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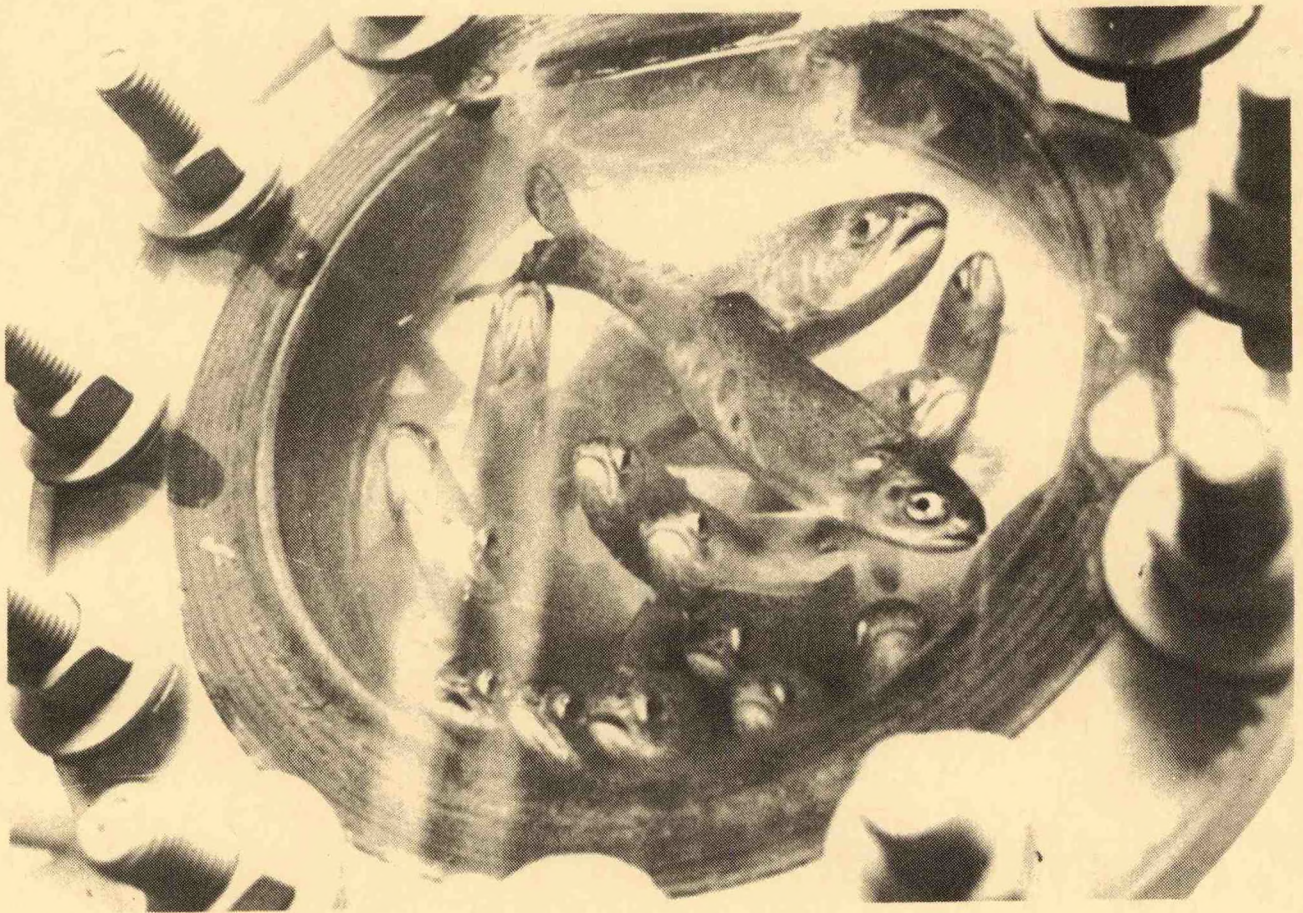


NOAA Technical Memorandum NMFS F/NWR-22

FISH TRANSPORTATION OVERSIGHT TEAM ANNUAL REPORT-FY 1987
TRANSPORT OPERATIONS ON THE SNAKE AND COLUMBIA RIVERS

CHARLES H. KOSKI, STEPHEN W. PETTIT,
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APRIL 1988



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

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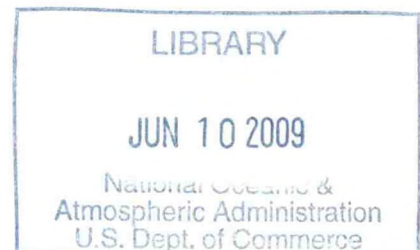
FISH TRANSPORTATION OVERSIGHT TEAM ANNUAL REPORT-FY 1987
TRANSPORT OPERATIONS ON THE SNAKE AND COLUMBIA RIVERS



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APRIL 1988

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Lower Granite Dam:

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Bradford Dredge, Joe Norton, IDFG

Little Goose Dam:

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William Knox, Mark T. Kirsch, ODFW

McNary Dam:

Brad Eby, Susan ~~Knox~~^{KNAPP}, NPW
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Cover Photo

Juvenile steelhead in sampling
manifold at Lower Granite Dam.
(Photo by Steve Pettit)

SUMMARY

The 1987 transport season began March 26 and ended October 29. A total of 19,821,789 juvenile salmonids was collected, including 5,512,434 at Lower Granite, 1,982,312 at Little Goose, and 12,326,034 at McNary. A total of 17,036,566 fish were transported, 1,681,436 by truck and 15,355,130 by barge.

