1	
1985	0.3	0.3	2.3	0.2	0.2	0.1
1986	0.3	0.3	2.3	0.2	0.1	0.1
1987		1.2		0.4	0.4	0.1
1988		0.5		0.3	0.3	0.1

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FACILITY OPERATIONS AND MAINTENANCE

Debris/Trash Racks

The drought and extremely low snow pack resulted in minimal trash accumulation in Lower Granite's forebay. Project personnel dipped trash from

powerhouse gatewells when surface coverage in each slot approached 25%. Generally, slots were dipped once or twice per week during the peak collection period, and less than once per week from mid-June until the end of the season. Project workers and FTOT expect, and stress the likelihood of a severe floating debris accumulation at the project if the 1989 runoff is normal or above.

Trash racks were only raked once during the 1988 migration, in conjunction with STS installation in early March. Gatewell orifices were checked at least twice daily during the season and more frequently during higher collection periods.

Submersible Traveling Screens

No major modifications were made to STSs prior to the 1988 transport season. Screens were installed in units 1-4 on March 8 and in units 5-6 on March 9. Screens were cycled (4 minutes on, 20 minutes off) for the entire collection season. There were no STS problems during 1988 operations.

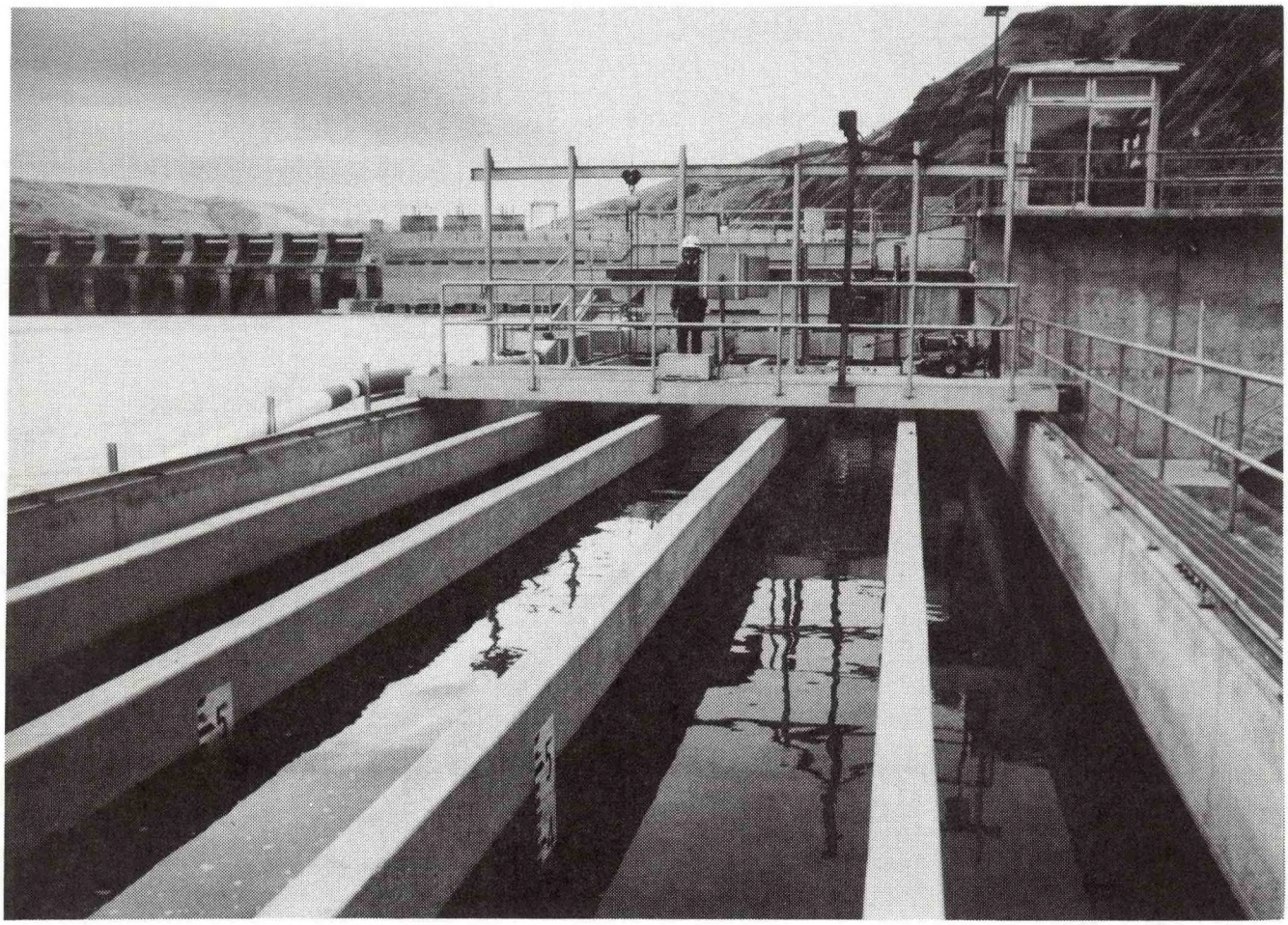
Video inspections of STS were conducted on April 19 and May 24 for units 1-3; April 20 for units 4 and 5; and April 20 and May 25 for unit 6. No problems were found during video inspections. Upon removal of STSs after the transport season, workers determined that only minor repairs would be necessary prior to 1989 use.

Wet Separator/Distribution System

The juvenile separator operated without any major problems. North and south shore make-up gallery gates needed minor attention during the 1988 season. As forebay elevations changed, these gates adjusted the intake water level to maintain a smooth flow condition throughout the collection channel. Powerhouse operators had to maintain a constant monitoring of this process and were required to provide manual assistance to the automatic controls when needed.

Direct Barge Loading Operations

During 1988, approximately 59.3% of the barged fish were directly loaded compared to 31.9% and 55.4% in 1987 and 1986, respectively. It appears that maximizing direct barge loading reduces facility mortality. The efforts by captains to decrease turn-around-time, bringing the third and fourth barges on as collection numbers increased and the more prolonged (longer peak mode) collection period all allowed more direct loading.



TRANSPORT/BYPASS OPERATIONS - LITTLE GOOSE DAM, 1988

The 1988 juvenile fish transportation season at Little Goose Dam was another successful operation despite a second continuous year of drought. The peak average daily flow was 88.3 kcfs on May 7, but average daily flows were 60 to 85 kcfs from May 5 to June 9, so river conditions were fairly good for fish passage throughout most of the outmigration.

FACILITY MODIFICATIONS

No major modifications were made at Little Goose facilities prior to the 1988 transport season. However, operating gates in A and B slots of all units were raised the same as Lower Granite. Two other minor modifications were made:

1. The inner, upstream edge of the camlock fitting on the barge loading hose was machined to provide a smoother surface inside the hose, thus reducing fish injury.

2. A fixed steel clamp was installed on the tailrace retaining wall to hold the barge loading line firmly in place.

COLLECTION OF JUVENILES

Migration and Collection

Juvenile fish were collected from April 6 through July 14, a period of 100 consecutive days. Facilities were operated for maximum collection, and all fish were transported because river flows remained below the 100 kcfs trigger for bypassing chinook salmon.

An estimated 1,726,771 juvenile salmon and steelhead were collected (Table 8). Composition by species was 48.0% chinook, 44.2% hatchery

steelhead, 7.8% wild steelhead, and 0.1% sockeye. This was based on daily sample counts which comprised 0.9% of the total collection (16,162 fish).

Total collection declined for the fifth consecutive year (Table 8) in comparison with collection at Lower Granite Dam (Table 4) where collection continued to increase. This trend may be due to reduced or total lack of spill in recent years and increased collection efficiency because of the effects of raised operating gates at Lower Granite Dam. Increased residualism in Little Goose Reservoir caused by lower than normal flows may also contribute to this trend.

The juvenile fish outmigration was typically distributed over the season in contrast to compressed runs observed in 1981 and 1987 (Table 9). Collection exceeded 10% of the annual total for four weeks compared with four or five weeks in 1982 through 1986. Forty percent or more passed in a single week in 1981 and 1987, and collection exceeded 10% for three weeks only during each of these years. The holding capacity of the facility was not exceeded in 1988. The maximum poundage loaded into a raceway was 3,008 pounds on April 23, less than the maximum capacity of 6,000 pounds per raceway.

Table 8. Annual collection, bypass, and transport at Little Goose Dam, 1981 to 1988.

Year	Chinook	Steelhead		Coho	Sockeye	Total
		Hatchery	Wild			
Collection						
1981	590,499	899,739				1,490,188
1982	351,716	763,260	165,280	215	5,031	1,265,503
1983	303,034	566,940	122,179	63	3,432	995,648
1984	1,030,253	1,695,494		0	11,677	2,737,424
1985	1,142,815	959,999	164,083	0	3,721	2,270,618
1986	725,511	1,144,436	220,973	0	2,312	2,093,232
1987	1,021,760	812,065	141,852	1,009	6,635	1,983,321
1988	828,016	762,534	133,777	0	2,444	1,726,771
Bypass						
1981	0	0		0	0	0
1982	0	0		0	0	0
1983	105,254	14,252		0	47	119,553
1984	361,853	83,407		0	662	445,922
1985	195,008	34,466	17,591	0	715	247,780
1986	26,970	5,283	33	0	119	32,405
1987	15,866	29,311	5,563	0	0	50,740
1988	0	0	0	0	0	0
Truck						
1981	211,630	106,012		0	0	317,642
1982	113,721	81,635		201	2,294	197,851
1983	83,715	39,210		0	918	123,843
1984	178,176	55,506		0	2,133	235,815
1985	34,846	7,106	783	0	500	43,235
1986	50,028	17,153	11,538	0	669	79,388
1987	15,834	20,143	2,819	0	49	38,845
1988	14,706	36,001	1,315	0	262	52,284
Barge						
1981	372,681	774.668		0	0	1,147,349
1982	218,568	815,825		14	1,852	1,036,259
1983	108,228	634,436		63	2,367	745,094
1984	467,919	1,562,043		0	8,530	2,038,492
1985	897,520	918,569	147,351	0	2,305	1,965,745
1986	646,611	1,114,284	210,366	0	1,504	1,972,765
1987	971,888	758,510	133,252	993	6,538	1,871,181
1988	801,955	719,896	132,136	0	2,142	1,656,129

Table 9. Weekly collection as a percentage of total annual collection at Little Goose Dam, 1981 to 1988.

Dates	1981	1982	1983	1984	1985	1986	1987	1988
Mar 26-Apr 1	----	----	----	----	0.1[a]	0.4[a]	----	----
Apr 2-8	----	----	0.7[b]	1.9[a]	0.1[a]	1.7	0.1	0.0[a c]
Apr 9-15	0.1[a]	1.1	3.3[b]	3.1	1.2	3.6	0.3	0.0
Apr 16-22	0.1	4.7	0.1[b]	6.0	8.2	9.5	2.2	3.7
Apr 23-29	13.2	12.9	4.6[b]	13.5	21.2	16.2	15.1	15.5
Apr 30-May 6	39.7	11.4	4.6[b]	13.5	21.2	16.2	15.1	16.9
May 7-13	8.2	17.3	19.6	16.2	21.6	14.2	26.2	23.2
May 14-20	6.8	17.4	12.9	19.4	10.4	11.4	5.4	16.2
May 21-27	11.5	13.7	18.7	10.2	11.9	10.9	1.7	9.5
May 28-Jun 3	8.3	6.6	17.0	6.8	7.5	9.2	0.7	6.3
Jun 4-10	4.3	2.1	6.6	4.0	3.3	3.3	0.7	6.3
Jun 18-24	2.3	2.9	2.1	2.3	0.5	0.4	0.4	1.2
Jun 25-Jul 1	0.8	2.0	2.7	1.7	0.3	0.3	0.5	1.0
Jul 2-8	0.5	4.5	4.2	1.2	0.5	0.1[a]	0.3	0.4
Jul 9-15	0.6	0.8	----	0.7	0.5	-----	0.1[a]	0.3
Jul 16-22	0.2	0.6	----	0.4	0.2	-----	----	----

[a]Less than seven days collection in the week.
[b]Problems forced facility shutdown one or more days during the week.
[c]Less than 0.1 percent collected.

Maximum daily collection coincided with the single water budget release. The peak daily collection of 89,731 fish on May 7 was considerably less than the record of 250,978 collected in 1987 (Table 10). Peak collection days for the various species came in quick succession with chinook peaking May 7 (52,215), steelhead May 8 (40,370), and sockeye May 9 (499). Daily collection totals are detailed in Appendix Table 5.

Table 10. Summary of peak collection days for chinook, steelhead, and sockeye at Little Goose Dam, 1981 to 1988.

Year	Chinook	Steelhead	Sockeye	Total Collection
1981	May 5 (66,817)[a]	May 5 (171,817)		May 5 (238,634)
1982	May 2 (20,723)	May 9 (37,619)	April 12 (267)	May 9 (44,591)
1983	April 23 (20,990)	May 11 (37,006)	June 2 (456)	May 11 (40,312)
1984	April 26 (38,828)	May 18 (95,652)	May 27 (1,176)	May 18 (101,637)
1985	May 4 (82,897)	May 9 (71,637)	May 4 (342)	May 4 (93,613)
1986	April 26 (49,380)	May 10[b] (46,625)	June 8 (232)	April 26 (66,460)
1987	May 2 (131,755)	May 7[c] (170,244)	April 29 (2,764)	May 7 (250,978)
1988	May 7 (52,215)	May 8[d] (40,370)	May 9 (499)	May 7 (89,371)

[a] Numbers in parentheses are collection total for peak days.
[b] Hatchery steelhead peaked on May 10 (43,672) and wild steelhead peaked on April 29 (15,615).
[c] Hatchery and wild steelhead peaked on May 7 (140,540 and 29,704, respectively).
[d] Hatchery steelhead peaked on May 8 (36,289) and wild steelhead peaked on April 27 (6,413).

Transportation

An estimated 1,708,413 fish (98.9% of total collection) were transported from Little Goose Dam in 1988, of which 3.1% were trucked and 96.9% were barged (Table 8). Although fish collection began on April 6, transport did not begin until April 11. The initial intent was to load the first truck on April 10 in adherence to the FTOT Annual Work Plan criterion that fish are to be held no longer than four days. However, because water temperatures were low (49° F.), a barge was to arrive on April 11, and only about 100 fish would be held for five days, with FTOT approval,it was decided that the first load of fish would be transported by barge on April 11.

Except for no trucking early in the season, the timing and means of transportation were similar to other years. Barging began on April 11 and ended June 14. Fish were not loaded into barges at Little Goose on May 20 and 26 because all available space was reserved for fish at McNary Dam. Alternate day trucking extended from June 16 to July 14. Truck and barge summaries are provided in Appendix Tables 6,7.

Bypass

No fish were bypassed at Little Goose during the transport season. River flows did not exceed the 100 kcfs level which would have triggered the bypass of chinook. Holding capacity of the facility was never exceeded so no bypass was required. The facilities were operated in a bypass mode from March 15 to April 6, and from July 14 to August 29 before and after transport operations. Numbers of fish bypassed are unknown and therefore are not accounted for in this report.

FISH CONDITION

Descaling

Descaling rates at Little Goose Dam in 1988 were higher than in 1987. No facility problems were discovered that could have caused this increase and there was little debris accumulation. However, FTOT revised the sample descaling criteria in 1988 by discarding the "9" category and the requirement that 40% scale loss occur in two or more sections on the same side of the fish. Under the revised criteria, fish were recorded as descaled if the cumulative scale loss on one side of the fish was enough to exceed 40% of two or more sections (see Appendix 1). The revised descaling criteria may have eliminated some of the confusing aspects of the old system and likely provided a better estimate of the number of descaled fish. Because the new criteria resulted in some fish being recorded as descaled that would not have been under the old system, this probably contributed to the higher descaling

rates. The revised descaling criteria went into effect at Little Goose on April 25, 1988.

Smolts were examined for descaling only in daily samples in 1988. Descaling samples were not taken from the gatewells.

In 1988, 7,393 chinook smolts were examined for descaling. The weighted mean descaling rate for chinook was 12.7%, the highest rate recorded since 1983. For steelhead, 7,169 hatchery and 1,108 wild smolts were examined for descaling. The weighted mean descaling rate for all steelhead (hatchery and wild) was 3.4%, an increase over the 2.9% recorded in 1987 (Table 11). Weighted mean descaling rates for hatchery and wild steelhead, calculated separately, were 3.5% and 2.7%, respectively. The maximum daily descaling rate (for days when at least 50 chinook were sampled) was 24.2% on May 13. Maximum daily descaling rate for hatchery and wild steelhead combined was 9.8% on May 1 (8 of 82 fish).

Table 11. Average percent descaling for chinook and steelhead collected at Little Goose Dam, 1981-1988.

		Steelhead		
Year	Chinook	Hatchery	Wild	Weighted Total
1981	15.4	----	----	16.8
1982	26.0	24.9	6.1	21.6
1983	18.4	8.6	4.2	7.8
1984	7.1	3.5	1.5	3.1
1985[a]	7.9	3.4	1.5	3.1
1986[a]	8.8	4.9	2.5	4.4
1987[a]	8.6	3.2	1.0	2.9
1988[a,b]	12.7	3.5	2.7	3.4

[a]Descaling rates to early 1988 include the "9" classification.
[b]Change in descaling criteria on April 25.

The maximum weekly descaling rate was 15.5% during June 24-30 (Table 12). Maximum weekly descaling rate for hatchery and wild steelhead was 8.2% during June 10-16 (Table 12).

Table 12. Weighted average weekly descaling rates at Little Goose Dam, 1988.

Date	Chinook	Steelhead	
		Hatchery	Wild
Apr 7-8	10.3[a]	0.0[a]	0.0[a]
Apr 9-15	11.0	0.0	0.0a
Apr 16-22	9.0	0.0	2.1
Apr 23-29	13.4	6.8	1.8
Apr 30-May 6	12.8	3.2	4.5
May 7-13	13.2	3.8	1.6[a]
May 14-20	14.6	2.2	3.6
May 21-27	8.1	2.7	2.0
May 28-June 3	11.1	4.0	1.5[a]
June 4-10	13.1	5.5	4.9[a]
June 11-17	11.4	8.4	5.4[a]
June 18-24	12.8	4.3	5.7[a]
June 25-July 1	15.5	3.2	0.0[a]
July 2-8	9.9	2.5	0.0[a]
July 9-15	6.0	3.6	0.0[a]
Average	12.7	3.5	2.7

[a]Less than 100 fish sampled.

Mortality

The system mortality rate for chinook in 1988 was lower than in 1987 but higher than in 1985 and 1986, while steelhead mortality equaled the highest rate recorded for Little Goose since 1981 (Table 13). Mortalities totaled 11,355 chinook (1.4%), 6,963 steelhead (0.8%), and 40 sockeye (1.6%) (Table 13 and Appendix Table 5). The figure of 11,355 chinook mortalities includes 1,770 fish (0.2% of total chinook collection) that were sacrificed for bacterial kidney disease (BKD) research being conducted by the U.S. Fish and Wildlife Service.

Table 13. Percent system mortality at Little Goose Dam by year, 1981-1988.

Year	Chinook	Steelhead	Sockeye	Total
1981	1.3	0.8	---	1.0
1982	6.2	0.4	---	2.1
1983	2.7	0.4	---	1.1
1984	1.5	0.2	6.3	0.7
1985	1.0	0.2	2.7	0.7
1986	0.9	0.1	1.0	0.4
1987	1.8	0.5	0.6	1.1
1988	1.2	0.8	1.6	1.0

System mortality rates for chinook and steelhead increased substantially after the first week of June. This increase in mortality corresponded to decreasing collection, decreasing river flows, and increasing water temperatures.

Transport mortality that occurred during the first two hours of trucking was attributed to the collection facility. The truck transport mortality rate for the season at Little Goose in was estimated at 1.2% for chinook, 1.4% for steelhead, and 1.4% for chinook and steelhead combined. These figures were underestimates because only floating, accessible fish could be counted in the truck. An adequate estimate of transport mortality on barges could not be calculated for fish from Little Goose because they were generally loaded into holds containing fish from Lower Granite and it was impossible to distinguish between fish from the two facilities.

Total transport mortality involves the time period from loading at the facility to unloading below Bonneville Dam. Total trucking mortality was 1.8% for chinook, 2.2% for steelhead, and 2.1% for both chinook and steelhead combined. These figures are considered to be reasonably close to the actual values because mortalities were dipped from the truck periodically and the drivers made visual estimates when fish were unloaded.

Adult Fish Bypass

The number of adult chinook crossing the separator in 1988 was similar to previous years but the number of adult steelhead was the lowest since 1984 (Table 14).

Table 14. Summary of adult chinook and steelhead removed from the juvenile fish separator at Little Goose Dam, 1984-1988.

Year	Chinook	Steelhead
1984	-	2,557
1985	-	3,298
1986	142	3,404
1987	170	3,243
1988	157	2,591

FACILITY OPERATIONS AND MAINTENANCE

Debris/Trashracks

Low river flows and no spill at Lower Granite resulted in minimal amounts of debris at Little Goose. All trashracks were raked on March 9 and 10, prior to the early bypass period. Because of concern over high descaling rates, the trashracks for unit 1 were raked again on May 19. Minimal debris was observed.

Gatewells were checked daily for floating debris. Cleaning took place when debris approached 25% surface coverage of a gatewell. The need for cleaning was infrequent.

Submersible Traveling Screens

The STSs for slots 1A to 4B were installed on March 14 and the remainder installed on March 15. They were operated in a cycling mode (approximately 4 minutes on and 20 minutes off) throughout the season. The STSs 1A through 5B

were pulled for the season on September 1 and the rest were pulled on September 6.

Only minor problems were encountered with the STSs. The STSs in 5C and 6C were removed from operation on March 16 because of electrical problems. They were repaired and reinstalled the next day. Video inspection of all screens took place on April 26 and 27 and again on June 7 and 8. No problems were observed. During the post-season inspection by FTOT on September 14 the STSs were found to be in good condition.

Collection System

Orifices were cycled on Mondays and Thursdays throughout the transportation season. When an orifice light burned out it was usually replaced within one day. On two occasions, however, lights were out for two days. Water level in the hopper remained constant throughout the season with nearly all readings being 1.9 to 2.1 feet below the top of the hopper.

After the facility was dewatered and shut down on August 29, the usual maintenance work began on the 42/28-inch bypass pipe which carries fish from the hopper to the upwell. The pipe was inspected and the interior was found in better condition than in previous years. However, some settling of the lower end of the 28-inch pipe had occurred, possibly due to movement of material around it. Water which would normally drain out of the pipe was up to 9 inches deep, compared to an inch or so in previous years. The lower 40-foot section of the 28-inch pipe was uncovered so that it and the two associated joints could be inspected. Except for the settling, the pipe was judged to be sound and no further action was deemed necessary.