Total collection included 50,740 juveniles bypassed at Little Goose and 2,345,147 at McNary. These included marked juvenile fish released back to the river at McNary as controls for transport evaluation.

Extreme low snowpack resulted in severe drought conditions throughout the Columbia River basin in 1987. Snake River flows peaked at 100 kcfs on April 30. Flows above powerhouse capacity never occurred; however, a minor amount of spill occurred at Lower Granite on April 30. Columbia River flows at McNary Dam peaked at 395 kcfs on June 1. McNary spilled for 24 days, with a peak spill of 101.8 kcfs on May 15.

✓ w/ Hosker

Lower Granite and Little Goose seasonal collection mortality was 0.72 and 1.14%, respectively. This compares with 0.19 and 0.36% in 1986. Seasonal collection mortality was 2.64% at the McNary facility compared to 1.45% recorded in 1986.

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), Columbia River Inter-Tribal Fish Commission (CRITFC), 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 providing 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.

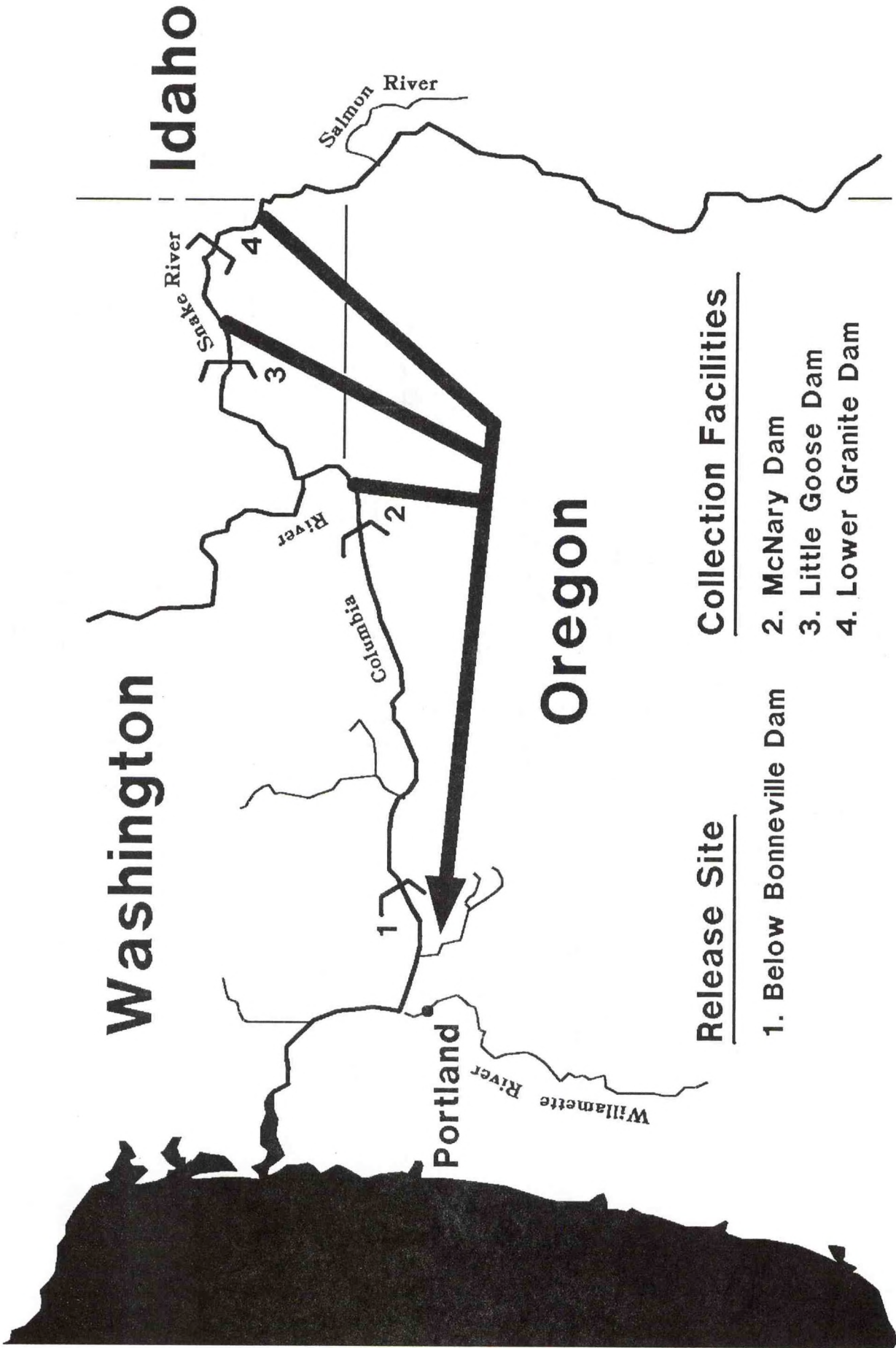
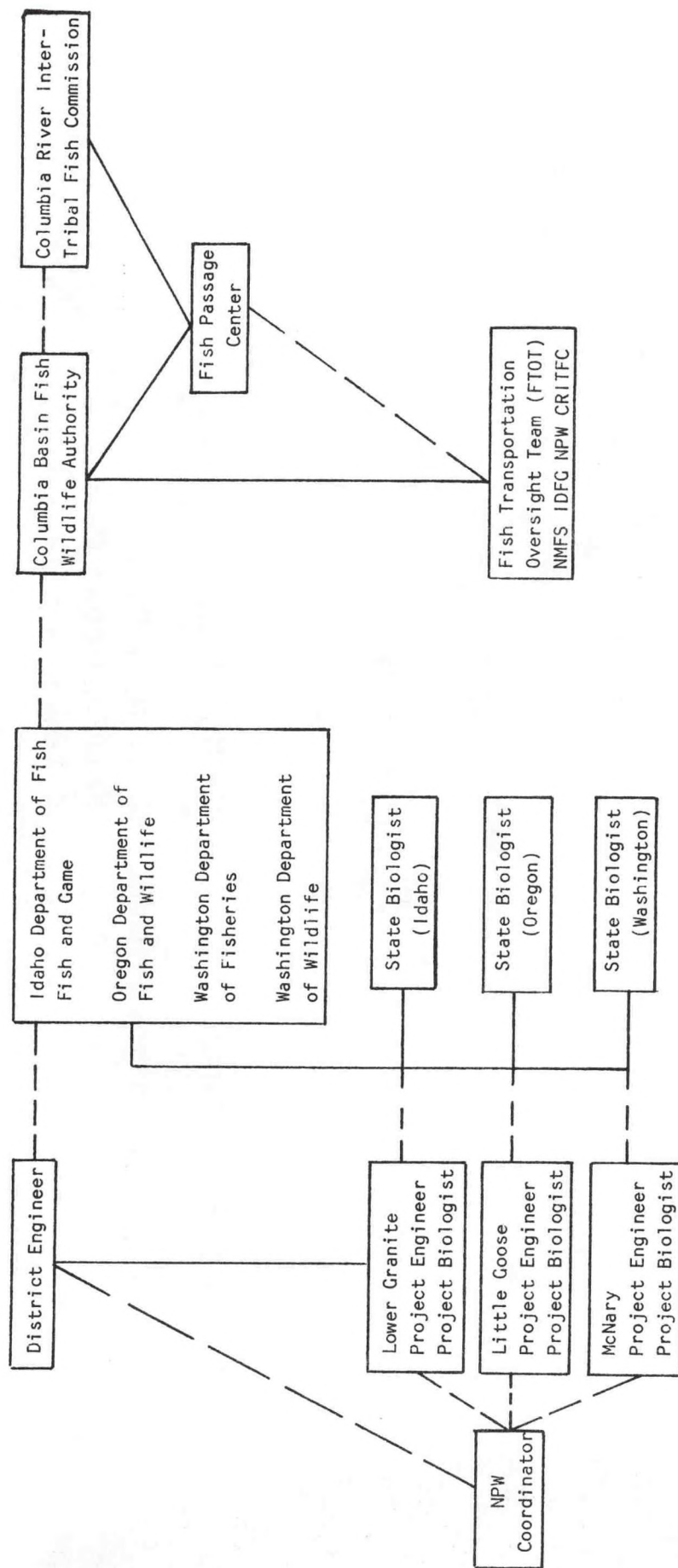


Figure 1. Locations of fish collection facilities, transportation route, and release site.

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 denotes 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 8- or 12-inch orifices into a transport conduit that carries them to a collection facility or to the tailrace.

This report summarizes 1987 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

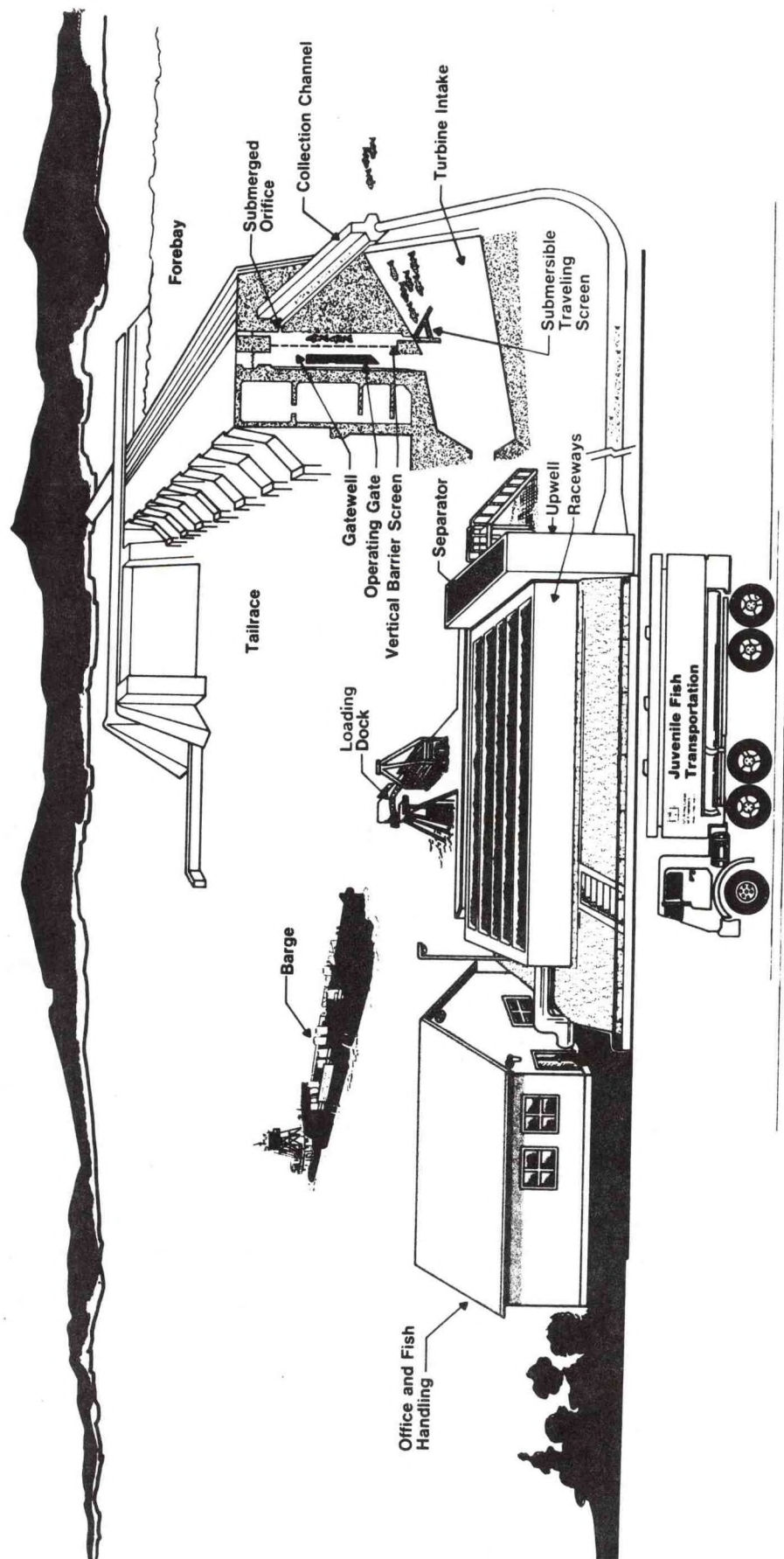
The observed January - July Columbia River runoff at The Dalles was 72% (76.5 million acre feet [MAF]) of the 20 year (1961-1980) average, Grand Coulee 78% (50.6 MAF), and the Snake River below Lower Granite 53% (16.0 MAF). Flows at Lower Granite and McNary dams are compared with the juvenile outmigrations in Figures 4 and 5.

Snake River

The observed April - August Snake River runoff measured at Lower Granite for 1987 was 11.1 MAF, 47% of the 1961 - 1980 average.

The water year ranked 48 in the 50-year average (1928 - 1978), which is the third lowest runoff on record. The record low was 1977. Spring flows in the Snake River ranged from 23 kcfs (April 1) to a peak flow of 100 kcfs (April 30). By June 1 flows had dropped to 94 kcfs and continued to decline for the remainder of the season to a low of 12 kcfs (July 5). From July 5 to the end of the transport season (July 31) flows ranged from 12 to 30 kcfs.

Figure 3. Juvenile salmonid collection and transportation system.