Distribution/Sampling System

The six electronic fish counters worked well this year in contrast to the experience in 1987. This was largely due to technical assistance provided by the National Marine Fisheries Service in November 1987 and occasionally during the 1988 fish run. This assistance was much appreciated.

Efforts were made throughout the season to evenly distribute fish in the raceways to reduce stress and possibly reduce the chance of disease transmission.

Gulls were not a significant problem around the raceway area. Although several fish were seen taken from the raceways by gulls, after being chased away by workers the gulls seemed to learn that they were not wanted and soon restricted their feeding activities to the river. For this reason protective netting was not installed over the raceways as recommended in the 1987 FTOT Annual Report.

RECOMMENDATIONS FOR 1989

Operations

1. Sampled fish should be pre-anesthetized (see item 3 below).

Facility Modifications

1. The distribution flume should be modified to reduce the number of fish holding in the area below the the counter tunnel exits. (This was implemented in August and September 1988.)

2. The distribution flume should also be modified to eliminate several abrupt edges which fish encounter. (This was implemented in August 1988.)

3. Install a pre-anesthetizing system in the fish sampling tank.

TRANSPORT/BYPASS OPERATIONS - MCNARY DAM, 1988

The 1988 collection was 9.6% less than the 1987 collection total although more fish were transported in 1988 than in 1987.

Low flow conditions similar to 1987 prevailed throughout the transport season and no spill occurred at McNary. Because of the low flow conditions no fish were bypassed except fish marked as control for the transport evaluation studies.

Although river flows were low, water temperature remained low through the spring and early summer which resulted in a decrease in facility related mortality. The Columbia River flows at McNary peaked at 240,800 cfs on May 14 with the lowest flow occurring on August 22, at 68,600 cfs.

FACILITY MODIFICATIONS

All recommendations expressed in the 1988 FTOT Annual Report were accomplished. Among these was the extension of the fish loading pipes to the temporary raceways 8 and 9 to reduce fish impingement on the water elimination screens. A newly designed revolving tail screen was installed in the raceway to ease dislodging debris. This was done by simply rotating the screen rather than manually lifting it and shaking off the debris. A low water alarm was installed on the separator to warn of water loss.

Braided dacron line was strung across the tailrace at intervals in an attempt to discourage gulls from feeding on smolts. Monofilament line was strung across the lower end of the ice and trash sluiceway also. The hand winch used to operate the sample tank crowder was replaced with an electric winch. A chute to carry debris from the sample tank was installed. The water elimination area (Johnson bar screen) on the separator was reduced in size.

COLLECTION OF JUVENILES

Collection

Collection began on March 24 and ceased on September 21. A total of 11,143,535 juvenile salmonids was collected. This was 1,182,499 fish lower than the record number collected in 1987 (12,326,034). Yearling chinook peaked on May 11 compared with May 10-11 in 1987. Peak daily collection (Figure 14) occurred on June 25 (628,800) of which 99.8% was subyearling chinook. The June 25 peak was a record daily count and on June 21 an hourly record was set when 133,557 fish (expanded) was counted.

The number of each species collected declined when compared to 1987 counts. Sockeye showed the greatest decline (-59.1%) and wild steelhead followed with a decline of 35.9%. Yearling chinook and hatchery steelhead were lower than 1987 by 13.9% and 12.1% respectively. Coho declined 5.7% and subyearling chinook 2.1%. Subyearling chinook comprised the highest proportion of the season total collection (61.8%) compared to 57% in 1987 (Table 15).

The 10th and 90th percentiles of the outmigration are shown in Figure 15. The policy of providing maximum protection of the middle 80% of the run continued.

The annual collection, bypass, barge and truck total for 1981 through 1988 is shown in Table 16.

Bypass

Flows at McNary exceeded the 220kcfs trigger for bypassing yearling chinook as specified in the FTOT Work Plan only 3 days, May 14, May 17, and June 3.

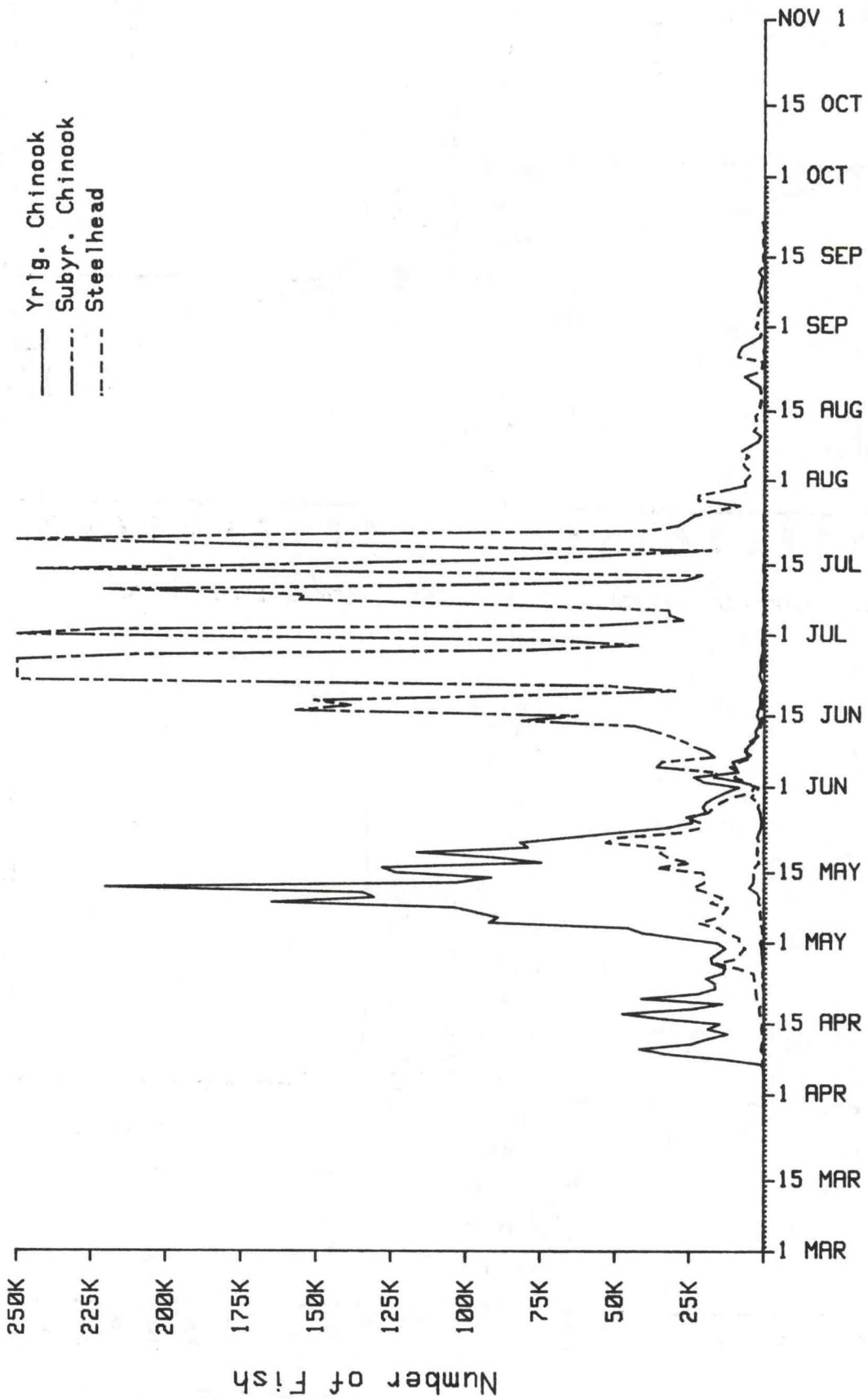
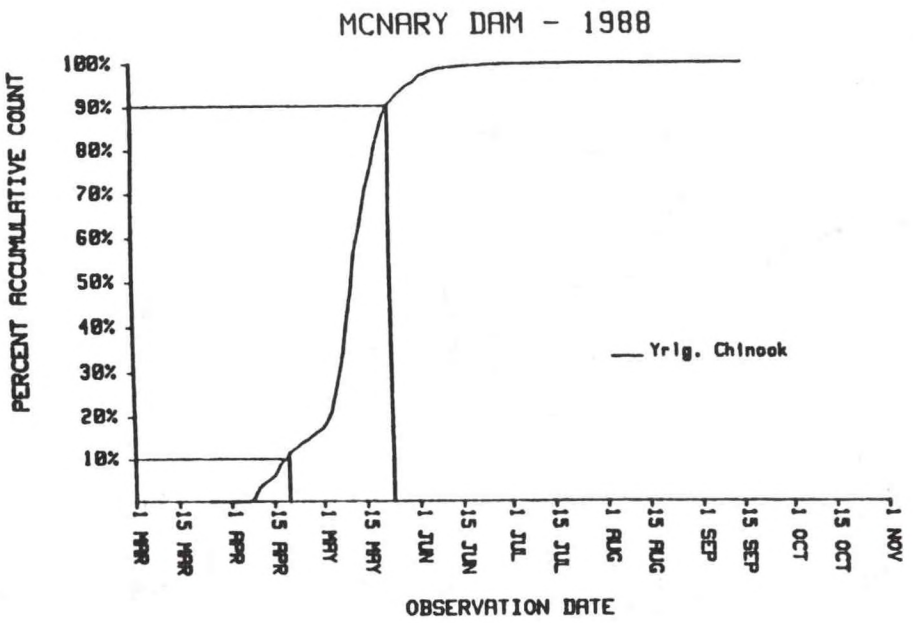
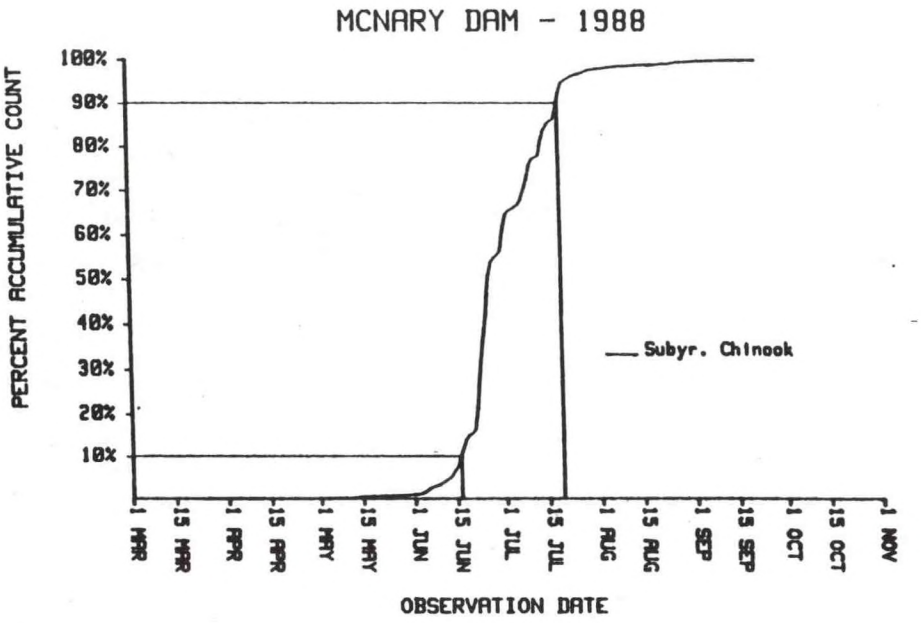
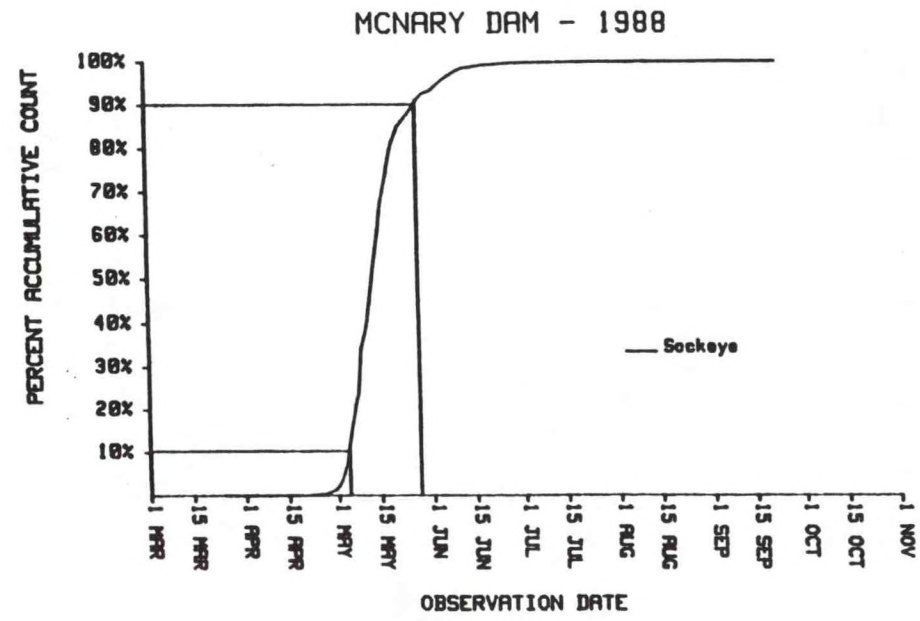


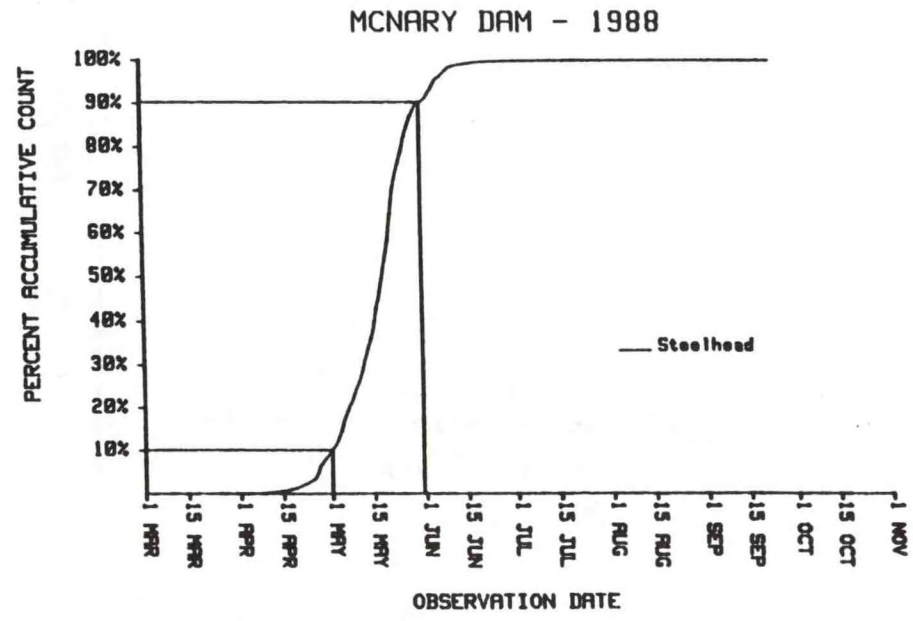
Figure 14. Daily counts of yearling chinook, subyearling chinook and steelhead collected at McNary Dam, 1988.

Figure 15. Time frame when 10% and 90% of yearling chinook, subyearling chinook, steelhead and sockeye were collected at McNary Dam, 1988.









All fish collected in 1988 were transported to avoid bypassing fish into a poor flow conditions. Marked control groups for transport evaluation (135,006) were released into the tailrace. The marked control groups comprised 1.2% of the total fish collected. Bypass continued until November 9 when all STSs were pulled and the flume was dewatered.

Table 15. Monthly Summary of Juvenile Collected, McNary Dam, 1988.

Month	Chinook [a/]		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	140	20	200	70	0	20	450
April	517,500	5,440	49,830	33,470	2,970	5,580	614,790
May	2,325,536	62,898	543,808	117,769	189,448	228,831	3,468,290
June	121,249	4,167,001	65,691	10,844	20,614	16,467	4,401,866
July	5,498	2,507,007	864	103	72	476	2,514,020
August	1,200	117,560	220	0	20	260	119,260
September	140	24,552	64	11	20	72	24,859
TOTAL	2,971,263	6,884,478	660,677	162,267	213,144	251,706	11,143,535
% of Collection	26.7	61.8	5.9	1.5	1.9	2.3	100.0

[a/] Includes 23,525 accelerated sub-yearling spring chinook released from Leavenworth NFH

Transportation

A record total of 10,820,592 juvenile salmonids were transported in 1988. This was 97.1% of the total collected (Table 16) compared to 78.3% transported in 1987. More fish were collected in 1987 (12,326,034) but, 2,345,147 were bypassed.

Barge transport began on April 12 and continued through July 27. A total of 9,140,843 juvenile salmonids were hauled by barge, 84.5% of the total transported (Table 16).

Table 16. Annual collection, transport and bypass at McNary Dam, 1981-1988.

Year	Chinook		Steelhead[a/]		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Collection							
1981	1,237,726	2,121,722		336,419	106,220	367,725	4,202,506
1982	822,009	1,696,104		364,174	74,741	195,412	3,152,440
1983	720,756	4,389,357		338,267	86,608	262,803	5,797,791
1984	1,261,187	4,098,004		610,511	82,144	191,930	6,243,776
1985	2,952,613	6,562,483		840,493	71,752	1,030,017	11,457,358
1986	2,486,407	6,135,379	500,979	215,356	80,436	797,040	10,215,597
1987	3,450,113	7,029,401	751,733	253,234	225,960	615,593	12,326,034
1988	2,971,263	6,884,478	660,677	162,267	213,144	251,706	11,143,535
Bypass							
1981	19,491	77,082		15,223	1,415	5,156	118,367
1982	8,726	74,650		7,965	8,066	13,849	113,256
1983	707,790	49,527		275,825	84,127	224,494	1,341,763
1984	967,693	159,401		244,579	40,750	92,518	1,504,941
1985	2,051,196	126,321		292,033	8,115	629,499	3,107,164
1986	2,184,582	167,549	231,598	137,042	47,369	538,526	3,306,666
1987	1,734,041	96,371	230,763	79,815	43,362	160,795	2,345,147
1988	74,996	60,010	0	0	0	0	135,006
Truck							
1981	286,476	2,031,925		77,109	12,851	31,198	2,439,559
1982	61,552	1,454,799		14,843	1,539	18,650	1,551,383
1983	4,997	2,044,524		15,639	871	8,357	2,074,388
1984	28,599	552,163		30,194	1,469	4,243	616,668
1985	188,849	199,796		12,206	79	1,694	402,624
1986	64,309	496,335	1,438	5,354	249	899	568,584
1987	686,168	426,725	132,509	69,010	8,375	37,834	1,360,621
1988	1,010,910	318,666	163,655	38,547	63,870	84,101	1,679,749
Barge							
1981	946,577	69,196		290,211	89,755	277,695	1,673,434
1982	719,640	133,185		330,684	62,751	154,880	1,491,140
1983	5,713	2,177,652		39,729	1,200	27,331	2,251,625
1984	263,973	3,357,820		336,453	38,633	95,085	4,091,964
1985	713,274	6,211,697		535,504	63,794	392,281	7,916,550
1986	225,459	5,352,212	265,357	72,705	32,733	243,371	6,191,837
1987	1,003,251	6,238,323	385,011	103,649	173,265	391,668	8,295,167
1988	1,842,043	6,377,598	490,919	122,595	148,295	159,393	9,140,843

a/ Steelhead were separated into hatchery and wild beginning in 1986.

Subyearling chinook comprised the majority of fish transported (61.9%) (Table 17). A combination of truck and barge was used during the peak of the spring season to avoid overloading the barges. Trucks were used every other day after barging operation ceased. Truck operations continued until September 21 and accounted for 1,679,749 fish being hauled which was 15.5% of the total transported.

Table 17. Monthly Summary of Juveniles transported, McNary Dam, 1988.

	Chinook		Steelhead				
Month	Yearling	Subyearling	Hatchery	Wild	Coho	Sockeye	Total
March	78	0	108	20	0	0	206
April	499,316	5,233	49,838	33,474	2,968	5,579	596,408
May	2,227,438	61,315	538,839	116,743	188,514	220,804	3,353,653
June	118,819	3,768,369	64,622	10,793	20,562	16,279	3,999,444
July	5,970	2,718,572	878	101	81	503	2,726,105
August	1,192	119,307	227	0	20	259	121,005
September	140	23,468	62	11	20	70	23,771
TOTAL	2,852,953	6,696,264	654,574	161,142	212,165	243,494	10,820,592
% of Transport	26.4	61.9	6.0	1.5	2.0	2.3	100.0
% of Collection	96.0	97.3	99.1	99.3	99.5	96.7	97.1

Sampling

A total of 767,284 fish were sampled in 1988 which was 5.9% of total collected. This compares with 830,000 or 6.7% sampled in 1987.

A split sample mode was incorporated by doubling the sampling frequency and reducing sample duration by one half. As a result, samples were taken six times per hour instead of the usual three. This gave a more representative sample of fish exiting the separator.

The holding criteria of 15,000 fish in the sample tank was exceeded eight days. Early processing of sampled fish during peak collection reduced fish density in the sample tank. No obvious stress-related problem due to

overcrowding occurred. When a sample rate change became necessary during a 24 hour sample period, fish were crowded beyond the counter tunnels and processed as soon as possible. Fish sampled at the new rate were held on the opposite side of the crowder screen. This procedure allowed full separation of the two respective samples collected within the 24 hour period.

FISH CONDITION

Descaling

The FTOT descaling criteria were revised in April 1988. Two categories, "sectional" and "9", were combined into a single new category called "descaled" (see Descaling p. 21). Comparison can be made with data from previous years by combining "sectional" and "9" categories to be equivalent to the "descaled" category in 1988. Annual descaling rates are compared in Table 18.

Table 18. Annual descaling rates (percent) at McNary, 1985-1988.

	Chinook		Steelhead			
	Yearling	Subyearling	Hatchery	Wild	Coho	Sockeye
1985	6.0	1.5	2.2		8.5	8.8
1986	7.0	3.2	4.4		3.6	21.1
1987	5.5	1.1	4.6	4.0	4.4	10.9
1988	7.6	1.2	7.4	3.7	5.7	10.4

Monthly sample tank descaling rates show a relatively large increase compared to 1987 for yearling chinook (+2.1%), hatchery steelhead (+2.9%), and for coho (+1.9%). A slight decrease in descaling was evident for wild steelhead (-0.4%) and for sockeye (-0.5%) when compared with 1987 data. (Table 19).

Descaling, apparently caused by bird attacks upstream from McNary Dam, occurred in 1.68% of all steelhead sampled.

Table 19. Monthly sample tank descaling rates (percent), McNary Dam, 1988.

Month	Chinook		Steelhead		Coho	Sockeye	Weighted Average
	Yearling	Subyearling	Hatchery	Wild			
Mar	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apr	3.3	0.0	3.4	3.6	0.0	0.0	3.3
May	9.4	0.0	6.9	3.3	5.9	10.5	8.4
Jun	13.8	1.8	13.2	6.0	3.8	9.2	5.0
Jul	0.0	0.6	0.0	0.0	0.0	0.0	0.6
Aug	0.0	1.2	0.0	0.0	0.0	0.0	1.2
Sep	0.0	1.8	0.0	0.0	0.0	0.0	1.8
Weighted Average	7.6	1.2	7.4	3.7	5.7	10.4	5.3
Daily Max.	21.0	8.3	20.7	18.8	10.5	15.2	
Daily Min.	0.0	0.0	0.0	0.0	3.0	3.2	

Physical Injury

Collection of small numbers of decapitated yearling chinook and steelhead was a frequent occurrence in the early spring. Eye injuries were occasionally observed on spring migrants. Torn opercula were observed on each species sampled. The incidence of steelhead with injuries from birds increased as the season progressed and reached a peak of 33.0% of the June 10 sample. Overall 7.3% of all steelhead sampled showed evidence of injury or descaling caused by birds. Evidence of injury caused by birds on other species declined with decreasing fish size. Smaller fish are more easily captured, and less likely to escape predation encounters.

Wounds caused by juvenile Pacific lamprey, parasitic copedods and leeches were found most often on subyearling chinook. External columnaris lesions were prevalent on subyearling chinook in late summer. Nearly 20.0% of all hatchery steelhead sampled this season showed signs of injury or were descaled. A summary of body/head injuries and total descaling rates are shown in table 20.

Table 20. Summary of body/head injury and descaling rates (percent) at McNary Dam, 1988.

Condition	Chinook		Steelhead		Coho	Sockeye	Weighted Average
	Yearling	Subyearling	Hatchery	Wild			
Body/Head Injuries	3.5	2.4	11.8	5.9	4.3	3.3	4.1
Descaled	7.6	1.2	7.4	3.7	5.7	10.4	5.3
TOTAL	11.1	3.7	19.2	9.6	9.9	13.7	9.4

Mortality

Overall system mortality was lower in 1988 than in 1987 (Table 21). The greatest reduction occurred for subyearling chinook (-1.95%) and sockeye (-0.93%). Increases over 1987 levels occurred for yearling chinook (+0.64%), hatchery (+0.31%) and wild steelhead (+0.20%), and coho (+0.04%).

Table 21. 1988 McNary System Mortality Rates by month (percent).

Month	Chinook		Steelhead				Average
	Yearling	Subyearling	Hatchery	Wild	Coho	Sockeye	
March	2.1	0.0	0.0	0.0	0.0	0.0	1.1
April	0.7	4.1	0.2	0.1	0.1	0.4	0.6
May	1.6	2.5	0.7	0.5	0.5	3.4	1.5
May [a/]	0.1	1.8	0.4	0.2	0.2	2.7	0.9
June	0.7	0.6	1.5	0.5	0.2	1.4	0.6
July	0.7	3.8	7.5	1.9	6.9	0.4	3.9
August	0.7	3.4	4.1	0.0	0.0	0.4	3.3
September	0.0	4.4	3.1	0.0	0.0	2.8	4.4
Weighted Average	1.4	1.9	0.8	0.4	0.5	3.2	1.7
Average[a]	0.9	1.9	0.5	0.2	0.2	2.6	1.5

a/ Mortality calculated without the May 13 raceway kill.

An accidental fish kill occurred on May 13, when a raceway inflow valve was not opened after changing raceways. An estimated 15,385 yearling chinook, 435 subyearling chinook, 2151 hatchery steelhead, 415 wild steelhead, 574 coho, and 1553 sockeye were lost. System mortality, calculated without these fish, shows yearling chinook with the only increase in mortality (+0.12%) over 1987.

Cooler water combined with an early migration peak helped reduce system mortality for subyearling chinook. Initiation on July 8 of FTOT turbine loading criteria which shifted generation to the north end of the powerhouse contributed to lower overall mortality. Even though special powerhouse loading criteria were in effect, elevated mortality due to thermal stress began in the early afternoon of July 17. By the July 18 noon count, system mortality, primarily subyearlings, had risen from the July daily average of 1.2% to 8.3%. On July 19 system mortality increased to 14.3% or 36,776 mortalities for the day. Mortality dropped to 4.2% on July 20 and reached 1.9% by July 22. Mortality remained moderate to July 26 but gradually increased as system water continued to warm. Temperatures of 75°F were recorded for water exiting the upwell tank on July 24 and 25. A noticeable increase in mortality began at 1100 hours on July 26 and reached 33.8% by noon July 27. Visual observations of smolts in the gatewells of units 1 and 6, combined with information from gatewell and flume thermal profiles (Figures 16 and 17), showed that unit one was a hot spot. Unit 1 was operating continously to provide attraction flow for adult passage.

After coordination with the Fish Passage Center, Unit 1 shut down on July 27. Mortality dropped to 18.9% on July 28. Thermal profiling on July 28 verified that passage conditions were more favorable in both the gatewells and the flume (Figures 18 and 19.). Improved passage conditions were the result of both the discontinued operation of unit 1 and overall cooler system water. Mortality fluctuated from 8.2% to 15.9% for the following four days and finally declined.

The percentages of adult chinook, sockeye, and steelhead using the Oregon ladder for the 12 days before, 12 days during, and 12 days after the unit 1 outage are compared in Table 22. The comparison indicates that percentage usage of the Oregon ladder by adults of all three species during the outage of unit 1 increased above levels seen before and after.

Sample tank mortality in 1988 (Table 23) for all species combined was considerably below that recorded in 1987 and the lowest since 1984 (Table 24). The largest reduction (3.4%) in mortality was recorded for sockeye.

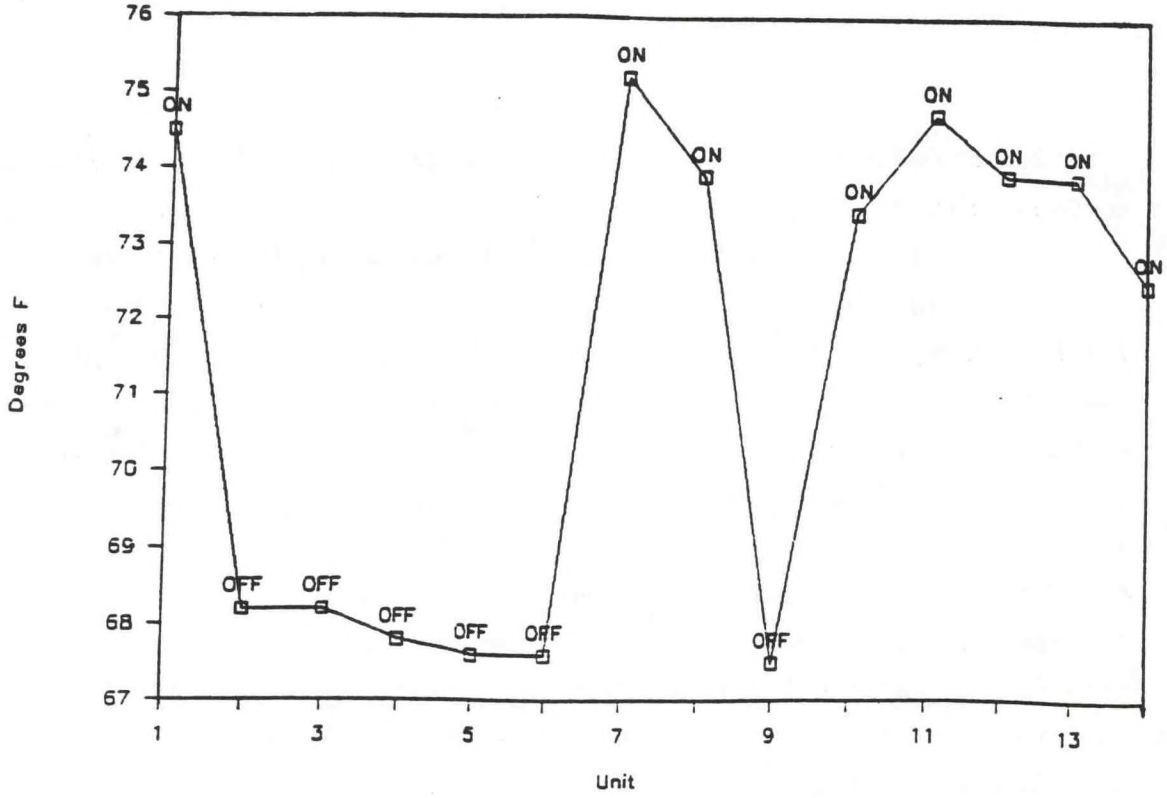


Figure 16. **Temperature taken in the gatewells at 27 ft. depth on July 27, 1988 comparing units operating (on) and not operating (off) at McNary Dam.**

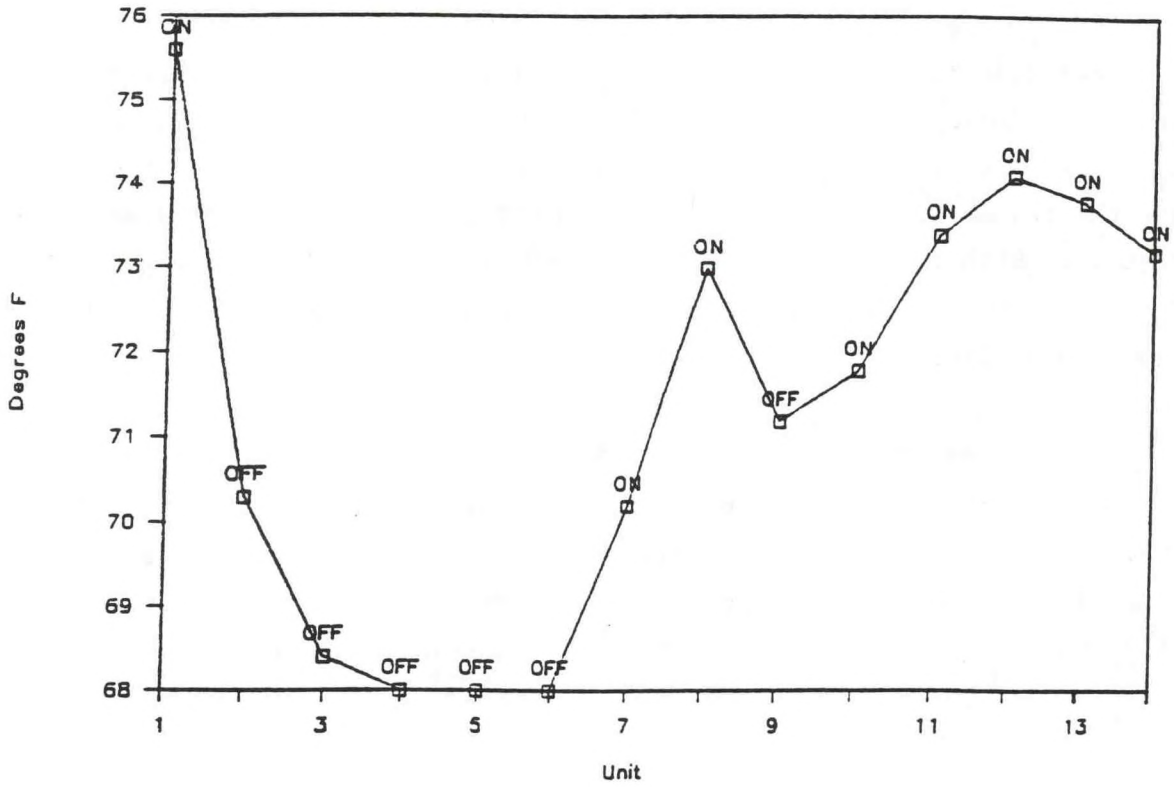


Figure 17. **Temperatures taken in the collection flume on July 27, 1988 comparing units operating (on) and not operating (off) at McNary Dam.**

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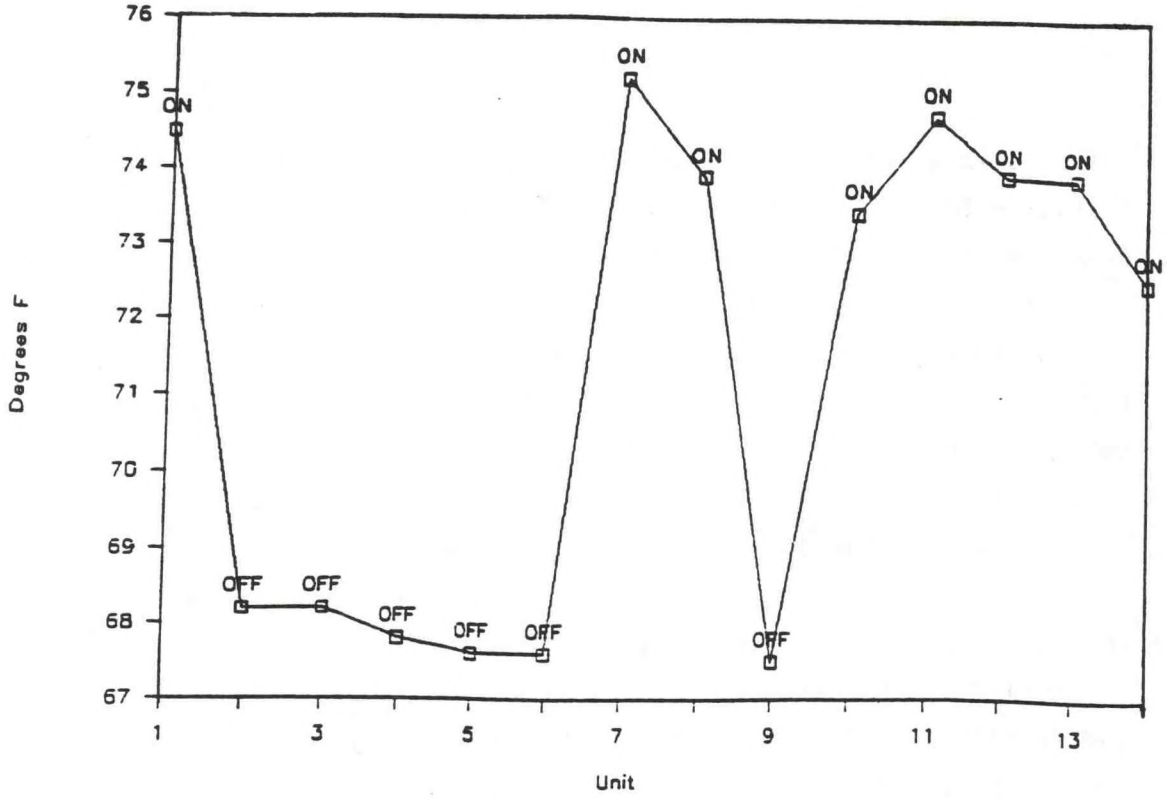

Figure 16. **Temperature taken in the gatewells at 27 ft. depth on July 27, 1988 comparing units operating (on) and not operating (off) at McNary Dam.**

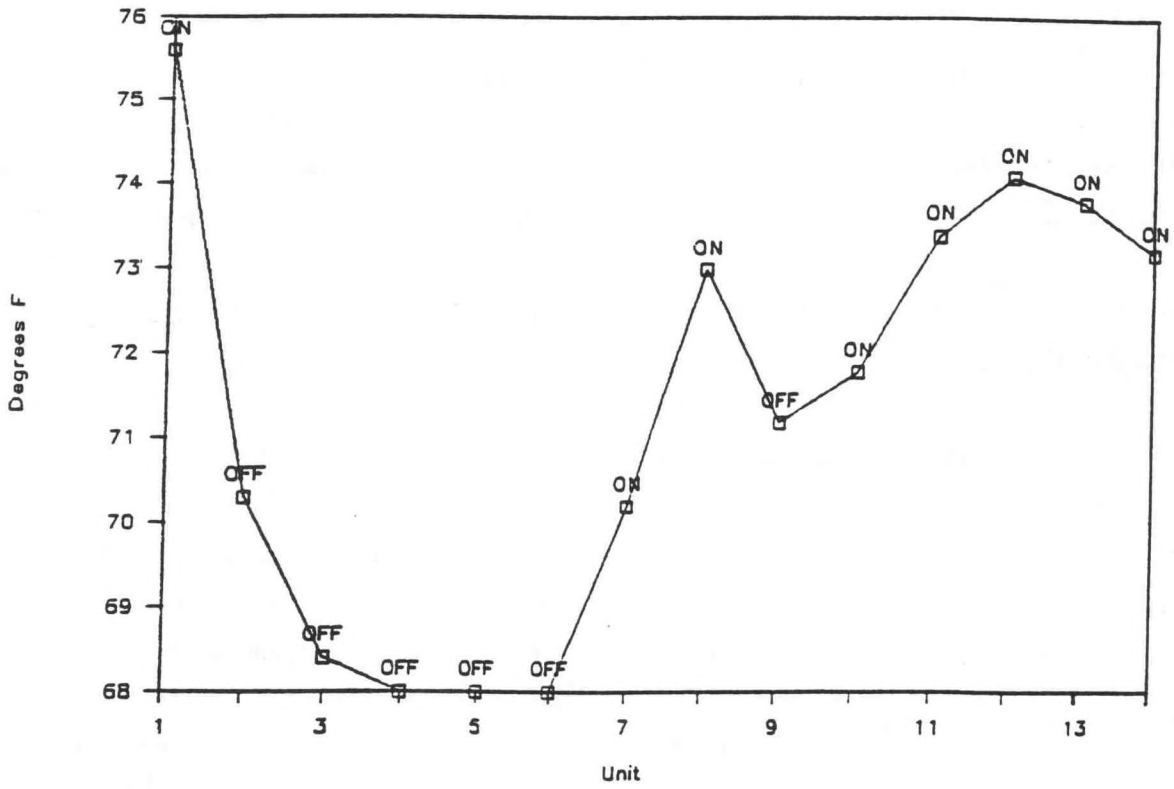

Figure 17. **Temperatures taken in the collection flume on July 27, 1988 comparing units operating (on) and not operating (off) at McNary Dam.**

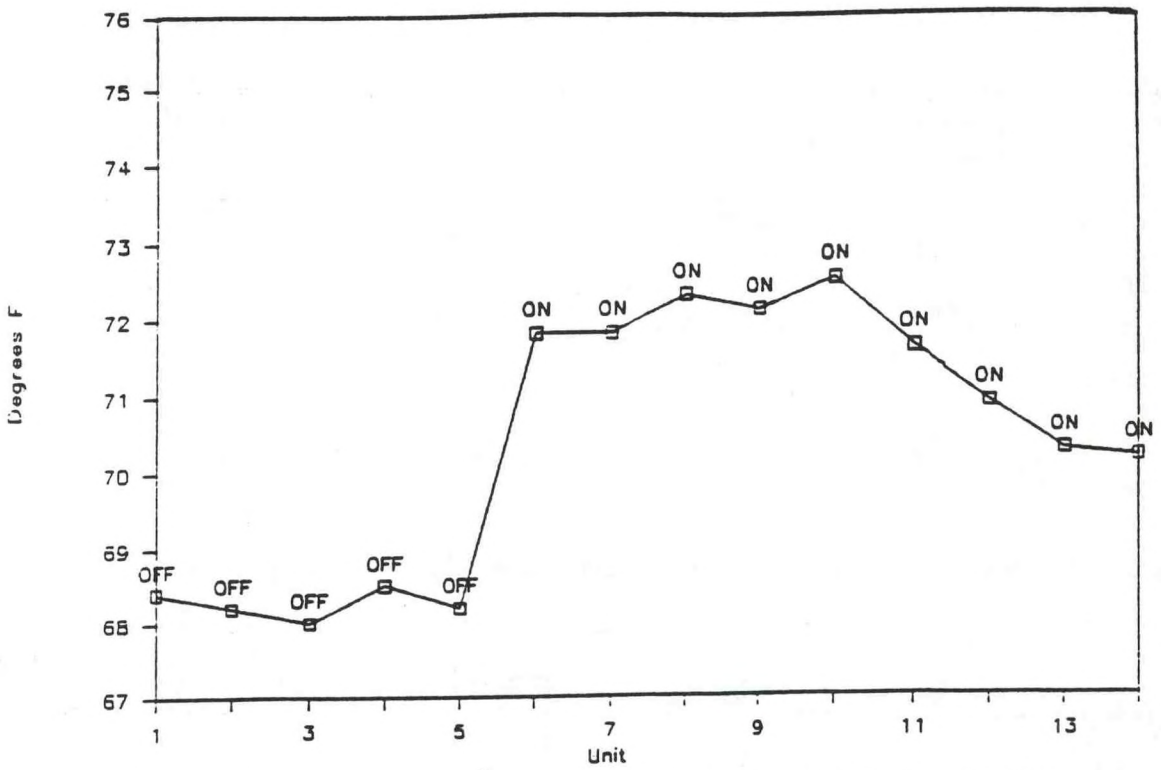

Figure 18. **Temperature taken in the gatewells at 27 ft. depth on July 28, 1988 comparing units operating (on) and not operating (off) at McNary Dam.**

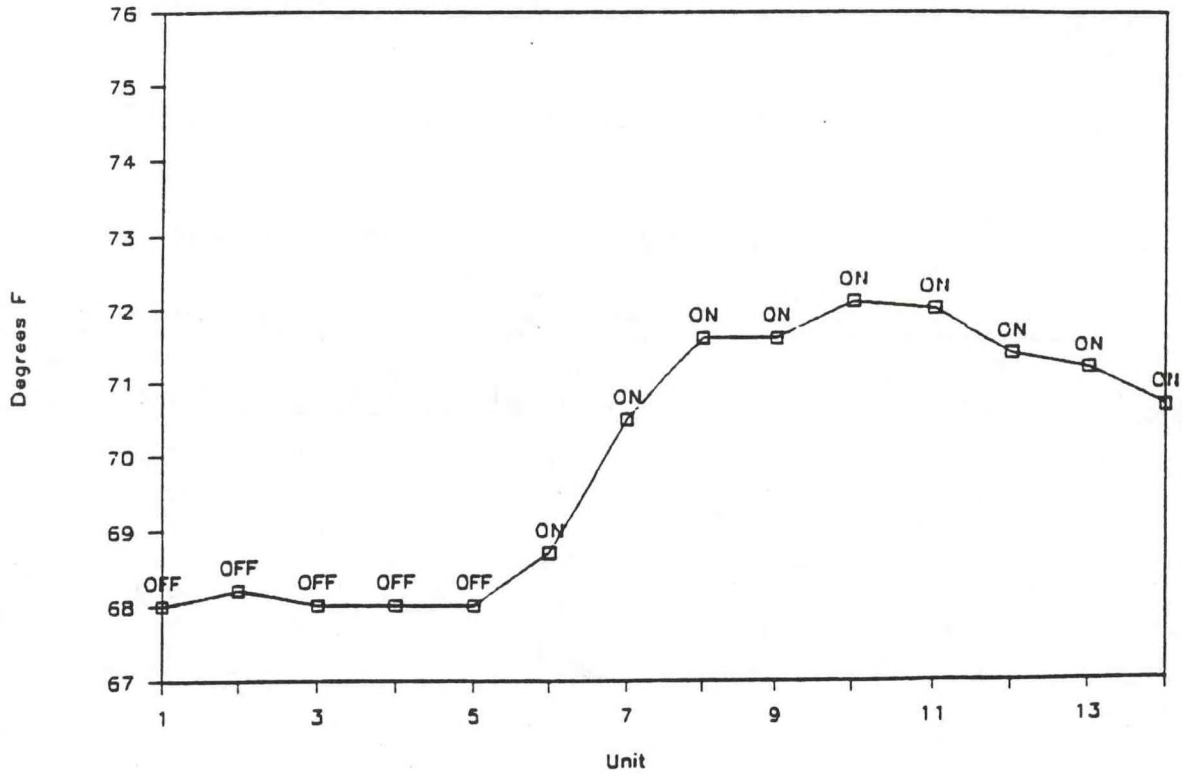

Figure 19. **Temperature taken in the collection flume on July 28, 1988, comparing units operating (on) and not operation (off) at McNary Dam.**

Table 22. Percentage adult passage through the Oregon ladder 12 days before, 12 days during, and 12 days after unit 1 was taken out of operation.