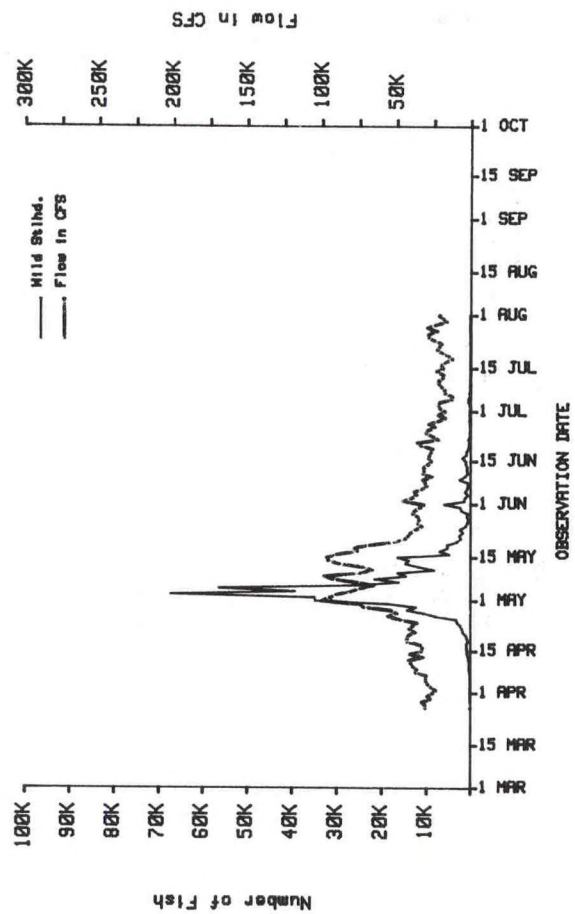
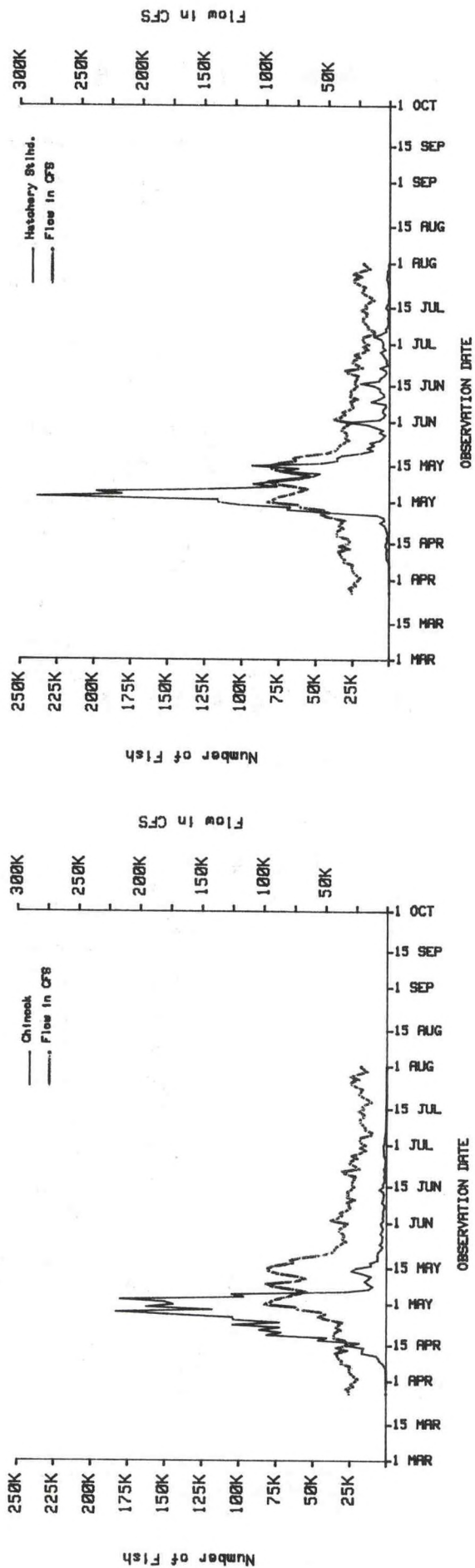
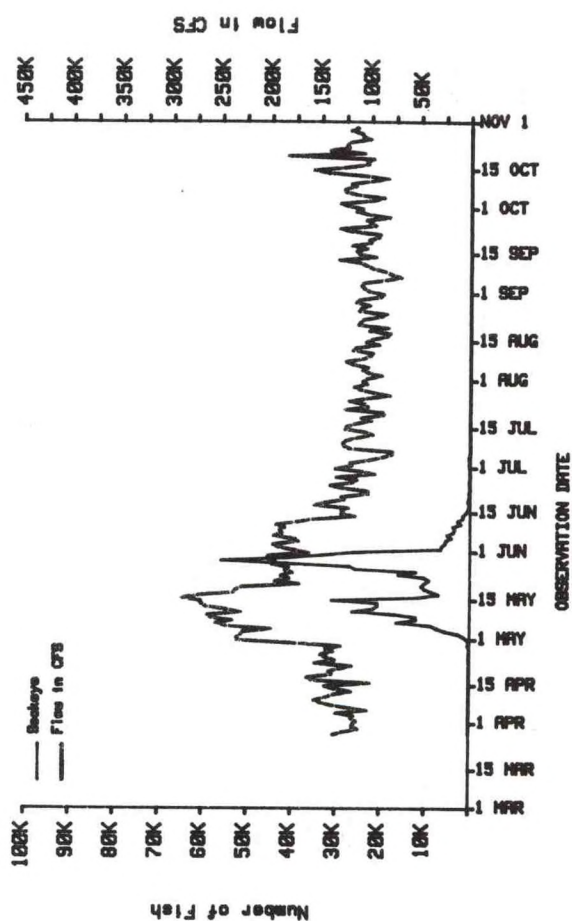
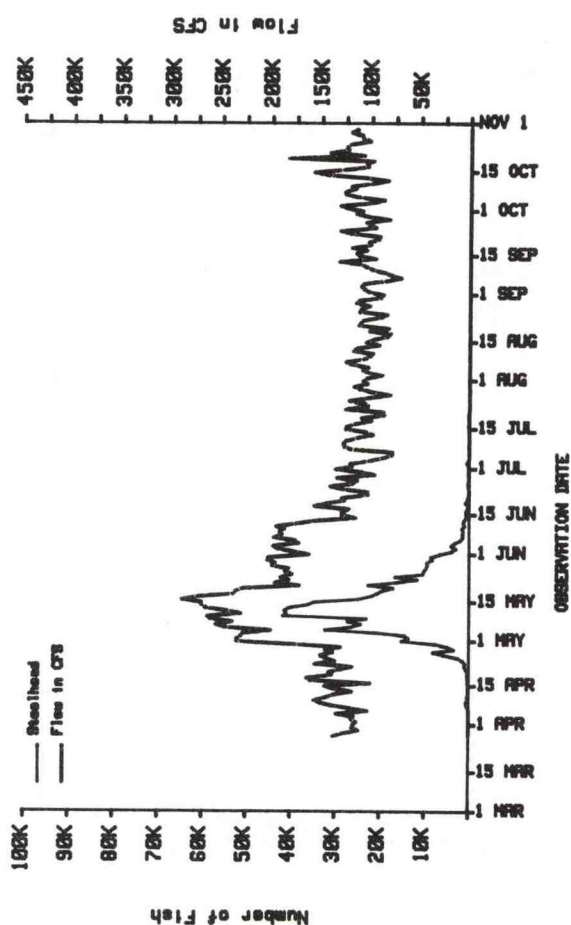
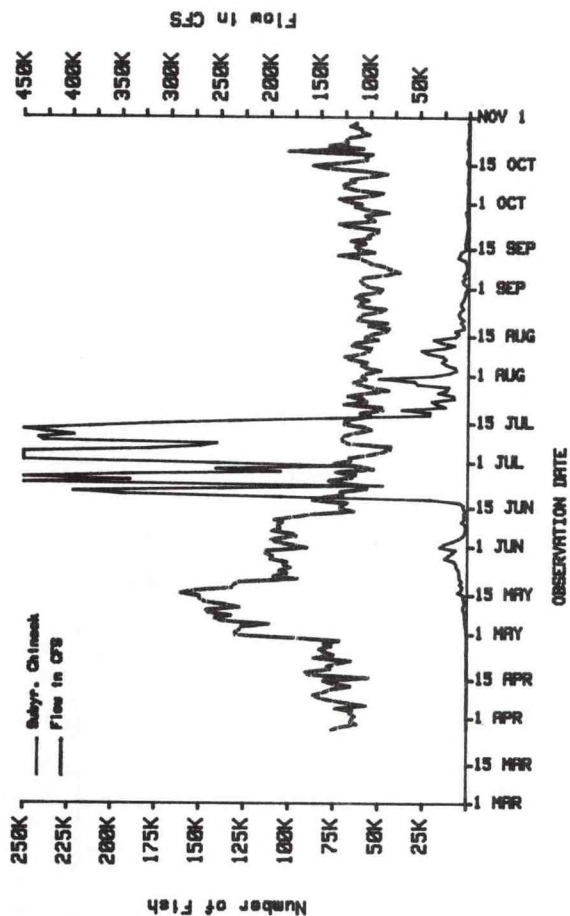
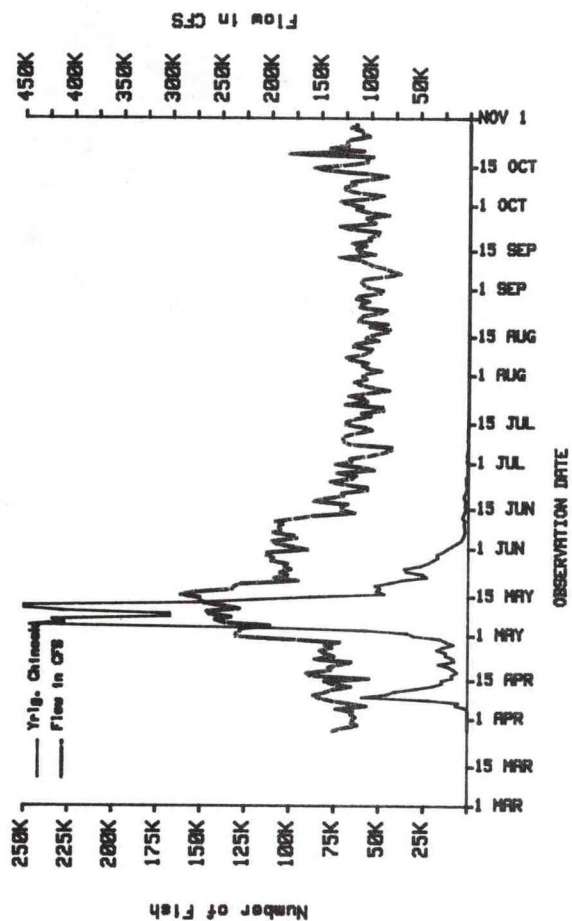