Adult Species	Before Unit 1 Outage	During Unit 1 Outage	After Unit 1 Outage
Chinook	77	92	84
Sockeye	89	91	84
Steelhead	81	85	80

Table 23. McNary Sample Tank Mortality Rates (percent), 1988..

Month	Chinook		Steelhead		Coho	Sockeye	Weighted Average
	Yearling	Subyearling	Hatchery	Wild			
March	7.1	0.0	0.0	0.0	.0.0	0.0	6.7
April	0.9	0.2	0.9	0.8	0.0	0.5	0.9
May	1.2	0.4	0.8	0.5	0.2	3.4	1.1
June	1.2	0.6	1.6	0.5	0.4	3.3	0.7
July	3.8	3.7	3.9	0.0	0.0	4.0	3.7
August	8.3	3.5	9.1	0.0	0.0	0.0	3.5
September	0.0	3.8	0.0	0.0	0.0	16.7	3.8
Weighted Average	1.1	1.9	0.9	0.6	0.2	3.4	1.5

Table 24. Comparisons of Annual Sample Tank Mortality Rates (percent), 1982-1988.

Year	Chinook		Steelhead	Coho	Sockeye	Weighted Average
	Yearling	Subyearling				
1982	2.2	2.0	0.8	0.2	2.7	1.9
1983	1.3	0.9	0.4	0.0	1.7	0.0
1984	0.8	1.2	0.3	0.3	2.5	1.0
1985	1.3	3.4	0.5	0.2	3.4	2.6
1986	1.4	2.5	0.7	0.5	6.0	2.4
1987	1.4	3.5	0.5	0.5	6.8	2.8
1988	1.1	1.9	0.8	0.9	3.4	1.5

Subyearling chinook (1.63%), yearling chinook (0.30%), and coho (0.31%) also showed reduced sample tank mortalities. The only recorded increase in mortality was for hatchery (0.35%) and for wild steelhead (0.24%). The reduction in 1988 sample tank mortality from that of 1987 may be attributed to improved handling of sampled fish, reduced thermal mortality of subyearling chinook, fewer sockeye sampled, and cooler system water through the peak collection periods of all species sampled in 1988.

Fish Size

Fork length data for all species was taken throughout the season. Yearling chinook ranged from 90mm to 270mm with a mean length of 159mm. Subyearling chinook ranged from 35mm to 180mm with a mean length of 104mm. Hatchery steelhead ranged from 130mm to 355mm with a mean length of 221mm. Wild steelhead ranged from 125mm to 345mm with an average length of 190mm. Coho ranged from 105mm to 260mm with an average length of 157mm. Sockeye ranged from 80mm to 325mm with an average length of 110mm.

Weight data was collected throughout the season for each species. Daily average weights for all species combined ranged from 6.2 fish/lb when yearling chinook and hatchery steelhead dominated the collection to 61.5 fish/lb when the collection was primarily early subyearling chinook (Table 25).

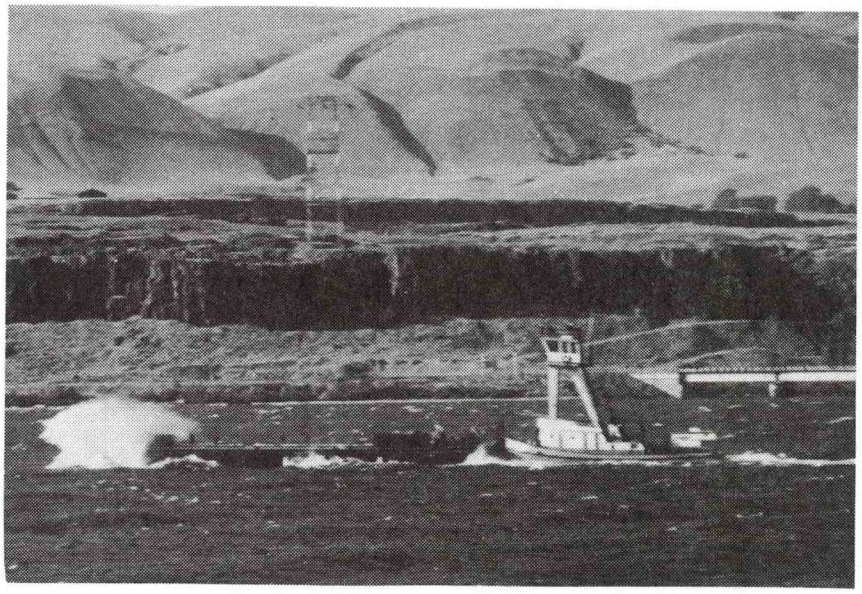

Table 25. Average Weights for all species combined, 1988.

Date	#Fish/lb.	Date	#Fish/lb.	Date	#Fish/lb.
April 7	7.1	June 1	20.4	August 2	23.8
April 9	7.4	June 3	27.2	August 3	24.4
April 12	7.6	June 6	36.6	August 4	24.4
April 14	8.6	June 8	30.7	August 5	23.3
April 17	8.3	June 10	36.8	August 7	23.8
April 18	9.6	June 12	42.0	August 8	23.8
April 19	10.3	June 15	55.3	August 9	22.5
April 21	6.9	June 17	61.5	August 10	19.2
April 22	8.3	June 20	48.4	August 11	19.2
April 24	6.2	June 21	53.2	August 15	18.3
April 25	7.8	June 22	56.4	August 17	16.7
April 26	8.5	June 23	56.9	August 18	15.9
April 27	8.3	June 25	59.6	August 20	14.8
April 29	8.4	June 27	59.6	August 22	14.7
April 30	8.4	June 28	53.7	August 24	13.3
May 1	10.6	June 29	49.7	August 25	14.1
May 2	12.8	July 1	53.0	August 27	14.5
May 4	16.3	July 4	37.8	August 29	14.7
May 6	18.3	July 5	43.3	August 30	14.7
May 8	19.5	July 8	42.8	August 31	15.4
May 11	26.9	July 10	41.9	September 1	16.1
May 12	20.3	July 11	44.8	September 3	14.3
May 14	26.3	July 13	41.3	September 4	14.8
May 16	21.0	July 14	37.3	September 5	14.3
May 17	21.6	July 15	37.3	September 6	16.1
May 18	19.2	July 18	39.1	September 8	15.6
May 19	20.5	July 19	35.6	September 9	15.6
May 20	14.4	July 21	38.3	September 12	15.9
May 23	13.2	July 22	36.4	September 13	16.0
May 24	13.3	July 25	34.9	September 14	16.5
May 26	14.5	July 26	33.8	September 15	15.6
May 27	15.5	July 27	30.2	September 17	17.0
May 31	21.3	July 28	29.4	September 19	14.8
		July 29	29.1	September 20	15.6
		July 31	29.9	September 21	13.7

OPERATIONS AND MAINTENANCE

Debris Trashracks

Trashrack cleaning was performed throughout March in conjunction with STS installation. The modified trash rake was adjusted to the proper cleaning angle in late March, enabling the remaining racks to be effectively raked. In response to deteriorating fish condition in mid-May, trash racks for units 4-14 were again raked from June 7 - 15. This action was delayed for approximately three weeks due to the temporary outage of the gantry crane winch assembly. In late August, drawdown criteria were exceeded which prompted additional trash rack cleaning. A decrease in fish condition during this time reinforced the decision to rake trash.

Gatewell drawdown measurements were taken weekly for most of the season. During July, drawdown monitoring was performed less frequently to avoid exacerbating the thermal mortality situation with fluctuating unit loads. Overall, debris load in 1988 was relatively low due to lower than normal river flows.

Submersible Traveling Screens

The STSs in priority units 4 - 10 were in place and operating by March 9 while remaining STSs were installed and in operation by March 30. Thirty-three of the STS mesh assemblies were replaced prior to installation. All STSs were operated in a cycling mode until May 13 when they were placed in continuous run in response to poor fish condition. The screens remained in the continuous run mode until August 8, at which time the cycling mode was resumed due to fish length exceeding 112mm, as per FTOT criteria.

Sixty-two unit inspections (3 screens per unit) occurred from April 7 to September 20. The video inspection schedule developed for the 1987 season was adhered to in 1988. In April, inspection frequency ranged from one to four per week. From May through July, generally three units per week were inspected. Inspection frequency was reduced to two per week from August

through September. Each unit and its complement of screens received from three to five inspections during the collection season. Only one STS (6A) was pulled in response to a suspected malfunction. The STS was immediately placed back in service. Except for several broken fastener bars on STSs in slots 1A and 4A, no STS mesh damage was observed.

Powerhouse Collection Channel

Pre-season repairs in the collection channel included replacement or reinforcement of approximately twelve stationary dissipation screens, tightening and siliconing of bolt heads and other minor caulking. It was found that stationary screens adjacent to cross weirs were prone to wear. All removable dissipation screens were cleaned of debris daily during the season.

Post-season inspection revealed continued electrolysis pitting on the removable aluminum screen frames. Localized areas of wear and rotted plywood were found in the collection channel. Several additional stationary dissipation screens were worn and need reinforcement. Numerous cross weirs within the channel also require replacement.

Orifice Maintenance

Orifices were cycled daily throughout the season to relieve debris blockages. Only two partially obstructed orifices were noted. Early in the season, a number of knife gate valves became "sticky" and would not open or close smoothly. Orifice cycling was discontinued to prevent possible vibration damage to the orifice spools. It was determined that the penetrant in the lubrication oil was causing the valves to "chatter". The penetrant/oil mixture was subsequently replaced with a standard marine oil and the knife gate problem was resolved. As an added precautionary measure, all knife gate blades were degreased, cleaned and re-lubricated.

Sequential cycling of south orifices occurred during a two week period in early spring. This was stopped in an attempt to reduce the incidence of decapitated fingerlings.

Light transmission through the clear plastic orifice spools was greatly diminished by algal growth. A means of cleaning the spools will need to be devised.

Pinch Valve

The pneumatic pinch valve was regulated at a pressure of 11 psi for the duration of the collection season. In mid-July, it was discovered that the rubber liner was leaking. Operational changes were made to sustain the necessary pressure and provide adequate water to the separator until the end of the season. Replacement of the pinch valve liner was accomplished during winter maintenance.

Separator

Minor water level fluctuations occurred on the separator throughout the season, mostly due to problems with the pinch valve. Major water losses occurred on several occasions. A steelhead smolt trapped in the attraction bar pump impeller greatly reduced the pumping efficiency and attraction water was lost to the separator on April 19. It was believed the fish entered the headbox from the barge flush line, and from the headbox, entered the water intake for the attraction bar pump. To prevent additional fish from entering the headbox a screened grating was placed over the flush line intake.

In May, an unusually high number of smolts, mostly steelhead, were found in the attraction water lines. It was subsequently determined that these fish were entering the attraction water manifold from the two flush lines to the raceway loading flume. These flush lines were immediately capped with perforated caps and the attraction water lines were purged to remove residual fish.

Raceways

The extension of the loading pipes to ponds 8 and 9 reduced impingement of fish on the water dissipation screens proved effective. Impingement of stressed and moribund fish still occurred but to a lesser extent than in previous years.

New headscreen flaps were fabricated and installed to prevent smolts from jumping over the headscreens and entering the headbox. A new standard operating procedure of measuring and recording outflow from loaded raceways was instigated in response to the fish kill on May 13 (see Mortality section).

RECOMMENDATIONS

Numerous operational and facility modifications are recommended and planned for the 1989 season to ensure worker safety and the welfare of the juvenile fish and to improve facility operations.

Operational

1. The possibility of leaving STS in service until January 1 each year for protection of adult fallbacks should investigated.

2. Separation by size during holding and transport should be undertaken to minimize stress resulting from mixing larger and small fish in a confined environment.

3. Beginning June 15 and concluding August 31, temperatures should be recorded once daily at intake unit gatewells for water depth of approximately 27 foot on the upstream side of the vertical barrier screen for all 14 units. These temperatures should be averaged separately for operating and non-operating units. The average

temperature difference should be used to evaluate proposed deviations in unit operation from that stipulated in FTOT criteria.

Facility

1. New counters for the fish sorting crew should be installed to increase count accuracy, reduce sorter fatigue and simplify recording.

2. A flush and bypass system should be installed in the truck loading flume to prevent fingerling stranding which frequently occurs during raceway sweeping and screen cleaning.

3. Extensions should be affixed to the base of the raceway flume exits to fill in the gap that is present between the headscreen and the flume. This would prevent jumping smolts from entering behind the headscreen and into the headbox, especially during raceway loading and mometary loading chute removal.

4. Storage decks need to be built out from the raceway tail area for tailscreens, weirboards, crowders, etc. A separate storage area would eliminate equipment clutter along the raceway tail deck and on the marking building roof.

5. The installation of piano wire over the tailrace area should be implemented to discourage bird predation.

6. A means of shading the counter/sample tank area should be installed to eliminate the intensive heat experienced by facility personnel during mid-summer.

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Koski, C.H., S.W. Pettit, J.B. Athearn, and A.L. Heindl. Fish Transportation Oversight Team Annual Report-FY 1987 Transport Operations on the Snake and Columbia Rivers. NOAA Technical Memorandum NMFS F/NWR-22.

Appendix Tables

Appendix Table 1.-- Daily Collection Counts of Chinook, Wild and Hatchery Steelhead, and Sockeye, Facility Mortalities, and Daily River Flows and Spills During 1988, at Lower Granite Dam.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Mar 25	0	4	4	0	8	0	0.00	24,500	0	0.00
Mar 26	11	11	11	23	56	0	0.00	24,900	0	0.00
Mar 27	11	22	11	0	44	0	0.00	30,000	0	0.00
Mar 28	0	10	10	0	20	0	0.00	30,200	0	0.00
Mar 29	20	30	49	0	99	0	0.00	28,700	0	0.00
Mar 30	10	20	30	20	80	0	0.00	27,800	0	0.00
Mar 31	40	10	30	10	90	0	0.00	28,700	0	0.00
Apr 1	94	31	31	0	156	0	0.00	28,300	0	0.00
Apr 2	219	23	10	0	252	0	0.00	22,700	0	0.00
Apr 3	658	25	100	50	833	6	.72	29,400	0	0.00
Apr 4	1,573	136	214	19	1,942	1	.05	32,900	0	0.00
Apr 5	1,504	68	137	0	1,709	1	.06	33,200	0	0.00
Apr 6	1,648	75	131	19	1,873	7	.37	30,200	0	0.00
Apr 7	1,934	94	154	51	2,233	4	.18	29,400	0	0.00
Apr 8	4,140	121	201	13	4,475	15	.34	34,200	0	0.00
Apr 9	5,660	268	286	13	6,227	4	.06	31,800	0	0.00
Apr 10	5,750	275	365	13	6,403	10	.16	25,200	0	0.00
Apr 11	7,425	477	452	8	8,362	16	.19	28,600	0	0.00
Apr 12	6,664	536	383	77	7,660	4	.05	28,800	0	0.00
Apr 13	11,472	624	374	0	12,470	6	.05	32,500	0	0.00
Apr 14	20,486	1,225	490	66	22,267	4	.02	46,600	0	0.00
Apr 15	25,717	1,258	328	55	27,358	5	.02	56,200	0	0.00
Apr 16	31,652	1,549	438	33	33,672	13	.04	55,300	0	0.00
Apr 17	56,961	2,424	1,212	0	60,597	18	.03	62,800	0	0.00
Apr 18	57,950	2,466	1,233	0	61,649	22	.04	65,300	0	0.00
Apr 19	117,811	9,926	2,743	131	130,611	203	.16	70,300	0	0.00
Apr 20	206,539	22,707	12,320	0	241,566	92	.04	65,600	0	0.00
Apr 21	121,211	17,712	14,940	153	154,016	689	.45	61,300	0	0.00
Apr 22	129,369	22,950	32,759	0	185,078	207	.11	62,900	0	0.00
Apr 23	166,672	23,538	47,552	0	237,762	520	.22	61,000	0	0.00
Apr 24	108,764	13,354	38,775	0	160,893	119	.07	53,100	0	0.00
Apr 25	88,894	14,863	39,159	0	142,916	186	.13	51,100	0	0.00
Apr 26	53,243	14,908	38,335	0	106,486	142	.13	49,700	0	0.00
Apr 27	37,905	11,524	45,810	0	95,239	74	.08	41,800	0	0.00
Apr 28	55,621	14,510	50,784	0	120,915	94	.08	37,100	0	0.00
Apr 29	45,132	8,024	47,138	0	100,294	157	.16	41,200	0	0.00
Apr 30	72,786	7,043	37,567	0	117,396	365	.31	47,200	0	0.00
May 1	52,190	7,456	33,551	0	93,197	251	.27	48,200	0	0.00
May 2	32,191	5,008	34,337	0	71,536	71	.10	43,100	0	0.00
May 3	26,598	5,838	32,436	0	64,872	94	.14	45,400	0	0.00
May 4	44,241	9,260	49,386	0	102,887	114	.11	55,500	0	0.00
May 5	43,473	9,247	85,290	0	138,010	286	.21	82,100	0	0.00
May 6	68,638	15,227	150,394	0	234,259	231	.10	75,800	0	0.00
May 7	96,629	10,857	254,419	0	361,905	1,152	.32	89,500	0	0.00
May 8	69,869	8,173	185,613	0	263,655	1,120	.42	81,800	0	0.00
May 9	64,549	5,962	135,060	0	205,571	934	.45	79,000	0	0.00
May 10	56,077	8,926	129,036	0	194,039	107	.06	75,000	0	0.00
May 11	56,079	9,378	125,746	191	191,394	377	.20	68,300	0	0.00

Appendix Table 1.-- Continued.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
May 12	23,359	5,616	52,252	163	81,390	131	.16	73,500	0	0.00
May 13	52,122	13,810	82,415	147	148,494	190	.13	69,400	0	0.00
May 14	64,096	21,365	108,769	0	194,230	201	.10	71,000	0	0.00
May 15	41,996	23,880	208,606	0	274,482	376	.14	69,300	0	0.00
May 16	35,557	22,119	149,048	0	206,724	192	.09	69,400	0	0.00
May 17	31,924	17,720	96,798	0	146,442	242	.17	71,000	0	0.00
May 18	36,941	15,923	74,518	0	127,382	157	.12	81,500	0	0.00
May 19	43,403	31,119	130,005	205	204,732	199	.10	72,000	0	0.00
May 20	24,719	20,110	164,651	0	209,480	156	.07	60,800	0	0.00
May 21	23,040	19,878	107,670	0	150,588	379	.25	57,800	0	0.00
May 22	13,641	7,795	53,439	74	74,949	87	.12	60,100	0	0.00
May 23	18,678	6,582	33,976	59	59,295	56	.09	65,300	0	0.00
May 24	21,864	10,435	67,083	0	99,382	58	.06	77,300	0	0.00
May 25	52,980	21,132	223,525	0	297,637	137	.05	82,100	0	0.00
May 26	22,662	11,113	184,131	0	217,906	273	.13	82,200	0	0.00
May 27	16,031	7,439	104,781	0	128,251	326	.25	78,500	0	0.00
May 28	11,889	2,778	40,890	0	55,557	39	.07	75,400	0	0.00
May 29	15,362	5,512	52,626	0	73,500	67	.09	70,000	0	0.00
May 30	15,201	3,761	33,274	0	52,236	44	.08	63,300	0	0.00
May 31	12,562	5,274	41,421	0	59,257	27	.05	69,000	0	0.00
Jun 1	5,034	2,535	28,099	36	35,704	38	.11	56,700	0	0.00
Jun 2	3,789	1,344	16,876	22	22,031	21	.10	65,300	0	0.00
Jun 3	18,164	6,393	76,815	101	101,473	155	.15	63,500	0	0.00
Jun 4	5,803	1,754	34,193	0	41,750	555	1.33	70,800	0	0.00
Jun 5	5,501	1,572	15,995	46	23,114	12	.05	65,100	0	0.00
Jun 6	6,652	1,793	20,447	29	28,921	22	.08	70,500	0	0.00
Jun 7	10,527	2,445	40,193	0	53,165	36	.07	68,900	0	0.00
Jun 8	9,253	4,318	48,116	0	61,687	28	.05	64,900	0	0.00
Jun 9	7,100	2,028	41,583	0	50,711	51	.10	61,100	0	0.00
Jun 10	2,833	1,281	20,519	0	24,633	84	.34	55,400	0	0.00
Jun 11	2,959	536	8,156	0	11,651	26	.22	55,300	0	0.00
Jun 12	3,345	494	9,870	0	13,709	63	.46	49,900	0	0.00
Jun 13	3,956	448	7,095	0	11,499	37	.32	46,800	0	0.00
Jun 14	3,485	319	6,852	0	10,656	66	.62	49,500	0	0.00
Jun 15	3,444	488	7,398	0	11,330	40	.35	50,400	0	0.00
Jun 16	4,384	232	6,982	0	11,598	71	.61	43,400	0	0.00
Jun 17	3,323	191	3,310	0	6,824	77	1.13	45,300	0	0.00
Jun 18	3,086	259	4,755	0	8,100	69	.85	46,400	0	0.00
Jun 19	2,950	247	4,775	0	7,972	375	4.70	41,500	0	0.00
Jun 20	1,966	202	3,771	0	5,939	55	.93	45,100	0	0.00
Jun 21	4,902	342	9,612	0	14,856	246	1.66	39,800	0	0.00
Jun 22	3,634	349	10,553	0	14,536	693	4.77	37,400	0	0.00
Jun 23	3,650	428	14,544	0	18,622	234	1.26	35,300	0	0.00
Jun 24	2,687	365	7,364	0	10,416	861	8.27	34,400	0	0.00
Jun 25	3,786	186	6,345	0	10,317	263	2.55	33,500	0	0.00
Jun 26	2,737	148	4,524	8	7,417	770	10.38	26,800	0	0.00
Jun 27	3,864	276	7,302	57	11,499	274	2.38	31,400	0	0.00
Jun 28	3,813	273	6,710	11	10,807	1,221	11.30	33,800	0	0.00