Figure 4. Snake River flows versus daily counts of chinook, wild and hatchery steelhead during 1987 at Lower Granite.

Figure 5. Columbia River flows versus daily counts of yearling chinook, subyearling chinook, steelhead, sockeye, during 1987 at McNary Dam.



Regulated flows on the Snake River peaked at 100.1 kcfs on April 30, compared to 1986 peak of 211 kcfs on June 1. A minor amount of spill (0.1 kcfs) also occurred on April 30. Flows in the Snake River never exceeded Lower Granite powerhouse capacity and were above 85 kcfs for a total of only 9 days throughout the season (Figure 6) compared to 83 days in 1986.

Snake River flows did not meet FTOT criteria for bypassing chinook because the 100 kcfs trigger was exceeded only one day (April 30). Consequently, transportation continued throughout the season.

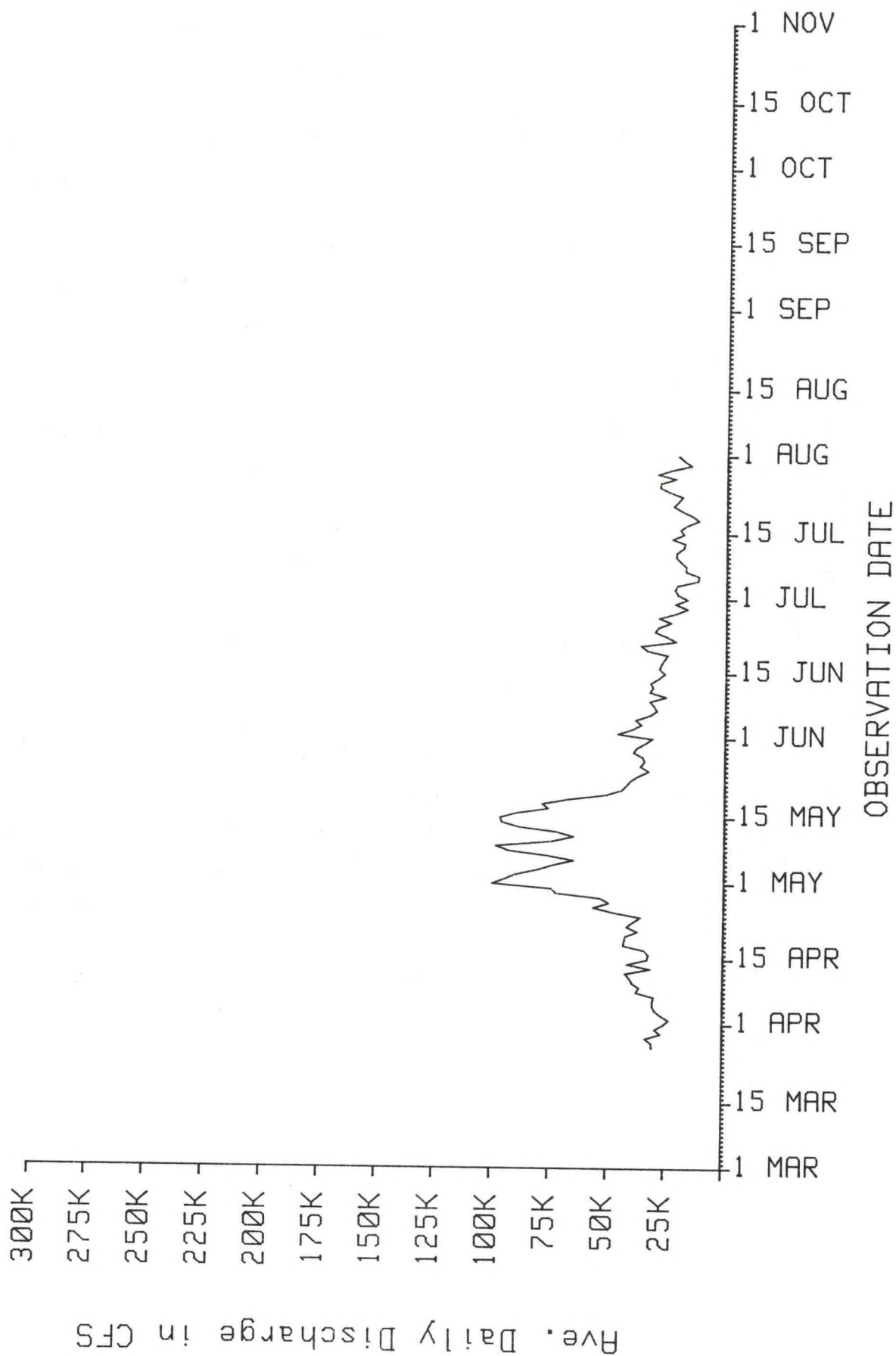
Low flows during the summer period resulted in higher water temperatures in the Snake River. Mortalities of juvenile fish held in the raceways at Lower Granite and Little Goose were, in part, a result of elevated water temperature.

Columbia River

Observed Columbia River runoff measured at The Dalles for the 1987 water year (October - September) was 101.9 MAF 78% of the 1961 - 1980 average. A peak flow of 291.6 kcfs occurred at McNary Dam on May 15, 1987, compared with 395 kcfs on June 1, 1986. Intermittent spill occurred at McNary Dam from April 30 thru May 28. The highest spill occurred on May 15 with 101.8 kcfs, 35% of the total river flow. The Columbia River flows at McNary exceeded the 220 kcfs trigger for bypassing yearling chinook as specified in the FTOT Annual Work Plan (Anonymous 1987) only 20 days (April 30-May 19) (Figure 7).

Special unit operations were implemented at McNary in the summer in an attempt to alleviate water temperature problems caused by low water flows and hot weather.

Figure 6. Observed flows at Lower Granite Dam in 1987.