Appendix Table 1.-- Continued.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Jun 29	1,913	140	4,930	0	6,983	593	8.49	25,100	0	0.00
Jun 30	1,041	99	1,966	0	3,106	1,368	44.04	33,700	0	0.00
Jul 1	1,374	119	4,480	0	5,973	231	3.87	28,200	0	0.00
Jul 2	1,319	57	4,383	0	5,759	1,359	23.60	28,200	0	0.00
Jul 3	1,003	46	4,069	0	5,118	372	7.27	22,400	0	0.00
Jul 4	997	33	2,270	0	3,300	1,358	41.15	21,200	0	0.00
Jul 5	1,080	12	911	0	2,003	110	5.49	24,400	0	0.00
Jul 6	905	0	1,610	0	2,515	422	16.78	21,700	0	0.00
Jul 7	701	34	866	0	1,601	54	3.37	24,400	0	0.00
Jul 8	851	0	1,128	0	1,979	459	23.19	23,300	0	0.00
Jul 9	729	11	1,368	0	2,108	95	4.51	20,600	0	0.00
Jul 10	895	33	1,842	0	2,770	544	19.64	20,200	0	0.00
Jul 11	1,052	22	1,312	0	2,386	113	4.74	19,200	0	0.00
Jul 12	1,201	11	926	0	2,138	424	19.83	19,800	0	0.00
Jul 13	650	11	430	0	1,091	75	6.87	13,200	0	0.00
Jul 14	620	0	233	0	853	354	41.50	17,500	0	0.00
Jul 15	376	0	266	0	642	15	2.34	16,200	0	0.00
Jul 16	330	0	242	0	572	173	30.24	19,100	0	0.00
Jul 17	288	0	343	0	631	37	5.86	18,900	0	0.00
Jul 18	497	0	342	0	839	104	12.40	19,000	0	0.00
Jul 19	265	0	342	0	607	45	7.41	16,000	0	0.00
Jul 20	300	0	468	0	768	131	17.06	15,000	0	0.00
Jul 21	251	0	438	0	689	54	7.84	16,100	0	0.00
Jul 22	309	11	298	0	618	153	24.76	14,300	0	0.00
Jul 23	318	23	218	0	559	49	8.77	16,800	0	0.00
Jul 24	242	22	132	0	396	147	37.12	13,300	0	0.00
Jul 25	154	0	177	0	331	40	12.08	15,600	0	0.00
Jul 26	0	0	0	0	0	50	0.00	19,200	0	0.00
Jul 27	0	0	0	0	0	0	0.00	18,000	0	0.00
Jul 28	0	0	0	0	0	0	0.00	21,400	0	0.00
Jul 29	0	0	0	0	0	0	0.00	18,700	0	0.00
Jul 30	0	0	0	0	0	0	0.00	15,100	0	0.00
Jul 31	0	0	0	0	0	0	0.00	14,900	0	0.00
TOTAL	2,790,395	593,464	4,148,456	1,903	7,534,218	26,430	.35			

APPENDIX TABLE 2.-- 1988 TRUCK TRANSPORTATION REPORT
AT LOWER GRANITE

	DAILY #'s TRUCKED					ACCUM. #'s TRUCKED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
28/ 3	22	47	36	23	128	22	47	36	23	128
29/ 3	0	0	0	0	0	22	47	36	23	128
30/ 3	0	0	0	0	0	22	47	36	23	128
31/ 3	0	0	0	0	0	22	47	36	23	128
1/ 4	0	0	0	0	0	22	47	36	23	128
2/ 4	0	0	0	0	0	22	47	36	23	128
3/ 4	0	0	0	0	0	22	47	36	23	128
4/ 4	2,609	274	463	99	3,445	2,631	321	499	122	3,573
5/ 4	0	0	0	0	0	2,631	321	499	122	3,573
6/ 4	3,095	143	267	19	3,524	5,726	464	766	141	7,097
7/ 4	0	0	0	0	0	5,726	464	766	141	7,097
8/ 4	6,014	215	350	60	6,639	11,740	679	1,116	201	13,736
9/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
10/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
11/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
12/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
13/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
14/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
15/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
16/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
17/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
18/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
19/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
20/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
21/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
22/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
23/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
24/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
25/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
26/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
27/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
28/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
29/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
30/ 4	0	0	0	0	0	11,740	679	1,116	201	13,736
1/ 5	0	0	0	0	0	11,740	679	1,116	201	13,736
2/ 5	0	0	0	0	0	11,740	679	1,116	201	13,736
3/ 5	0	0	0	0	0	11,740	679	1,116	201	13,736
4/ 5	0	0	0	0	0	11,740	679	1,116	201	13,736
5/ 5	0	0	0	0	0	11,740	679	1,116	201	13,736
6/ 5	0	0	0	0	0	11,740	679	1,116	201	13,736
7/ 5	9,239	1,038	24,326	0	34,603	20,979	1,717	25,442	201	48,339
8/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
9/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
10/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
11/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
12/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
13/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
14/ 5	0	0	0	0	0					

APPENDIX TABLE 2.-- Continued

	DAILY #'s TRUCKED					ACCUM. #'s TRUCKED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
15/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
16/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
17/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
18/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
19/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
20/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
21/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
22/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
23/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
24/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
25/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
26/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
27/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
28/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
29/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
30/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
31/ 5	0	0	0	0	0	20,979	1,717	25,442	201	48,339
1/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
2/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
3/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
4/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
5/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
6/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
7/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
8/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
9/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
10/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
11/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
12/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
13/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
14/ 6	0	0	0	0	0	20,979	1,717	25,442	201	48,339
15/ 6	3,431	488	7,371	0	11,290	24,410	2,205	32,813	201	59,629
16/ 6	4,364	231	6,932	0	11,527	28,774	2,436	39,745	201	71,156
17/ 6	3,312	190	3,245	0	6,747	32,086	2,626	42,990	201	77,903
18/ 6	0	0	0	0	0	32,086	2,626	42,990	201	77,903
19/ 6	5,907	504	9,217	0	15,628	37,993	3,130	52,207	201	93,531
20/ 6	0	0	0	0	0	37,993	3,130	52,207	201	93,531
21/ 6	6,763	543	13,188	0	20,494	44,756	3,673	65,395	201	114,025
22/ 6	3,444	348	10,051	0	13,843	48,200	4,021	75,446	201	127,868
23/ 6	0	0	0	0	0	48,200	4,021	75,446	201	127,868
24/ 6	6,170	790	20,983	0	27,943	54,370	4,811	96,429	201	155,811
25/ 6	0	0	0	0	0	54,370	4,811	96,429	201	155,811
26/ 6	6,430	329	9,934	8	16,701	60,800	5,140	106,363	209	172,512
27/ 6	0	0	0	0	0	60,800	5,140	106,363	209	172,512
28/ 6	7,468	540	12,735	68	20,811	68,268	5,680	119,098	277	193,323
29/ 6	0	0	0	0	0	68,268	5,680	119,098	277	193,323
30/ 6	2,517	231	5,380	0	8,128	70,785	5,911	124,478	277	201,451
1/ 7	0	0	0	0	0	70,785	5,911	124,478	277	201,451
2/ 7	2,516	172	7,454	0	10,142	73,301	6,083	131,932	277	211,593

APPENDIX TABLE 2.-- Continued

	DAILY #'s TRUCKED					ACCUM. #'s TRUCKED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
3/ 7	0	0	0	0	0	73,301	6,083	131,932	277	211,593
4/ 7	1,698	72	4,918	0	6,688	74,999	6,155	136,850	277	218,281
5/ 7	0	0	0	0	0	74,999	6,155	136,850	277	218,281
6/ 7	1,839	9	2,138	0	3,986	76,838	6,164	138,988	277	222,267
7/ 7	0	0	0	0	0	76,838	6,164	138,988	277	222,267
8/ 7	1,353	32	1,682	0	3,067	78,191	6,196	140,670	277	225,314
9/ 7	0	0	0	0	0	78,191	6,196	140,670	277	225,334
10/ 7	1,399	42	2,798	0	4,239	79,590	6,238	143,468	277	229,573
11/ 7	0	0	0	0	0	79,590	6,238	143,468	277	229,573
12/ 7	2,021	32	1,934	0	3,987	81,611	6,270	145,402	277	233,560
13/ 7	0	0	0	0	0	81,611	6,270	145,402	277	233,560
14/ 7	1,057	11	447	0	1,515	82,668	6,281	145,849	277	235,075
15/ 7	0	0	0	0	0	82,668	6,281	145,849	277	235,075
16/ 7	578	0	448	0	1,026	83,246	6,281	146,297	277	236,101
17/ 7	0	0	0	0	0	83,246	6,281	146,297	277	236,101
18/ 7	692	0	637	0	1,329	83,938	6,281	146,934	277	237,430
19/ 7	0	0	0	0	0	83,938	6,281	146,934	277	237,430
20/ 7	449	0	750	0	1,199	84,387	6,281	147,684	277	238,629
21/ 7	0	0	0	0	0	84,387	6,281	147,684	277	238,629
22/ 7	418	11	671	0	1,100	84,805	6,292	148,355	277	239,729
23/ 7	0	0	0	0	0	84,805	6,292	148,355	277	239,729
24/ 7	417	45	297	0	759	85,222	6,337	148,652	277	240,488
25/ 7	0	0	0	0	0	85,222	6,337	148,652	277	240,488
26/ 7	86	0	155	0	241	85,308	6,337	148,807	277	240,729

APPENDIX TABLE 3.-- 1988 BARGE TRANSPORTATION REPORT
AT LOWER GRANITE

	DAILY #'s BARGED					ACCUM. #'s BARGED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
11/ 4	18,739	1,019	1,096	33	20,887	18,739	1,019	1,096	33	20,887
12/ 4	0	0	0	0	0	18,739	1,019	1,096	33	20,887
13/ 4	0	0	0	0	0	18,739	1,019	1,096	33	20,887
14/ 4	0	0	0	0	0	18,739	1,019	1,096	33	20,887
15/ 4	64,201	3,643	1,574	198	69,616	82,940	4,662	2,670	231	90,503
16/ 4	0	0	0	0	0	82,940	4,662	2,670	231	90,503
17/ 4	88,537	3,971	1,647	33	94,188	171,477	8,633	4,317	264	184,691
18/ 4	0	0	0	0	0	171,477	8,633	4,317	264	184,691
19/ 4	175,397	12,392	3,974	131	191,894	346,874	21,025	8,291	395	376,585
20/ 4	0	0	0	0	0	346,874	21,025	8,291	395	376,585
21/ 4	326,899	40,414	27,237	151	394,701	673,773	61,439	35,528	546	771,286
22/ 4	129,116	22,950	32,755	0	184,821	802,889	84,389	68,283	546	956,107
23/ 4	166,103	23,538	47,551	0	237,192	968,992	107,927	115,834	546	1,193,299
24/ 4	108,596	13,354	38,774	0	160,724	1,077,588	121,281	154,608	546	1,354,023
25/ 4	88,643	14,863	39,153	0	142,659	1,166,231	136,144	193,761	546	1,496,682
26/ 4	53,057	14,906	38,325	0	106,288	1,219,288	151,050	232,086	546	1,602,970
27/ 4	37,817	11,523	45,800	0	95,140	1,257,105	162,573	277,886	546	1,698,110
28/ 4	55,492	14,510	50,775	0	120,777	1,312,597	177,083	328,661	546	1,818,887
29/ 4	44,964	8,022	47,126	0	100,112	1,357,561	185,105	375,787	546	1,918,999
30/ 4	72,407	7,042	37,557	0	117,006	1,429,968	192,147	413,344	546	2,036,085
1/ 5	51,923	7,456	33,538	0	92,917	1,481,891	199,603	446,882	546	2,128,922
2/ 5	32,101	5,008	34,327	0	71,436	1,513,992	204,611	481,209	546	2,200,358
3/ 5	26,489	5,838	32,375	0	64,702	1,540,481	210,449	513,584	546	2,265,060
4/ 5	44,110	9,260	49,357	0	102,727	1,584,591	219,709	562,941	546	2,367,787
5/ 5	43,174	9,242	85,197	0	137,613	1,627,765	228,951	648,138	546	2,505,400
6/ 5	68,388	15,220	150,308	0	233,916	1,696,153	244,171	798,446	546	2,739,316
7/ 5	86,260	9,816	229,929	0	326,005	1,782,413	253,987	1,028,375	546	3,065,321
8/ 5	68,776	8,170	185,459	0	262,405	1,851,189	262,157	1,213,834	546	3,327,726
9/ 5	63,693	5,960	134,901	0	204,554	1,914,882	268,117	1,348,735	546	3,532,280
10/ 5	55,977	8,918	128,945	0	193,840	1,970,859	277,035	1,477,680	546	3,726,120
11/ 5	55,714	9,377	125,674	191	190,956	2,026,573	286,412	1,603,354	737	3,917,076
12/ 5	23,266	5,616	52,180	161	81,223	2,049,839	292,028	1,655,534	898	3,998,299
13/ 5	51,979	13,809	82,326	144	148,258	2,101,818	305,837	1,737,860	1,042	4,146,557
14/ 5	63,933	21,364	108,690	0	193,987	2,165,751	327,201	1,846,550	1,042	4,340,544
15/ 5	41,716	23,879	208,449	0	274,044	2,207,467	351,080	2,054,999	1,042	4,614,588
16/ 5	35,439	22,119	148,949	0	206,507	2,242,906	373,199	2,203,948	1,042	4,821,095
17/ 5	31,745	17,720	96,710	0	146,175	2,274,651	390,919	2,300,658	1,042	4,967,270
18/ 5	36,815	15,923	74,462	0	127,200	2,311,466	406,842	2,375,120	1,042	5,094,470
19/ 5	43,277	31,116	129,895	203	204,491	2,354,743	437,958	2,505,015	1,245	5,298,961
20/ 5	24,617	20,108	164,536	0	209,261	2,379,360	458,066	2,669,551	1,245	5,508,222
21/ 5	22,806	19,875	107,480	0	150,161	2,402,166	477,941	2,777,031	1,245	5,658,383
22/ 5	13,579	7,795	53,386	74	74,834	2,415,745	485,736	2,830,417	1,319	5,733,217
23/ 5	18,633	6,581	33,941	57	59,212	2,434,378	492,317	2,864,358	1,376	5,792,429
24/ 5	21,847	10,435	67,010	0	99,292	2,456,225	502,752	2,931,368	1,376	5,891,721
25/ 5	52,890	21,131	223,427	0	297,448	2,509,115	523,883	3,154,795	1,376	6,189,169
26/ 5	22,507	11,108	183,992	0	217,607	2,531,622	534,991	3,338,787	1,376	6,406,776
27/ 5	15,886	7,434	104,576	0	127,896	2,547,508	542,425	3,443,363	1,376	6,534,672
28/ 5	11,852	2,778	40,863	0	55,493	2,559,360	545,203	3,484,226	1,376	6,590,165

APPENDIX TABLE 3.-- Continued

	DAILY #'s BARGED					ACCUM. #'s BARGED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
29/ 5	15,312	5,512	52,584	0	73,408	2,574,672	550,715	3,536,810	1,376	6,663,573
30/ 5	15,160	3,761	33,246	0	52,167	2,589,832	554,476	3,570,056	1,376	6,715,740
31/ 5	12,528	5,274	41,403	0	59,205	2,602,360	559,750	3,611,459	1,376	6,774,945
1/ 6	5,003	2,533	28,069	36	35,641	2,607,363	562,283	3,639,528	1,412	6,810,586
2/ 6	3,760	1,344	16,859	22	21,985	2,611,123	563,627	3,656,387	1,434	6,832,571
3/ 6	0	0	0	0	0	2,611,123	563,627	3,656,387	1,434	6,832,571
4/ 6	23,568	8,141	110,653	101	142,463	2,634,691	571,768	3,767,040	1,535	6,975,034
5/ 6	0	0	0	0	0	2,634,691	571,768	3,767,040	1,535	6,975,034
6/ 6	12,092	3,365	36,419	75	51,951	2,646,783	575,133	3,803,459	1,610	7,026,985
7/ 6	0	0	0	0	0	2,646,783	575,133	3,803,459	1,610	7,026,985
8/ 6	19,701	6,762	88,276	0	114,739	2,666,484	581,895	3,891,735	1,610	7,141,724
9/ 6	0	0	0	0	0	2,666,484	581,895	3,891,735	1,610	7,141,724
10/ 6	9,864	3,305	61,990	0	75,159	2,676,348	585,200	3,953,725	1,610	7,216,883
11/ 6	0	0	0	0	0	2,676,348	585,200	3,953,725	1,610	7,216,883
12/ 6	6,230	1,029	17,962	0	25,221	2,682,578	586,229	3,971,687	1,610	7,242,104
13/ 6	0	0	0	0	0	2,682,578	586,229	3,971,687	1,610	7,242,104
14/ 6	7,396	765	13,866	0	22,027	2,689,974	586,994	3,985,553	1,610	7,264,131

APPENDIX TABLE 4.-- 1988 BYPASS REPORT
AT LOWER GRANITE

DAILY #'S BYPASSED					ACCUM. #'S BYPASSED				
Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total

No Juvenile Fish Bypassed

Appendix Table 5.-- Daily Collection Counts of Chinook, Wild and Hatchery Steelhead, and Sockeye, Facility Mortalities, and Daily River Flows and Spills During 1988, at Little Goose Dam.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Mar 26	0	0	0	0	0	0	0	0.00	24,600	0	0.00
Mar 27	0	0	0	0	0	0	0	0.00	16,400	0	0.00
Mar 28	0	0	0	0	0	0	0	0.00	32,500	0	0.00
Mar 29	0	0	0	0	0	0	0	0.00	28,000	0	0.00
Mar 30	0	0	0	0	0	0	0	0.00	30,700	0	0.00
Mar 31	0	0	0	0	0	0	0	0.00	26,500	0	0.00
Apr 1	0	0	0	0	0	0	0	0.00	29,300	0	0.00
Apr 2	0	0	0	0	0	0	0	0.00	22,400	0	0.00
Apr 3	0	0	0	0	0	0	0	0.00	25,700	0	0.00
Apr 4	0	0	0	0	0	0	0	0.00	33,500	0	0.00
Apr 5	0	0	0	0	0	0	0	0.00	34,000	0	0.00
Apr 6	0	0	0	0	0	0	0	0.00	31,600	0	0.00
Apr 7	32	0	4	41	0	77	0	0.00	29,100	0	0.00
Apr 8	75	0	17	80	0	172	0	0.00	35,400	0	0.00
Apr 9	165	0	40	250	0	455	2	.44	33,200	0	0.00
Apr 10	417	0	35	176	0	628	12	1.91	23,600	0	0.00
Apr 11	370	0	71	280	6	727	4	.55	30,800	0	0.00
Apr 12	254	0	91	376	8	729	26	3.57	28,100	0	0.00
Apr 13	361	0	86	283	8	738	26	3.52	35,200	0	0.00
Apr 14	534	0	56	251	16	857	30	3.50	46,600	0	0.00
Apr 15	1,129	0	105	518	23	1,775	29	1.63	52,200	0	0.00
Apr 16	2,421	0	303	516	60	3,300	36	1.09	59,200	0	0.00
Apr 17	2,295	0	322	359	0	2,976	41	1.38	61,200	0	0.00
Apr 18	2,150	0	393	393	63	2,999	34	1.13	67,300	0	0.00
Apr 19	3,864	0	433	700	25	5,022	40	.80	68,900	0	0.00
Apr 20	9,695	0	1,160	1,772	65	12,692	94	.74	62,900	0	0.00
Apr 21	9,413	0	1,769	836	0	12,018	144	1.20	63,400	0	0.00
Apr 22	23,300	0	2,458	236	105	26,099	127	.49	64,100	0	0.00
Apr 23	25,803	0	3,550	3,320	0	32,673	134	.41	60,400	0	0.00
Apr 24	31,229	0	4,821	2,602	0	38,652	215	.56	51,000	0	0.00
Apr 25	23,592	0	5,375	2,886	0	31,853	155	.49	51,600	0	0.00
Apr 26	29,280	0	3,453	2,866	74	35,673	193	.54	53,800	0	0.00
Apr 27	32,389	0	6,413	5,498	275	44,575	265	.59	38,700	0	0.00
Apr 28	34,985	0	4,623	7,102	0	46,710	341	.73	37,900	0	0.00
Apr 29	21,368	0	3,995	4,692	0	30,055	417	1.39	42,400	0	0.00
Apr 30	29,241	0	1,971	1,541	0	32,753	192	.59	46,500	0	0.00
May 1	35,129	0	3,789	6,923	0	45,841	227	.50	49,500	0	0.00
May 2	27,877	0	3,212	7,772	0	38,861	172	.44	44,300	0	0.00
May 3	20,020	0	3,062	8,021	0	31,103	119	.38	46,600	0	0.00
May 4	21,828	0	3,481	8,669	0	33,978	191	.56	54,000	0	0.00
May 5	20,238	0	2,430	8,920	192	31,780	280	.88	82,900	0	0.00
May 6	45,415	0	5,667	27,155	236	78,473	407	.52	76,500	0	0.00
May 7	52,215	0	5,050	32,466	0	89,731	1,230	1.37	88,300	0	0.00
May 8	31,043	0	4,081	36,289	0	71,413	616	.86	81,800	0	0.00
May 9	36,136	0	3,065	30,007	499	69,707	472	.68	80,100	0	0.00
May 10	14,713	0	2,148	34,957	322	52,140	526	1.01	77,000	0	0.00
May 11	8,373	0	432	33,710	0	42,515	282	.66	44,500	0	0.00
May 12	6,947	0	1,699	28,009	148	36,803	181	.49	62,000	0	0.00

Appendix Table 5.-- Continued.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
May 13	9,519	0	2,714	30,840	0	43,073	171	.40	72,000	0	0.00
May 14	21,747	0	881	23,509	0	46,137	238	.52	74,600	0	0.00
May 15	11,346	0	433	18,705	0	30,484	234	.77	64,900	0	0.00
May 16	14,224	0	2,599	28,402	0	45,225	264	.58	70,200	0	0.00
May 17	12,654	0	3,860	23,120	0	39,634	375	.95	72,100	0	0.00
May 18	15,827	0	4,377	23,740	0	43,944	306	.70	84,800	0	0.00
May 19	13,696	0	4,989	28,004	0	46,689	354	.76	66,700	0	0.00
May 20	6,308	0	3,756	24,736	0	34,800	230	.66	67,600	0	0.00
May 21	4,182	0	3,898	19,971	0	28,051	223	.79	58,400	0	0.00
May 22	7,368	0	3,808	19,040	0	30,216	246	.81	57,400	0	0.00
May 23	7,492	0	2,497	18,909	0	28,898	176	.61	64,000	0	0.00
May 24	5,167	0	1,418	11,441	0	18,026	138	.77	77,100	0	0.00
May 25	6,384	0	3,352	16,200	0	25,936	129	.50	78,700	0	0.00
May 26	5,265	0	2,028	11,876	0	19,169	156	.81	81,300	0	0.00
May 27	5,390	0	1,376	7,144	0	13,910	189	1.36	84,300	0	0.00
May 28	4,617	0	841	6,144	0	11,602	152	1.31	75,900	0	0.00
May 29	7,903	0	2,070	16,614	0	26,587	176	.66	63,900	0	0.00
May 30	8,954	0	1,393	11,717	0	22,064	115	.52	59,400	0	0.00
May 31	6,575	0	414	5,145	0	12,134	94	.77	73,800	0	0.00
Jun 1	3,716	0	1,309	12,279	0	17,304	107	.62	58,900	0	0.00
Jun 2	3,328	0	296	6,551	0	10,175	100	.98	58,500	0	0.00
Jun 3	1,291	0	515	5,519	0	7,325	129	1.76	66,300	0	0.00
Jun 4	1,209	0	250	7,948	0	9,407	176	1.87	69,400	0	0.00
Jun 5	3,128	0	415	7,416	47	11,006	127	1.15	67,500	0	0.00
Jun 6	3,172	0	502	5,627	0	9,301	93	1.00	73,300	0	0.00
Jun 7	3,645	0	453	6,027	0	10,125	111	1.10	70,300	0	0.00
Jun 8	3,538	0	674	7,676	0	11,888	141	1.19	70,700	0	0.00
Jun 9	3,635	0	469	7,529	0	11,633	117	1.01	68,700	0	0.00
Jun 10	1,481	0	819	4,003	0	6,303	132	2.09	45,300	0	0.00
Jun 11	1,598	0	86	1,035	0	2,719	140	5.15	56,200	0	0.00
Jun 12	1,364	0	54	2,290	0	3,708	106	2.86	43,700	0	0.00
Jun 13	1,242	0	38	1,520	0	2,800	231	8.25	50,400	0	0.00
Jun 14	536	0	40	1,448	0	2,024	173	8.55	48,800	0	0.00
Jun 15	411	0	120	1,390	17	1,938	239	12.33	49,000	0	0.00
Jun 16	388	0	81	2,384	0	2,853	213	7.47	44,700	0	0.00
Jun 17	390	0	116	3,157	0	3,663	137	3.74	44,400	0	0.00
Jun 18	435	0	91	2,559	23	3,108	248	7.98	41,200	0	0.00
Jun 19	1,171	0	130	2,229	18	3,548	388	10.94	42,200	0	0.00
Jun 20	1,722	0	30	2,453	0	4,205	206	4.90	49,700	0	0.00
Jun 21	874	0	129	2,923	0	3,926	360	9.17	40,900	0	0.00
Jun 22	940	0	122	2,390	29	3,481	169	4.85	39,100	0	0.00
Jun 23	392	0	25	2,194	0	2,611	277	10.61	34,800	0	0.00
Jun 24	605	0	19	1,168	0	1,792	177	9.88	30,700	0	0.00
Jun 25	812	0	47	1,977	47	2,883	161	5.58	35,900	0	0.00
Jun 26	695	0	41	3,227	20	3,983	254	6.38	32,100	0	0.00
Jun 27	613	0	81	2,320	15	3,029	295	9.74	28,500	0	0.00
Jun 28	469	0	138	1,436	0	2,043	250	12.24	36,600	0	0.00
Jun 29	366	0	0	815	0	1,181	153	12.96	26,700	0	0.00

Appendix Table 5.-- Continued.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Jun 30	793	0	36	440	0	1,269	129	10.17	27,900	0	0.00
Jul 1	556	0	48	1,570	23	2,197	170	7.74	28,500	0	0.00
Jul 2	695	0	47	1,185	0	1,927	222	11.52	28,500	0	0.00
Jul 3	501	0	37	526	13	1,077	133	12.35	27,800	0	0.00
Jul 4	439	0	23	336	12	810	150	18.52	20,100	0	0.00
Jul 5	233	0	0	323	0	556	95	17.09	24,300	0	0.00
Jul 6	309	0	8	211	8	536	115	21.46	21,900	0	0.00
Jul 7	299	0	0	282	0	581	65	11.19	25,000	0	0.00
Jul 8	191	0	29	411	29	660	80	12.12	23,000	0	0.00
Jul 9	353	0	31	596	10	990	98	9.90	20,600	0	0.00
Jul 10	257	0	37	521	0	815	151	18.53	19,300	0	0.00
Jul 11	274	0	0	419	8	701	64	9.13	19,500	0	0.00
Jul 12	285	0	19	246	0	550	100	18.18	20,000	0	0.00
Jul 13	355	0	8	119	0	482	56	11.62	14,000	0	0.00
Jul 14	346	0	0	114	0	460	80	17.39	17,800	0	0.00
Jul 15	50	0	0	16	0	66	14	21.21	26,300	0	0.00
Jul 16	0	0	0	0	0	0	0	0.00	17,600	0	0.00
Jul 17	0	0	0	0	0	0	0	0.00	14,800	0	0.00
Jul 18	0	0	0	0	0	0	0	0.00	19,600	0	0.00
Jul 19	0	0	0	0	0	0	0	0.00	16,700	0	0.00
Jul 20	0	0	0	0	0	0	0	0.00	12,500	0	0.00
Jul 21	0	0	0	0	0	0	0	0.00	16,200	0	0.00
Jul 22	0	0	0	0	0	0	0	0.00	14,000	0	0.00
Jul 23	0	0	0	0	0	0	0	0.00	13,800	0	0.00
Jul 24	0	0	0	0	0	0	0	0.00	12,300	0	0.00
Jul 25	0	0	0	0	0	0	0	0.00	15,700	0	0.00
Jul 26	0	0	0	0	0	0	0	0.00	18,400	0	0.00
Jul 27	0	0	0	0	0	0	0	0.00	17,900	0	0.00
Jul 28	0	0	0	0	0	0	0	0.00	21,300	0	0.00
Jul 29	0	0	0	0	0	0	0	0.00	20,300	0	0.00
Jul 30	0	0	0	0	0	0	0	0.00	13,700	0	0.00
Jul 31	0	0	0	0	0	0	0	0.00	14,900	0	0.00
TOTAL	828,016	0	133,777	762,534	2,444	1,726,771	18,368	1.06			

APPENDIX TABLE 6.-- 1988 TRUCK TRANSPORTATION REPORT
AT LITTLE GOOSE

	DAILY #'s TRUCKED					ACCUM. #'s TRUCKED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
17/ 6	621	163	3,267	12	4,063	621	163	3,267	12	4,063
18/ 6	0	0	0	0	0	621	163	3,267	12	4,063
19/ 6	809	185	5,227	25	6,246	1,430	348	8,494	37	10,309
20/ 6	0	0	0	0	0	1,430	348	8,494	37	10,309
21/ 6	2,727	140	4,438	16	7,321	4,157	488	12,932	53	17,630
22/ 6	0	0	0	0	0	4,157	488	12,932	53	17,630
23/ 6	0	0	0	0	0	4,157	488	12,932	53	17,630
24/ 6	0	0	0	0	0	4,157	488	12,932	53	17,630
25/ 6	898	43	2,995	2	3,938	5,055	531	15,927	55	21,568
26/ 6	0	0	0	0	0	5,055	531	15,927	55	21,568
27/ 6	1,389	86	5,045	67	6,587	6,444	617	20,972	122	28,155
28/ 6	0	0	0	0	0	6,444	617	20,972	122	28,155
29/ 6	937	201	3,239	13	4,390	7,381	818	24,211	135	32,545
30/ 6	0	0	0	0	0	7,381	818	24,211	135	32,545
1/ 7	1,091	34	1,013	1	2,139	8,472	852	25,224	136	34,684
2/ 7	0	0	0	0	0	8,472	852	25,224	136	34,684
3/ 7	1,206	88	2,454	24	3,772	9,678	940	27,678	160	38,456
4/ 7	0	0	0	0	0	9,678	940	27,678	160	38,456
5/ 7	839	45	652	22	1,558	10,517	985	28,330	182	40,014
6/ 7	0	0	0	0	0	10,517	985	28,330	182	40,014
7/ 7	465	3	413	5	886	10,982	988	28,743	187	40,900
8/ 7	0	0	0	0	0	10,982	988	28,743	187	40,900
9/ 7	464	30	661	31	1,186	11,446	1,018	29,404	218	42,086
10/ 7	0	0	0	0	0	11,446	1,018	29,404	218	42,086
11/ 7	508	55	933	9	1,505	11,954	1,073	30,337	227	43,591
12/ 7	0	0	0	0	0	11,954	1,073	30,337	227	43,591
13/ 7	498	19	552	6	1,075	12,452	1,092	30,889	233	44,666
14/ 7	0	0	0	0	0	12,452	1,092	30,889	233	44,666
15/ 7	611	5	187	0	803	13,063	1,097	31,076	233	45,469
16/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
17/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
18/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
19/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
20/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
21/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
22/ 7	0	0	0	0	0	13,063	1,097	31,076	233	45,469
23/ 7	1,643	218	4,925	29	6,815	14,706	1,315	36,001	262	52,284

APPENDIX TABLE 7.-- 1988 BARGE TRANSPORTATION REPORT
AT LITTLE GOOSE

	DAILY #'s BARGED					ACCUM. #'s BARGED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
12/ 4	1,087	181	890	7	2,165	1,087	181	890	7	2,165
13/ 4	0	0	0	0	0	1,087	181	890	7	2,165
14/ 4	0	0	0	0	0	1,087	181	890	7	2,165
15/ 4	0	0	0	0	0	1,087	181	890	7	2,165
16/ 4	2,945	425	1,537	74	4,981	4,032	606	2,427	81	7,146
17/ 4	0	0	0	0	0	4,032	606	2,427	81	7,146
18/ 4	4,558	656	830	58	6,102	8,590	1,262	3,257	139	13,248
19/ 4	0	0	0	0	0	8,590	1,262	3,257	139	13,248
20/ 4	8,040	1,030	1,477	83	10,630	16,630	2,292	4,734	222	23,878
21/ 4	0	0	0	0	0	16,630	2,292	4,734	222	23,878
22/ 4	20,569	3,070	2,131	63	25,833	37,199	5,362	6,865	285	49,711
23/ 4	27,590	3,211	1,343	84	32,228	64,789	8,573	8,208	369	81,939
24/ 4	28,348	4,122	3,141	0	35,611	93,137	12,695	11,349	369	117,550
25/ 4	29,611	5,357	2,881	0	37,849	122,748	18,052	14,230	369	155,399
26/ 4	22,549	4,136	2,546	23	29,254	145,297	22,188	16,776	392	184,653
27/ 4	29,393	4,275	3,598	130	37,396	174,690	26,463	20,374	522	222,049
28/ 4	32,149	5,768	5,820	192	43,929	206,839	32,231	26,194	714	265,978
29/ 4	33,568	4,979	7,054	0	45,601	240,407	37,210	33,248	714	311,579
30/ 4	20,715	2,909	3,196	0	26,820	261,122	40,119	36,444	714	338,399
1/ 5	31,024	2,523	3,138	0	36,685	292,146	42,642	39,582	714	375,084
2/ 5	36,298	4,020	8,147	0	48,465	328,444	46,662	47,729	714	423,549
3/ 5	23,519	3,006	7,495	0	34,020	351,963	49,668	55,224	714	457,569
4/ 5	19,339	3,022	7,767	0	30,128	371,302	52,690	62,991	714	487,697
5/ 5	23,530	3,441	9,817	85	36,873	394,832	56,131	72,808	799	524,570
6/ 5	20,414	2,518	10,529	153	33,614	415,246	58,649	83,337	952	558,184
7/ 5	56,762	6,612	35,120	177	98,671	472,008	65,261	118,457	1,129	656,855
8/ 5	39,795	4,451	33,597	0	77,843	511,803	69,712	152,054	1,129	734,698
9/ 5	20,731	2,184	18,721	110	41,746	532,534	71,896	170,775	1,239	776,444
10/ 5	43,916	4,663	52,695	570	101,844	576,450	76,559	223,470	1,809	878,288
11/ 5	5,967	776	16,458	106	23,307	582,417	77,335	239,928	1,915	901,595
12/ 5	11,480	1,354	45,028	97	57,959	593,897	78,689	284,956	2,012	959,554
13/ 5	6,785	1,810	25,274	78	33,947	600,682	80,499	310,230	2,090	993,501
14/ 5	17,331	2,265	32,632	0	52,228	618,013	82,764	342,862	2,090	1,045,729
15/ 5	10,027	398	14,026	0	24,451	628,040	83,162	356,888	2,090	1,070,180
16/ 5	7,972	640	10,703	0	19,315	636,012	83,802	367,591	2,090	1,089,495
17/ 5	12,396	1,815	22,467	0	36,678	648,408	85,617	390,058	2,090	1,126,173
18/ 5	23,046	5,967	42,373	0	71,386	671,454	91,584	432,431	2,090	1,197,559
19/ 5	14,031	4,298	23,553	0	41,882	685,485	95,882	455,984	2,090	1,239,441
20/ 5	13,170	5,700	33,988	0	52,858	698,655	101,582	489,972	2,090	1,292,299
21/ 5	0	0	0	0	0	698,655	101,582	489,972	2,090	1,292,299
22/ 5	9,423	6,924	37,488	0	53,835	708,078	108,506	527,460	2,090	1,346,134
23/ 5	8,121	3,580	20,940	0	32,641	716,199	112,086	548,400	2,090	1,378,775
24/ 5	6,127	1,931	14,877	0	22,935	722,326	114,017	563,277	2,090	1,401,710
25/ 5	4,989	1,946	11,874	0	18,809	727,315	115,963	575,151	2,090	1,420,519
26/ 5	6,042	2,947	14,990	0	23,979	733,357	118,910	590,141	2,090	1,444,498
27/ 5	0	0	0	0	0	733,357	118,910	590,141	2,090	1,444,498
28/ 5	10,609	3,016	17,124	0	30,749	743,966	121,926	607,265	2,090	1,475,247
29/ 5	3,917	841	6,368	0	11,126	747,883	122,767	613,633	2,090	1,486,373

APPENDIX TABLE 7.-- Continued

	DAILY #'s BARGED					ACCUM. #'s BARGED				
	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
30/ 5	11,930	2,550	20,740	0	35,220	759,813	125,317	634,373	2,090	1,521,593
31/ 5	6,706	737	7,030	0	14,473	766,519	126,054	641,403	2,090	1,536,066
1/ 6	3,982	490	5,192	0	9,664	770,501	126,544	646,595	2,090	1,545,730
2/ 6	4,839	1,197	13,471	0	19,507	775,340	127,741	660,066	2,090	1,565,237
3/ 6	1,630	274	4,249	0	6,153	776,970	128,015	664,315	2,090	1,571,390
4/ 6	0	0	0	0	0	776,970	128,015	664,315	2,090	1,571,390
5/ 6	2,787	702	13,452	12	16,953	779,757	128,717	677,767	2,102	1,588,343
6/ 6	0	0	0	0	0	779,757	128,717	677,767	2,102	1,588,343
7/ 6	6,536	935	12,888	35	20,394	786,293	129,652	690,655	2,137	1,608,737
8/ 6	0	0	0	0	0	786,293	129,652	690,655	2,137	1,608,737
9/ 6	7,235	1,145	14,357	0	22,737	793,528	130,797	705,012	2,137	1,631,474
10/ 6	0	0	0	0	0	793,528	130,797	705,012	2,137	1,631,474
11/ 6	0	0	0	0	0	793,528	130,797	705,012	2,137	1,631,474
12/ 6	0	0	0	0	0	793,528	130,797	705,012	2,137	1,631,474
13/ 6	2,560	95	3,184	0	5,839	796,088	130,892	708,196	2,137	1,637,313
14/ 6	0	0	0	0	0	796,088	130,892	708,196	2,137	1,637,313
15/ 6	1,335	83	2,466	5	3,889	797,423	130,975	710,662	2,142	1,641,202
16/ 6	4,532	1,161	9,234	0	14,927	801,955	132,136	719,896	2,142	1,656,129

APPENDIX TABLE 8.-- 1988 BYPASS REPORT
AT LITTLE GOOSE

DAILY #'S BYPASSED					ACCUM. #'S BYPASSED				
Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total

No Juvenile Fish Bypassed

Appendix Table 9.-- Daily Collection Counts of Chinook, Coho, Steelhead, and Sockeye, Facility Mortalities, and Daily River Flows and Spills During 1988, at McNary Dam.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Mar 25	10	0	0	20	0	30	0	0.00	130,400	0	0.00
Mar 26	0	0	0	50	0	50	0	0.00	115,900	0	0.00
Mar 27	40	0	0	40	0	80	2	2.50	127,200	0	0.00
Mar 28	30	0	0	20	0	50	2	4.00	126,700	0	0.00
Mar 29	0	0	0	10	0	10	0	0.00	133,800	0	0.00
Mar 30	20	0	0	70	20	110	0	0.00	129,600	0	0.00
Mar 31	40	20	0	60	0	120	1	.83	130,800	0	0.00
Apr 1	40	30	0	130	0	200	3	1.50	97,600	0	0.00
Apr 2	90	0	0	70	0	160	0	0.00	95,200	0	0.00
Apr 3	70	0	0	100	10	180	1	.56	94,500	0	0.00
Apr 4	90	0	0	90	0	180	1	.56	125,100	0	0.00
Apr 5	80	0	0	160	0	240	1	.42	125,700	0	0.00
Apr 6	870	10	0	280	0	1,160	7	.60	118,500	0	0.00
Apr 7	13,850	0	0	560	20	14,430	95	.66	122,000	0	0.00
Apr 8	32,760	0	0	550	10	33,320	135	.41	105,000	0	0.00
Apr 9	41,740	10	0	930	0	42,680	201	.47	98,200	0	0.00
Apr 10	24,330	0	0	510	0	24,840	143	.58	86,900	0	0.00
Apr 11	18,800	0	0	240	10	19,050	130	.68	104,700	0	0.00
Apr 12	12,110	0	0	600	30	12,740	63	.49	104,400	0	0.00
Apr 13	18,690	0	0	770	10	19,470	111	.57	104,400	0	0.00
Apr 14	14,710	0	0	530	10	15,250	115	.75	128,000	0	0.00
Apr 15	33,990	0	0	1,140	10	35,140	299	.85	159,900	0	0.00
Apr 16	47,530	10	0	1,410	20	48,970	366	.75	144,200	0	0.00
Apr 17	23,980	0	0	1,600	0	25,580	146	.57	112,400	0	0.00
Apr 18	13,770	10	0	910	20	14,710	93	.63	157,000	0	0.00
Apr 19	41,090	20	20	2,370	40	43,540	149	.34	184,800	0	0.00
Apr 20	22,030	40	120	2,650	70	24,910	222	.89	135,400	0	0.00
Apr 21	16,200	190	110	2,650	110	19,260	122	.63	142,700	0	0.00
Apr 22	16,430	570	160	2,950	80	20,190	163	.81	132,800	0	0.00
Apr 23	19,360	390	220	3,300	100	23,370	132	.56	131,100	0	0.00
Apr 24	13,590	410	240	3,520	210	17,970	87	.48	130,400	0	0.00
Apr 25	12,860	70	260	8,620	200	22,010	96	.44	120,500	0	0.00
Apr 26	17,310	410	340	15,900	440	34,400	114	.33	153,600	0	0.00
Apr 27	17,670	600	340	8,300	660	27,570	217	.79	134,400	0	0.00
Apr 28	15,070	700	460	7,800	850	24,880	183	.74	137,500	0	0.00
Apr 29	12,790	720	270	6,240	780	20,800	123	.59	135,500	0	0.00
Apr 30	15,600	1,250	430	8,420	1,890	27,590	250	.91	149,500	0	0.00
May 1	28,630	500	340	8,200	2,860	40,530	319	.79	146,500	0	0.00
May 2	40,820	460	300	12,490	5,010	59,080	570	.96	133,500	0	0.00
May 3	45,680	640	610	15,190	5,750	67,870	559	.82	170,000	0	0.00
May 4	91,990	1,270	800	21,880	11,930	127,870	1,061	.83	170,200	0	0.00
May 5	89,030	1,060	580	16,000	10,830	117,500	1,062	.90	151,800	0	0.00
May 6	96,310	1,390	410	13,470	10,530	122,110	2,254	1.85	147,700	0	0.00
May 7	103,910	970	280	12,110	7,830	125,100	1,492	1.19	185,300	0	0.00
May 8	164,840	1,950	130	17,830	25,250	210,000	2,116	1.01	146,600	0	0.00
May 9	130,586	1,614	229	13,972	7,200	153,601	1,234	.80	153,100	0	0.00
May 10	134,580	2,480	360	18,370	7,590	163,380	1,008	.62	213,200	0	0.00
May 11	220,183	5,040	777	23,909	13,086	262,995	1,988	.76	200,700	0	0.00

Appendix Table 9.-- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
May 12	103,286	3,586	857	20,100	14,157	141,986	1,100	.77	209,400	0	0.00
May 13	91,338	3,413	1,788	19,250	13,050	128,839	1,294	1.00	208,500	0	0.00
May 14	123,587	3,500	4,613	20,638	12,488	164,826	22,682	13.76	240,800	0	0.00
May 15	127,950	3,325	3,300	36,363	16,275	187,213	1,740	.93	173,200	0	0.00
May 16	74,529	1,743	3,386	24,557	8,957	113,172	898	.79	188,000	0	0.00
May 17	90,310	2,490	19,840	32,030	8,730	153,400	1,075	.70	224,000	0	0.00
May 18	116,280	2,228	41,748	34,723	10,558	205,537	1,524	.74	217,700	0	0.00
May 19	79,043	2,271	17,757	32,671	7,329	139,071	1,062	.76	205,800	0	0.00
May 20	81,650	1,590	16,960	53,090	4,740	158,030	1,133	.72	210,000	0	0.00
May 21	65,113	2,288	14,138	49,337	4,463	135,339	906	.67	199,100	0	0.00
May 22	48,400	1,688	8,350	28,287	2,250	88,975	727	.82	187,700	0	0.00
May 23	32,180	1,050	7,090	20,880	2,280	63,480	470	.74	166,400	0	0.00
May 24	24,047	787	7,147	21,067	1,960	55,008	482	.88	217,200	0	0.00
May 25	25,040	1,105	9,005	26,660	2,660	64,470	607	.94	221,900	0	0.00
May 26	19,287	1,360	7,987	18,633	2,580	49,847	393	.79	216,900	0	0.00
May 27	20,443	2,048	8,261	16,672	3,166	50,590	449	.89	216,100	0	0.00
May 28	19,280	1,700	5,920	14,500	2,007	43,407	550	1.27	174,700	0	0.00
May 29	16,254	4,307	3,520	10,973	2,000	37,054	330	.89	153,000	0	0.00
May 30	12,625	3,165	1,760	4,465	745	22,760	307	1.35	142,800	0	0.00
May 31	8,335	1,880	1,205	3,260	570	15,250	184	1.21	190,500	0	0.00
Jun 1	20,315	6,775	2,525	5,325	1,125	36,065	193	.54	218,200	0	0.00
Jun 2	23,550	16,740	3,470	9,940	1,720	55,420	542	.98	211,800	0	0.00
Jun 3	8,600	15,671	2,357	8,142	1,529	36,299	411	1.13	221,000	0	0.00
Jun 4	9,586	36,014	3,186	11,371	1,543	61,700	492	.80	205,300	0	0.00
Jun 5	10,629	34,243	1,614	8,557	1,586	56,629	526	.93	181,700	0	0.00
Jun 6	5,186	16,571	814	3,729	1,214	27,514	205	.75	211,700	0	0.00
Jun 7	6,157	18,929	1,086	6,257	1,000	33,429	263	.79	181,100	0	0.00
Jun 8	5,386	23,671	1,414	6,143	1,171	37,785	290	.77	208,300	0	0.00
Jun 9	3,571	26,886	929	4,857	1,186	37,429	382	1.02	203,500	0	0.00
Jun 10	2,700	31,357	657	2,229	714	37,657	433	1.15	168,700	0	0.00
Jun 11	2,900	36,900	400	1,286	743	42,229	391	.93	180,100	0	0.00
Jun 12	1,843	43,314	300	1,229	286	46,972	294	.63	127,100	0	0.00
Jun 13	1,557	81,400	186	814	129	84,086	425	.51	128,300	0	0.00
Jun 14	2,429	62,600	357	943	329	66,658	324	.49	171,800	0	0.00
Jun 15	2,143	157,886	371	986	329	161,715	561	.35	142,000	0	0.00
Jun 16	1,343	138,557	171	671	229	140,971	479	.34	154,800	0	0.00
Jun 17	1,300	150,743	114	757	271	153,185	829	.54	157,900	0	0.00
Jun 18	1,457	84,400	229	586	171	86,843	366	.42	156,600	0	0.00
Jun 19	843	29,843	57	557	100	31,400	240	.76	121,100	0	0.00
Jun 20	300	52,614	57	386	43	53,400	338	.63	136,000	0	0.00
Jun 21	986	338,371	86	214	157	339,814	951	.28	145,700	0	0.00
Jun 22	1,667	593,640	67	447	140	595,961	2,021	.34	158,000	0	0.00
Jun 23	1,167	427,733	33	200	167	429,300	3,229	.75	163,800	0	0.00
Jun 24	1,233	371,133	33	100	100	372,599	2,538	.68	160,400	0	0.00
Jun 25	1,200	627,233	0	200	167	628,800	5,400	.86	148,800	0	0.00
Jun 26	800	210,233	0	200	133	211,366	30	.01	120,800	0	0.00
Jun 27	433	77,333	33	200	67	78,066	580	.74	139,700	0	0.00
Jun 28	740	41,340	40	80	60	42,260	239	.57	121,800	0	0.00

Appendix Table 9.-- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Jun 29	714	72,071	14	29	29	72,857	257	.35	127,000	0	0.00
Jun 30	514	342,800	14	100	29	343,457	1,281	.37	114,200	0	0.00
Jul 1	620	221,940	20	120	20	222,720	2,226	1.00	112,000	0	0.00
Jul 2	200	54,233	0	33	33	54,499	365	.67	109,900	0	0.00
Jul 3	67	27,200	0	0	0	27,267	369	1.35	97,700	0	0.00
Jul 4	367	31,700	0	33	33	32,133	300	.93	80,100	0	0.00
Jul 5	90	32,130	0	10	0	32,230	268	.83	98,500	0	0.00
Jul 6	230	85,410	0	20	10	85,670	1,018	1.19	125,700	0	0.00
Jul 7	400	155,743	0	129	57	156,329	1,634	1.05	120,800	0	0.00
Jul 8	340	153,780	0	160	20	154,300	2,297	1.49	102,600	0	0.00
Jul 9	467	220,733	33	0	0	221,233	2,656	1.20	119,800	0	0.00
Jul 10	100	103,233	0	0	0	103,333	2,250	2.18	105,100	0	0.00
Jul 11	120	26,620	0	20	0	26,760	669	2.50	110,400	0	0.00
Jul 12	160	20,840	0	10	10	21,020	202	.96	124,000	0	0.00
Jul 13	302	243,227	9	71	27	243,636	3,416	1.40	128,800	0	0.00
Jul 14	300	164,020	0	120	20	164,460	1,332	.81	110,200	0	0.00
Jul 15	100	92,960	0	60	40	93,160	1,005	1.08	108,000	0	0.00
Jul 16	100	52,167	0	0	33	52,300	657	1.26	74,600	0	0.00
Jul 17	80	17,860	0	40	0	17,980	271	1.51	79,900	0	0.00
Jul 18	129	163,406	10	10	20	163,575	13,547	8.28	105,600	0	0.00
Jul 19	267	256,600	0	0	33	256,900	36,776	14.32	126,900	0	0.00
Jul 20	33	170,533	0	0	33	170,599	7,210	4.23	126,200	0	0.00
Jul 21	233	39,133	0	0	33	39,399	1,242	3.15	118,200	0	0.00
Jul 22	157	28,786	0	57	14	29,014	553	1.91	121,300	0	0.00
Jul 23	200	25,933	0	0	0	26,133	645	2.47	94,400	0	0.00
Jul 24	167	23,300	0	0	0	23,467	635	2.71	82,800	0	0.00
Jul 25	29	16,500	0	14	0	16,543	565	3.42	90,700	0	0.00
Jul 26	80	8,180	0	0	0	8,260	449	5.44	104,000	0	0.00
Jul 27	60	22,160	0	20	0	22,240	7,527	33.84	91,400	0	0.00
Jul 28	40	21,980	0	0	20	22,040	4,172	18.93	91,700	0	0.00
Jul 29	60	13,860	0	0	20	13,940	1,143	8.20	81,900	0	0.00
Jul 30	0	6,380	0	20	0	6,400	1,018	15.91	84,200	0	0.00
Jul 31	0	6,460	0	20	0	6,480	757	11.68	72,000	0	0.00
Aug 1	0	5,000	0	0	0	5,000	480	9.60	91,800	0	0.00
Aug 2	0	4,940	0	0	0	4,940	158	3.20	88,200	0	0.00
Aug 3	0	6,720	0	20	0	6,740	336	4.99	98,800	0	0.00
Aug 4	0	7,440	0	0	0	7,440	201	2.70	94,100	0	0.00
Aug 5	0	5,280	0	0	20	5,300	326	6.15	94,500	0	0.00
Aug 6	80	7,920	0	0	20	8,020	257	3.20	98,700	0	0.00
Aug 7	20	5,000	0	0	0	5,020	137	2.73	94,600	0	0.00
Aug 8	20	2,140	0	20	0	2,180	68	3.12	80,200	0	0.00
Aug 9	40	1,320	0	0	20	1,380	65	4.71	103,400	0	0.00
Aug 10	0	3,700	0	20	0	3,720	167	4.49	93,100	0	0.00
Aug 11	20	2,540	0	0	20	2,580	94	3.64	111,800	0	0.00
Aug 12	0	2,920	0	20	0	2,940	136	4.63	108,900	0	0.00
Aug 13	60	3,180	0	20	0	3,260	168	5.15	93,700	0	0.00
Aug 14	20	1,900	0	0	0	1,920	66	3.44	84,500	0	0.00
Aug 15	40	1,680	0	0	20	1,740	69	3.97	79,300	0	0.00

Appendix Table 9.-- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	COLLECTION MORTALITY PERCENT	RIVER FLOW IN CFS	SPILL TOTAL	SPILL PERCENT
Aug 16	0	1,280	0	0	0	1,280	27	2.11	100,500	0	0.00
Aug 17	0	1,460	0	0	0	1,460	43	2.95	94,900	0	0.00
Aug 18	0	1,380	0	0	0	1,380	30	2.17	97,400	0	0.00
Aug 19	0	1,780	0	20	0	1,800	76	4.22	108,600	0	0.00
Aug 20	0	4,520	0	0	0	4,520	186	4.12	109,600	0	0.00
Aug 21	0	6,720	20	0	0	6,740	153	2.27	82,700	0	0.00
Aug 22	0	1,820	0	0	0	1,820	45	2.47	68,600	0	0.00
Aug 23	0	820	0	0	0	820	32	3.90	112,800	0	0.00
Aug 24	0	900	0	0	0	900	45	5.00	123,900	0	0.00
Aug 25	200	9,040	0	40	20	9,300	167	1.80	98,700	0	0.00
Aug 26	460	8,540	0	20	60	9,080	98	1.08	144,100	0	0.00
Aug 27	40	7,500	0	0	0	7,540	61	.81	101,300	0	0.00
Aug 28	120	4,360	0	0	20	4,500	63	1.40	83,500	0	0.00
Aug 29	20	1,540	0	20	0	1,580	68	4.30	102,300	0	0.00
Aug 30	0	1,080	0	0	20	1,100	59	5.36	128,400	0	0.00
Aug 31	60	3,140	0	20	40	3,260	97	2.98	121,600	0	0.00
Sep 1	40	2,460	0	0	0	2,500	46	1.84	125,400	0	0.00
Sep 2	0	2,640	0	0	0	2,640	68	2.58	109,800	0	0.00
Sep 3	0	2,080	0	0	0	2,080	63	3.03	122,200	0	0.00
Sep 4	0	880	0	0	20	900	94	10.44	106,800	0	0.00
Sep 5	20	1,200	0	0	0	1,220	158	12.95	108,400	0	0.00
Sep 6	40	1,500	20	0	20	1,580	79	5.00	113,800	0	0.00
Sep 7	0	2,160	0	20	0	2,180	58	2.66	126,300	0	0.00
Sep 8	0	1,520	0	0	0	1,520	50	3.29	117,600	0	0.00
Sep 9	0	1,320	0	0	0	1,320	57	4.32	124,700	0	0.00
Sep 10	0	860	0	40	0	900	85	9.44	114,000	0	0.00
Sep 11	0	2,100	0	0	0	2,100	61	2.90	101,800	0	0.00
Sep 12	0	900	0	0	0	900	40	4.44	85,900	0	0.00
Sep 13	0	520	0	0	0	520	35	6.73	115,600	0	0.00
Sep 14	20	680	0	0	0	700	47	6.71	108,900	0	0.00
Sep 15	20	520	0	0	20	560	22	3.93	109,000	0	0.00
Sep 16	0	440	0	0	0	440	22	5.00	114,000	0	0.00
Sep 17	0	660	0	0	0	660	23	3.48	93,400	0	0.00
Sep 18	0	570	0	10	0	580	27	4.66	89,200	0	0.00
Sep 19	0	420	0	0	0	420	21	5.00	102,000	0	0.00
Sep 20	0	280	0	0	0	280	22	7.86	127,100	0	0.00
Sep 21	0	842	0	5	12	859	10	1.16	115,500	0	0.00
TOTAL	2,971,263	6,884,478	213,144	822,944	251,706	11,143,535	182,099	1.63			

APPENDIX TABLE 10.-- 1988 TRUCK TRANSPORTATION REPORT
AT MCNARY

	DAILY #'s TRUCKED						ACCUM. #'s TRUCKED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
28/ 3	78	0	0	128	0	206	78	0	0	128	0	206
29/ 3	0	0	0	0	0	0	78	0	0	128	0	206
30/ 3	0	0	0	0	0	0	78	0	0	128	0	206
31/ 3	0	0	0	0	0	0	78	0	0	128	0	206
1/ 4	97	50	0	269	20	436	175	50	0	397	20	642
2/ 4	0	0	0	0	0	0	175	50	0	397	20	642
3/ 4	0	0	0	0	0	0	175	50	0	397	20	642
4/ 4	0	0	0	0	0	0	175	50	0	397	20	642
5/ 4	329	0	0	418	10	757	504	50	0	815	30	1,399
6/ 4	0	0	0	0	0	0	504	50	0	815	30	1,399
7/ 4	14,634	9	0	825	20	15,488	15,138	59	0	1,640	50	16,887
8/ 4	31,655	0	0	550	10	32,215	46,793	59	0	2,190	60	49,102
9/ 4	40,256	9	0	929	0	41,194	87,049	68	0	3,119	60	90,296
10/ 4	23,525	0	0	508	0	24,033	110,574	68	0	3,627	60	114,329
11/ 4	0	0	0	0	0	0	110,574	68	0	3,627	60	114,329
12/ 4	0	0	0	0	0	0	110,574	68	0	3,627	60	114,329
13/ 4	17,975	0	0	769	10	18,754	128,549	68	0	4,396	70	133,083
14/ 4	14,283	0	0	530	10	14,823	142,832	68	0	4,926	80	147,906
15/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
16/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
17/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
18/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
19/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
20/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
21/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
22/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
23/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
24/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
25/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
26/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
27/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
28/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
29/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
30/ 4	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
1/ 5	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
2/ 5	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
3/ 5	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
4/ 5	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
5/ 5	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
6/ 5	0	0	0	0	0	0	142,832	68	0	4,926	80	147,906
7/ 5	91,972	806	261	11,608	7,038	111,685	234,804	874	261	16,534	7,118	259,591
8/ 5	108,805	1,348	92	12,580	17,280	140,105	343,609	2,222	353	29,114	24,398	399,696
9/ 5	104,615	1,304	190	11,577	5,730	123,416	448,224	3,526	543	40,691	30,128	523,112
10/ 5	24,479	451	65	3,343	1,380	29,718	472,703	3,977	608	44,034	31,508	552,830
11/ 5	175,771	4,122	641	19,680	10,467	210,681	648,474	8,099	1,249	63,714	41,975	763,511
12/ 5	33,149	2,054	616	11,858	9,991	57,668	681,623	10,153	1,865	75,572	51,966	821,179
13/ 5	20,162	752	394	4,244	2,877	28,429	701,785	10,905	2,259	79,816	54,843	849,608
14/ 5	16,127	456	601	2,689	1,627	21,500	717,912	11,361	2,860	82,505	56,470	871,108

APPENDIX TABLE 10.-- Continued

	DAILY #'s TRUCKED						ACCUM. #'s TRUCKED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
15/ 5	53,232	1,383	1,373	15,125	6,770	77,883	771,144	12,744	4,233	97,630	63,240	948,991
16/ 5	13,622	319	619	4,488	1,637	20,685	784,766	13,063	4,852	102,118	64,877	969,676
17/ 5	87,780	2,476	19,831	31,801	8,456	150,344	872,546	15,539	24,683	133,919	73,333	1,120,020
18/ 5	63,099	1,109	23,066	18,297	5,323	110,894	935,645	16,648	47,749	152,216	78,656	1,230,914
19/ 5	15,210	437	3,417	6,312	1,410	26,786	950,855	17,085	51,166	158,528	80,066	1,257,700
20/ 5	11,885	230	2,464	7,762	691	23,032	962,740	17,315	53,630	166,290	80,757	1,280,732
21/ 5	39,079	1,433	8,925	31,201	2,611	83,249	1,001,819	18,748	62,555	197,491	83,368	1,363,981
22/ 5	7,321	255	1,263	4,296	340	13,475	1,009,140	19,003	63,818	201,787	83,708	1,377,456
23/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
24/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
25/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
26/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
27/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
28/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
29/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
30/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
31/ 5	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
1/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
2/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
3/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
4/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
5/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
6/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
7/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
8/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
9/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
10/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
11/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
12/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
13/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
14/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
15/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
16/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
17/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
18/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
19/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
20/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
21/ 6	0	0	0	0	0	0	1,009,140	19,003	63,818	201,787	83,708	1,377,456
22/ 6	340	120,997	12	97	24	121,470	1,009,480	140,000	63,830	201,884	83,732	1,498,926
23/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
24/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
25/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
26/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
27/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
28/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
29/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
30/ 6	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
1/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
2/ 7	0	0	0									

APPENDIX TABLE 10.-- Continued

	DAILY #'s TRUCKED						ACCUM. #'s TRUCKED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
21/ 8	0	10,901	20	0	0	10,921	1,009,875	257,186	63,850	202,031	83,871	1,616,813
22/ 8	0	0	0	0	0	0	1,009,875	257,186	63,850	202,031	83,871	1,616,813
23/ 8	0	2,563	0	0	0	2,563	1,009,875	259,749	63,850	202,031	83,871	1,619,376
24/ 8	0	0	0	0	0	0	1,009,875	259,749	63,850	202,031	83,871	1,619,376
25/ 8	197	9,731	0	40	20	9,988	1,010,072	269,480	63,850	202,071	83,891	1,629,364
26/ 8	459	8,443	0	20	60	8,982	1,010,531	277,923	63,850	202,091	83,951	1,638,346
27/ 8	40	7,439	0	0	0	7,479	1,010,571	285,362	63,850	202,091	83,951	1,645,825
28/ 8	0	0	0	0	0	0	1,010,571	285,362	63,850	202,091	83,951	1,645,825
29/ 8	139	5,771	0	19	20	5,949	1,010,710	291,133	63,850	202,110	83,971	1,651,774
30/ 8	0	0	0	0	0	0	1,010,710	291,133	63,850	202,110	83,971	1,651,774
31/ 8	60	4,065	0	19	60	4,204	1,010,770	295,198	63,850	202,129	84,031	1,655,978
1/ 9	0	0	0	0	0	0	1,010,770	295,198	63,850	202,129	84,031	1,655,978
2/ 9	40	4,986	0	0	0	5,026	1,010,810	300,184	63,850	202,129	84,031	1,661,004
3/ 9	0	0	0	0	0	0	1,010,810	300,184	63,850	202,129	84,031	1,661,004
4/ 9	0	2,805	0	0	18	2,823	1,010,810	302,989	63,850	202,129	84,049	1,663,827
5/ 9	0	0	0	0	0	0	1,010,810	302,989	63,850	202,129	84,049	1,663,827
6/ 9	60	2,463	20	0	20	2,563	1,010,870	305,452	63,870	202,129	84,069	1,666,390
7/ 9	0	0	0	0	0	0	1,010,870	305,452	63,870	202,129	84,069	1,666,390
8/ 9	0	3,574	0	18	0	3,592	1,010,870	309,026	63,870	202,147	84,069	1,669,982
9/ 9	0	0	0	0	0	0	1,010,870	309,026	63,870	202,147	84,069	1,669,982
10/ 9	0	2,038	0	40	0	2,078	1,010,870	311,064	63,870	202,187	84,069	1,672,060
11/ 9	0	0	0	0	0	0	1,010,870	311,064	63,870	202,187	84,069	1,672,060
12/ 9	0	2,899	0	0	0	2,899	1,010,870	313,963	63,870	202,187	84,069	1,674,959
13/ 9	0	0	0	0	0	0	1,010,870	313,963	63,870	202,187	84,069	1,674,959
14/ 9	20	1,118	0	0	0	1,138	1,010,890	315,081	63,870	202,187	84,069	1,676,097
15/ 9	0	0	0	0	0	0	1,010,890	315,081	63,870	202,187	84,069	1,676,097
16/ 9	20	916	0	0	20	956	1,010,910	315,997	63,870	202,187	84,089	1,677,053
17/ 9	0	0	0	0	0	0	1,010,910	315,997	63,870	202,187	84,089	1,677,053
18/ 9	0	0	0	0	0	0	1,010,910	315,997	63,870	202,187	84,089	1,677,053
19/ 9	0	1,579	0	10	0	1,589	1,010,910	317,576	63,870	202,197	84,089	1,678,642
20/ 9	0	0	0	0	0	0	1,010,910	317,576	63,870	202,197	84,089	1,678,642
21/ 9	0	1,090	0	5	12	1,107	1,010,910	318,666	63,870	202,202	84,101	1,679,749

APPENDIX TABLE 10.-- Continued

	DAILY #'s TRUCKED						ACCUM. #'s TRUCKED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
3/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
4/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
5/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
6/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
7/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
8/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
9/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
10/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
11/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
12/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
13/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
14/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
15/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
16/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
17/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
18/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
19/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
20/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
21/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
22/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
23/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
24/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
25/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
26/ 7	0	0	0	0	0	0	1,009,480	140,000	63,830	201,884	83,732	1,498,926
27/ 7	0	0	0	0	20	17,868	1,009,520	157,808	63,830	201,884	83,752	1,516,794
28/ 7	40	17,808	0	0	0	0	1,009,520	157,808	63,830	201,884	83,752	1,516,794
29/ 7	0	0	0	18	20	18,179	1,009,578	175,891	63,830	201,902	83,772	1,534,973
30/ 7	58	18,083	0	0	0	0	1,009,578	175,891	63,830	201,902	83,772	1,534,973
31/ 7	0	0	0	16	0	10,243	1,009,578	186,118	63,830	201,918	83,772	1,545,216
1/ 8	0	10,227	0	0	0	0	1,009,578	186,118	63,830	201,918	83,772	1,545,216
2/ 8	0	0	0	20	0	11,186	1,009,578	197,284	63,830	201,938	83,772	1,556,402
3/ 8	0	11,166	0	0	0	0	1,009,578	197,284	63,830	201,938	83,772	1,556,402
4/ 8	0	0	0	0	20	12,213	1,009,578	209,477	63,830	201,938	83,792	1,568,615
5/ 8	0	12,193	0	0	0	0	1,009,578	209,477	63,830	201,938	83,792	1,568,615
6/ 8	0	0	0	0	19	12,646	1,009,677	222,005	63,830	201,938	83,811	1,581,261
7/ 8	99	12,528	0	0	0	0	1,009,677	222,005	63,830	201,938	83,811	1,581,261
8/ 8	0	0	0	19	20	3,427	1,009,736	225,334	63,830	201,957	83,831	1,584,688
9/ 8	59	3,329	0	0	0	0	1,009,736	225,334	63,830	201,957	83,831	1,584,688
10/ 8	0	0	0	18	20	6,039	1,009,756	231,315	63,830	201,975	83,851	1,590,727
11/ 8	20	5,981	0	0	0	0	1,009,756	231,315	63,830	201,975	83,851	1,590,727
12/ 8	0	0	0	37	0	5,896	1,009,816	237,114	63,830	202,012	83,851	1,596,623
13/ 8	60	5,799	0	0	0	0	1,009,816	237,114	63,830	202,012	83,851	1,596,623
14/ 8	0	0	0	0	20	3,525	1,009,875	240,560	63,830	202,012	83,871	1,600,148
15/ 8	59	3,446	0	0	0	0	1,009,875	240,560	63,830	202,012	83,871	1,600,148
16/ 8	0	0	0	0	0	2,670	1,009,875	243,230	63,830	202,012	83,871	1,602,818
17/ 8	0	2,670	0	0	0	0	1,009,875	243,230	63,830	202,012	83,871	1,602,818
18/ 8	0	0	0	19	0	3,074	1,009,875	246,285	63,830	202,031	83,871	1,605,892
19/ 8	0	3,055	0	0	0	0	1,009,875	246,285	63,830	202,031	83,871	1,605,892
20/ 8	0	0	0									

APPENDIX TABLE 11.-- 1988 BARGE TRANSPORTATION REPORT
AT MCNARY

	DAILY #'s BARGED						ACCUM. #'s BARGED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
12/ 4	29,427	0	0	836	40	30,303	29,427	0	0	836	40	30,303
13/ 4	0	0	0	0	0	0	29,427	0	0	836	40	30,303
14/ 4	0	0	0	0	0	0	29,427	0	0	836	40	30,303
15/ 4	0	0	0	0	0	0	29,427	0	0	836	40	30,303
16/ 4	76,952	10	0	2,543	30	79,535	106,379	10	0	3,379	70	109,838
17/ 4	0	0	0	0	0	0	106,379	10	0	3,379	70	109,838
18/ 4	36,032	10	0	2,504	20	38,566	142,411	20	0	5,883	90	148,404
19/ 4	0	0	0	0	0	0	142,411	20	0	5,883	90	148,404
20/ 4	61,251	60	140	5,013	109	66,573	203,662	80	140	10,896	199	214,977
21/ 4	0	0	0	0	0	0	203,662	80	140	10,896	199	214,977
22/ 4	31,666	752	270	5,591	189	38,468	235,328	832	410	16,487	388	253,445
23/ 4	18,870	382	220	3,295	99	22,866	254,198	1,214	630	19,782	487	276,311
24/ 4	13,298	410	240	3,516	210	17,674	267,496	1,624	870	23,298	697	293,985
25/ 4	12,328	58	260	8,615	199	21,460	279,824	1,682	1,130	31,913	896	315,445
26/ 4	16,615	409	339	15,890	439	33,692	296,439	2,091	1,469	47,803	1,335	349,137
27/ 4	17,307	530	340	8,284	660	27,121	313,746	2,621	1,809	56,087	1,995	376,258
28/ 4	14,761	610	460	7,795	850	24,476	328,507	3,231	2,269	63,882	2,845	400,734
29/ 4	12,473	706	270	6,229	775	20,453	340,980	3,937	2,539	70,111	3,620	421,187
30/ 4	15,582	1,228	429	8,403	1,879	27,521	356,562	5,165	2,968	78,514	5,499	448,708
1/ 5	28,055	468	336	8,188	2,840	39,887	384,617	5,633	3,304	86,702	8,339	488,595
2/ 5	39,499	444	296	12,478	4,928	57,645	424,116	6,077	3,600	99,180	13,267	546,240
3/ 5	44,334	568	610	14,570	5,657	65,739	468,450	6,645	4,210	113,750	18,924	611,979
4/ 5	89,358	1,156	800	21,802	11,741	124,857	557,808	7,801	5,010	135,552	30,665	736,836
5/ 5	85,764	986	579	15,975	10,643	113,947	643,572	8,787	5,589	151,527	41,308	850,783
6/ 5	90,894	1,226	410	13,457	10,256	116,243	734,466	10,013	5,999	164,984	51,564	967,026
7/ 5	7,214	67	19	867	543	8,710	741,680	10,080	6,018	165,851	52,107	975,736
8/ 5	48,797	576	38	5,293	7,467	62,171	790,477	10,656	6,056	171,144	59,574	1,037,907
9/ 5	22,122	273	38	2,368	1,219	26,020	812,599	10,929	6,094	173,512	60,793	1,063,927
10/ 5	105,207	1,966	295	14,893	5,905	128,266	917,806	12,895	6,389	188,405	66,698	1,192,193
11/ 5	38,706	883	136	4,190	2,293	46,208	956,512	13,778	6,525	192,595	68,991	1,238,401
12/ 5	67,330	1,528	241	7,320	4,022	80,441	1,023,842	15,306	6,766	199,915	73,013	1,318,842
13/ 5	67,611	2,566	1,394	14,928	9,928	96,427	1,091,453	17,872	8,160	214,843	82,941	1,415,269
14/ 5	87,175	2,558	3,436	15,308	8,798	117,275	1,178,628	20,430	11,596	230,151	91,739	1,532,544
15/ 5	70,603	1,887	1,926	21,148	8,968	104,532	1,249,231	22,317	13,522	251,299	100,707	1,637,076
16/ 5	59,367	1,411	2,767	20,008	7,046	90,599	1,308,598	23,728	16,289	271,307	107,753	1,727,675
17/ 5	0	0	0	0	0	0	1,308,598	23,728	16,289	271,307	107,753	1,727,675
18/ 5	50,100	1,100	18,572	16,409	4,902	91,083	1,358,698	24,828	34,861	287,716	112,655	1,818,758
19/ 5	61,339	1,827	14,314	25,554	5,652	108,686	1,420,037	26,655	49,175	313,270	118,307	1,927,444
20/ 5	66,508	1,333	14,433	44,706	3,838	130,818	1,486,545	27,988	63,608	357,976	122,145	2,058,262
21/ 5	23,831	837	5,174	18,071	1,633	49,546	1,510,376	28,825	68,782	376,047	123,778	2,107,808
22/ 5	39,431	1,426	7,072	24,031	1,762	73,722	1,549,807	30,251	75,854	400,078	125,540	2,181,530
23/ 5	31,079	1,042	7,085	21,010	2,187	62,403	1,580,886	31,293	82,939	421,088	127,727	2,243,933
24/ 5	23,025	780	7,135	21,945	1,854	54,739	1,603,911	32,073	90,074	443,033	129,581	2,298,672
25/ 5	23,527	1,103	8,990	25,985	2,551	62,156	1,627,438	33,176	99,064	469,018	132,132	2,360,828
26/ 5	18,068	1,353	7,978	18,559	2,505	48,463	1,645,506	34,529	107,042	487,577	134,637	2,409,291
27/ 5	19,481	2,027	8,250	16,676	2,911	49,345	1,664,987	36,556	115,292	504,253	137,548	2,458,636
28/ 5	17,527	1,686	5,901	14,467	1,926	41,507	1,682,514	38,242	121,193	518,720	139,474	2,500,143
29/ 5	15,829	4,298	3,519	10,907	1,949	36,502	1,698,343	42,540	124,712	529,627	141,423	2,536,645

APPENDIX TABLE 11.-- Continued

	DAILY #'s BARGED						ACCUM. #'s BARGED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
30/ 5	11,603	3,136	1,752	4,405	708	21,604	1,709,946	45,676	126,464	534,032	142,131	2,558,249
31/ 5	7,746	1,869	1,200	3,203	544	14,562	1,717,692	47,545	127,664	537,235	142,675	2,572,811
1/ 6	19,341	6,757	2,519	5,296	1,094	35,007	1,737,033	54,302	130,183	542,531	143,769	2,607,818
2/ 6	23,015	16,690	3,464	9,852	1,769	54,790	1,760,048	70,992	133,647	552,383	145,538	2,662,608
3/ 6	8,575	15,403	2,354	8,073	1,509	35,914	1,768,623	86,395	136,001	560,456	147,047	2,698,522
4/ 6	0	0	0	0	0	0	1,768,623	86,395	136,001	560,456	147,047	2,698,522
5/ 6	20,149	69,547	4,794	19,760	3,069	117,319	1,788,772	155,942	140,795	580,216	150,116	2,815,841
6/ 6	0	0	0	0	0	0	1,788,772	155,942	140,795	580,216	150,116	2,815,841
7/ 6	11,314	35,188	1,896	9,892	2,181	60,471	1,800,086	191,130	142,691	590,108	152,297	2,876,312
8/ 6	0	0	0	0	0	0	1,800,086	191,130	142,691	590,108	152,297	2,876,312
9/ 6	8,903	50,071	2,338	10,886	2,267	74,465	1,808,989	241,201	145,029	600,994	154,564	2,950,777
10/ 6	0	0	0	0	0	0	1,808,989	241,201	145,029	600,994	154,564	2,950,777
11/ 6	5,527	67,607	1,057	3,421	1,450	79,062	1,814,516	308,808	146,086	604,415	156,014	3,029,839
12/ 6	0	0	0	0	0	0	1,814,516	308,808	146,086	604,415	156,014	3,029,839
13/ 6	3,382	122,521	483	1,987	473	128,846	1,817,898	431,329	146,569	606,402	156,487	3,158,685
14/ 6	0	0	0	0	0	0	1,817,898	431,329	146,569	606,402	156,487	3,158,685
15/ 6	4,539	217,204	726	1,876	651	224,996	1,822,437	648,533	147,295	608,278	157,138	3,383,681
16/ 6	0	0	0	0	0	0	1,822,437	648,533	147,295	608,278	157,138	3,383,681
17/ 6	2,623	283,490	285	1,379	498	288,275	1,825,060	932,023	147,580	609,657	157,636	3,671,956
18/ 6	0	0	0	0	0	0	1,825,060	932,023	147,580	609,657	157,636	3,671,956
19/ 6	2,286	113,713	286	1,083	269	117,637	1,827,346	1,045,736	147,866	610,740	157,905	3,789,593
20/ 6	0	0	0	0	0	0	1,827,346	1,045,736	147,866	610,740	157,905	3,789,593
21/ 6	1,274	383,170	143	546	200	385,333	1,828,620	1,428,906	148,009	611,286	158,105	4,174,926
22/ 6	0	0	0	0	0	0	1,828,620	1,428,906	148,009	611,286	158,105	4,174,926
23/ 6	2,484	887,834	87	514	277	891,196	1,831,104	2,316,740	148,096	611,800	158,382	5,066,122
24/ 6	1,218	365,912	31	86	95	367,342	1,832,322	2,682,652	148,127	611,886	158,477	5,433,464
25/ 6	1,179	618,824	0	195	166	620,364	1,833,501	3,301,476	148,127	612,081	158,643	6,053,828
26/ 6	794	206,970	0	178	131	208,073	1,834,295	3,508,446	148,127	612,259	158,774	6,261,901
27/ 6	432	75,937	33	194	67	76,663	1,834,727	3,584,383	148,160	612,453	158,841	6,338,564
28/ 6	733	40,429	40	76	60	41,338	1,835,460	3,624,812	148,200	612,529	158,901	6,379,902
29/ 6	711	70,105	14	24	29	70,883	1,836,171	3,694,917	148,214	612,553	158,930	6,450,785
30/ 6	0	0	0	0	0	0	1,836,171	3,694,917	148,214	612,553	158,930	6,450,785
1/ 7	1,122	554,478	29	208	49	555,886	1,837,293	4,249,395	148,243	612,761	158,979	7,006,671
2/ 7	0	0	0	0	0	0	1,837,293	4,249,395	148,243	612,761	158,979	7,006,671
3/ 7	263	80,707	0	29	33	81,032	1,837,556	4,330,102	148,243	612,790	159,012	7,087,703
4/ 7	0	0	0	0	0	0	1,837,556	4,330,102	148,243	612,790	159,012	7,087,703
5/ 7	454	62,001	0	39	33	62,527	1,838,010	4,392,103	148,243	612,829	159,045	7,150,230
6/ 7	0	0	0	0	0	0	1,838,010	4,392,103	148,243	612,829	159,045	7,150,230
7/ 7	625	232,019	0	140	67	232,851	1,838,635	4,624,122	148,243	612,969	159,112	7,383,081
8/ 7	0	0	0	0	0	0	1,838,635	4,624,122	148,243	612,969	159,112	7,383,081
9/ 7	807	367,480	33	156	19	368,495	1,839,442	4,991,602	148,276	613,125	159,131	7,751,576
10/ 7	0	0	0	0	0	0	1,839,442	4,991,602	148,276	613,125	159,131	7,751,576
11/ 7	220	127,544	0	8	0	127,772	1,839,662	5,119,146	148,276	613,133	159,131	7,879,348
12/ 7	0	0	0	0	0	0	1,839,662	5,119,146	148,276	613,133	159,131	7,879,348
13/ 7	462	254,205	9	79	37	254,792	1,840,124	5,373,351	148,285	613,212	159,168	8,134,140
14/ 7	0	0	0	0	0	0	1,840,124	5,373,351	148,285	613,212	159,168	8,134,140
15/ 7	398	253,652	0	174	60	254,284	1,840,522	5,627,003	148,285	613,386	159,228	8,388,424
16/ 7	0	0	0	0	0	0	1,840,522	5,627,003	148,285	613,386	159,228	8,388,424
17/ 7	178	70,464	0	36	32	70,710	1,840,700	5,697,467	148,285	613,422	159,260	8,459,134

APPENDIX TABLE 11.-- Continued

	DAILY #'s BARGED						ACCUM. #'s BARGED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
18/ 7	0	0	0	0	0	0	1,840,700	5,697,467	148,285	613,422	159,260	8,459,134
19/ 7	396	364,791	10	8	53	365,258	1,841,096	6,062,258	148,295	613,430	159,313	8,824,392
20/ 7	33	162,708	0	0	33	162,774	1,841,129	6,224,966	148,295	613,430	159,346	8,987,166
21/ 7	233	37,468	0	0	33	37,734	1,841,362	6,262,434	148,295	613,430	159,379	9,024,900
22/ 7	0	0	0	0	0	0	1,841,362	6,262,434	148,295	613,430	159,379	9,024,900
23/ 7	351	54,190	0	54	14	54,609	1,841,713	6,316,624	148,295	613,484	159,393	9,079,509
24/ 7	0	0	0	0	0	0	1,841,713	6,316,624	148,295	613,484	159,393	9,079,509
25/ 7	194	38,603	0	13	0	38,810	1,841,907	6,355,227	148,295	613,497	159,393	9,118,319
26/ 7	0	0	0	0	0	0	1,841,907	6,355,227	148,295	613,497	159,393	9,118,319
27/ 7	136	22,371	0	17	0	22,524	1,842,043	6,377,598	148,295	613,514	159,393	9,140,843

APPENDIX TABLE 12.-- 1988 BYPASS REPORT
AT MCNARY

	DAILY #'S BYPASSED						ACCUM. #'S BYPASSED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
8/ 4	970	0	0	0	0	970	970	0	0	0	0	970
9/ 4	1,285	0	0	0	0	1,285	2,255	0	0	0	0	2,255
10/ 4	664	0	0	0	0	664	2,919	0	0	0	0	2,919
11/ 4	637	0	0	0	0	637	3,556	0	0	0	0	3,556
12/ 4	477	0	0	0	0	477	4,033	0	0	0	0	4,033
13/ 4	665	0	0	0	0	665	4,698	0	0	0	0	4,698
14/ 4	372	0	0	0	0	372	5,070	0	0	0	0	5,070
15/ 4	1,383	0	0	0	0	1,383	6,453	0	0	0	0	6,453
16/ 4	2,347	0	0	0	0	2,347	8,800	0	0	0	0	8,800
17/ 4	1,058	0	0	0	0	1,058	9,858	0	0	0	0	9,858
18/ 4	487	0	0	0	0	487	10,345	0	0	0	0	10,345
19/ 4	1,100	0	0	0	0	1,100	11,445	0	0	0	0	11,445
20/ 4	466	0	0	0	0	466	11,911	0	0	0	0	11,911
21/ 4	330	0	0	0	0	330	12,241	0	0	0	0	12,241
22/ 4	367	0	0	0	0	367	12,608	0	0	0	0	12,608
23/ 4	429	0	0	0	0	429	13,037	0	0	0	0	13,037
24/ 4	209	0	0	0	0	209	13,246	0	0	0	0	13,246
25/ 4	278	0	0	0	0	278	13,524	0	0	0	0	13,524
26/ 4	236	0	0	0	0	236	13,760	0	0	0	0	13,760
27/ 4	232	0	0	0	0	232	13,992	0	0	0	0	13,992
28/ 4	221	0	0	0	0	221	14,213	0	0	0	0	14,213
29/ 4	224	0	0	0	0	224	14,437	0	0	0	0	14,437
30/ 4	318	0	0	0	0	318	14,755	0	0	0	0	14,755
1/ 5	320	0	0	0	0	320	15,075	0	0	0	0	15,075
2/ 5	881	0	0	0	0	881	15,956	0	0	0	0	15,956
3/ 5	972	0	0	0	0	972	16,928	0	0	0	0	16,928
4/ 5	1,919	0	0	0	0	1,919	18,847	0	0	0	0	18,847
5/ 5	1,950	0	0	0	0	1,950	20,797	0	0	0	0	20,797
6/ 5	2,983	0	0	0	0	2,983	23,780	0	0	0	0	23,780
7/ 5	3,713	0	0	0	0	3,713	27,493	0	0	0	0	27,493
8/ 5	5,848	0	0	0	0	5,848	33,341	0	0	0	0	33,341
9/ 5	2,399	0	0	0	0	2,399	35,740	0	0	0	0	35,740
10/ 5	4,215	0	0	0	0	4,215	39,955	0	0	0	0	39,955
11/ 5	4,203	0	0	0	0	4,203	44,158	0	0	0	0	44,158
12/ 5	1,956	0	0	0	0	1,956	46,114	0	0	0	0	46,114
13/ 5	2,789	0	0	0	0	2,789	48,903	0	0	0	0	48,903
14/ 5	2,956	0	0	0	0	2,956	51,859	0	0	0	0	51,859
15/ 5	3,082	0	0	0	0	3,082	54,941	0	0	0	0	54,941
16/ 5	990	0	0	0	0	990	55,931	0	0	0	0	55,931
17/ 5	1,844	0	0	0	0	1,844	57,775	0	0	0	0	57,775
18/ 5	2,010	0	0	0	0	2,010	59,785	0	0	0	0	59,785
19/ 5	1,777	0	0	0	0	1,777	61,562	0	0	0	0	61,562
20/ 5	1,636	0	0	0	0	1,636	63,198	0	0	0	0	63,198
21/ 5	1,637	0	0	0	0	1,637	64,835	0	0	0	0	64,835
22/ 5	1,149	0	0	0	0	1,149	65,984	0	0	0	0	65,984
23/ 5	782	0	0	0	0	782	66,766	0	0	0	0	66,766
24/ 5	728	0	0	0	0	728	67,494	0	0	0	0	67,494
25/ 5	1,216	0	0	0	0	1,216	68,710	0	0	0	0	68,710

APPENDIX TABLE 12.-- Continued

	DAILY #'S BYPASSED						ACCUM. #'S BYPASSED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
26/ 5	1,002	0	0	0	0	1,002	69,712	0	0	0	0	69,712
27/ 5	734	0	0	0	0	734	70,446	0	0	0	0	70,446
28/ 5	1,458	0	0	0	0	1,458	71,904	0	0	0	0	71,904
29/ 5	701	0	0	0	0	701	72,605	0	0	0	0	72,605
30/ 5	861	0	0	0	0	861	73,466	0	0	0	0	73,466
31/ 5	504	0	0	0	0	504	73,970	0	0	0	0	73,970
1/ 6	864	0	0	0	0	864	74,834	0	0	0	0	74,834
2/ 6	162	0	0	0	0	162	74,996	0	0	0	0	74,996
3/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
4/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
5/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
6/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
7/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
8/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
9/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
10/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
11/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
12/ 6	0	0	0	0	0	0	74,996	0	0	0	0	74,996
13/ 6	0	1,550	0	0	0	1,550	74,996	1,550	0	0	0	76,546
14/ 6	0	639	0	0	0	639	74,996	2,189	0	0	0	77,185
15/ 6	0	1,851	0	0	0	1,851	74,996	4,040	0	0	0	79,036
16/ 6	0	2,219	0	0	0	2,219	74,996	6,259	0	0	0	81,255
17/ 6	0	2,354	0	0	0	2,354	74,996	8,613	0	0	0	83,609
18/ 6	0	0	0	0	0	0	74,996	8,613	0	0	0	83,609
19/ 6	0	0	0	0	0	0	74,996	8,613	0	0	0	83,609
20/ 6	0	1,277	0	0	0	1,277	74,996	9,890	0	0	0	84,886
21/ 6	0	5,315	0	0	0	5,315	74,996	15,205	0	0	0	90,201
22/ 6	0	4,449	0	0	0	4,449	74,996	19,654	0	0	0	94,650
23/ 6	0	2,895	0	0	0	2,895	74,996	22,549	0	0	0	97,545
24/ 6	0	2,717	0	0	0	2,717	74,996	25,266	0	0	0	100,262
25/ 6	0	3,036	0	0	0	3,036	74,996	28,302	0	0	0	103,298
26/ 6	0	1,704	0	0	0	1,704	74,996	30,006	0	0	0	105,002
27/ 6	0	823	0	0	0	823	74,996	30,829	0	0	0	105,825
28/ 6	0	683	0	0	0	683	74,996	31,512	0	0	0	106,508
29/ 6	0	1,717	0	0	0	1,717	74,996	33,229	0	0	0	108,225
30/ 6	0	5,063	0	0	0	5,063	74,996	38,292	0	0	0	113,288
1/ 7	0	1,716	0	0	0	1,716	74,996	40,008	0	0	0	115,004
2/ 7	0	0	0	0	0	0	74,996	40,008	0	0	0	115,004
3/ 7	0	0	0	0	0	0	74,996	40,008	0	0	0	115,004
4/ 7	0	0	0	0	0	0	74,996	40,008	0	0	0	115,004
5/ 7	0	0	0	0	0	0	74,996	40,008	0	0	0	115,004
6/ 7	0	3,978	0	0	0	3,978	74,996	43,986	0	0	0	118,982
7/ 7	0	2,562	0	0	0	2,562	74,996	46,548	0	0	0	121,544
8/ 7	0	1,983	0	0	0	1,983	74,996	48,531	0	0	0	123,527
9/ 7	0	0	0	0	0	0	74,996	48,531	0	0	0	123,527
10/ 7	0	0	0	0	0	0	74,996	48,531	0	0	0	123,527
11/ 7	0	362	0	0	0	362	74,996	48,893	0	0	0	123,889
12/ 7	0	808	0	0	0	808	74,996	49,701	0	0	0	124,697
13/ 7	0	4,318	0	0	0	4,318	74,996	54,019	0	0	0	129,015

APPENDIX TABLE 12.-- Continued

	DAILY #'S BYPASSED						ACCUM. #'S BYPASSED					
	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrlg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
14/ 7	0	999	0	0	0	999	74,996	55,018	0	0	0	130,014
15/ 7	0	0	0	0	0	0	74,996	55,018	0	0	0	130,014
16/ 7	0	0	0	0	0	0	74,996	55,018	0	0	0	130,014
17/ 7	0	0	0	0	0	0	74,996	55,018	0	0	0	130,014
18/ 7	0	3,034	0	0	0	3,034	74,996	58,052	0	0	0	133,048
19/ 7	0	920	0	0	0	920	74,996	58,972	0	0	0	133,968
20/ 7	0	615	0	0	0	615	74,996	59,587	0	0	0	134,583
21/ 7	0	423	0	0	0	423	74,996	60,010	0	0	0	135,006