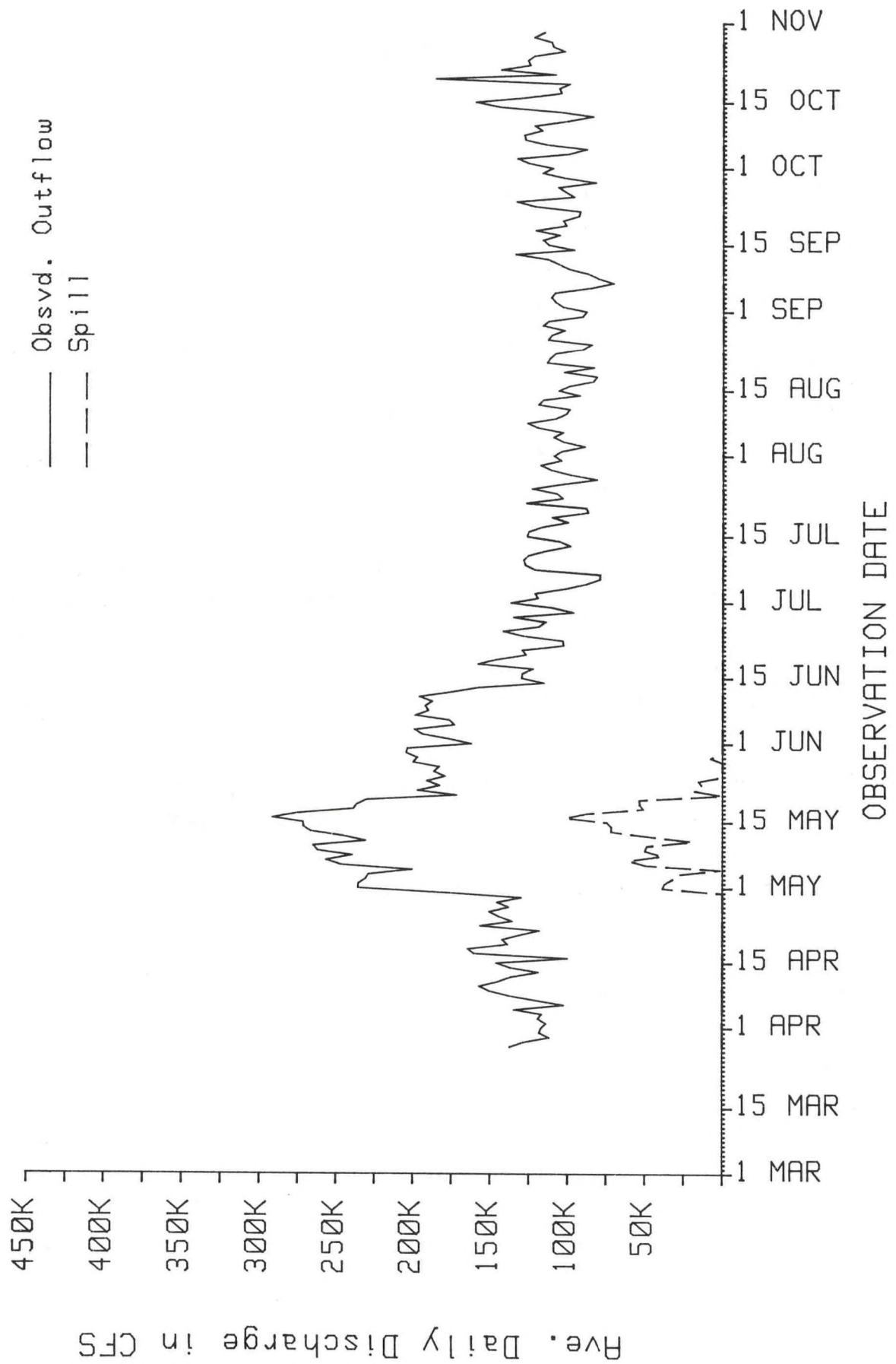


Figure 7. Observed flows and spill at McNary Dam in 1987.

EQUIPMENT

Transport Vehicles

Present criteria allow holding fish a maximum of two days in a raceway before being loaded into trucks or barges for transport to below Bonneville Dam. 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.

Figure 8. Operational dates for barge and truck transportation in 1987.

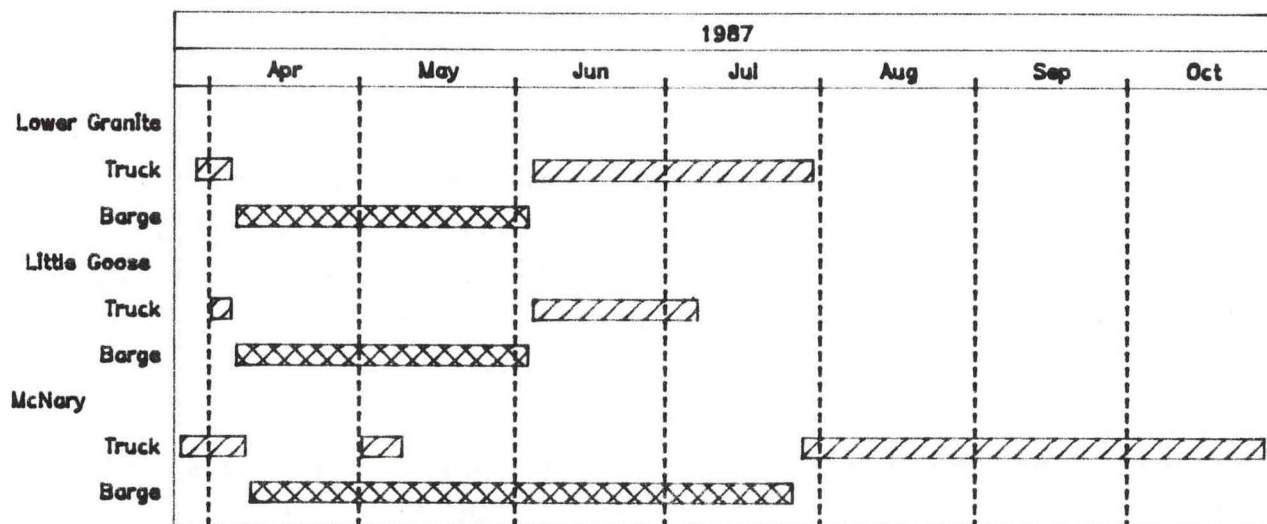
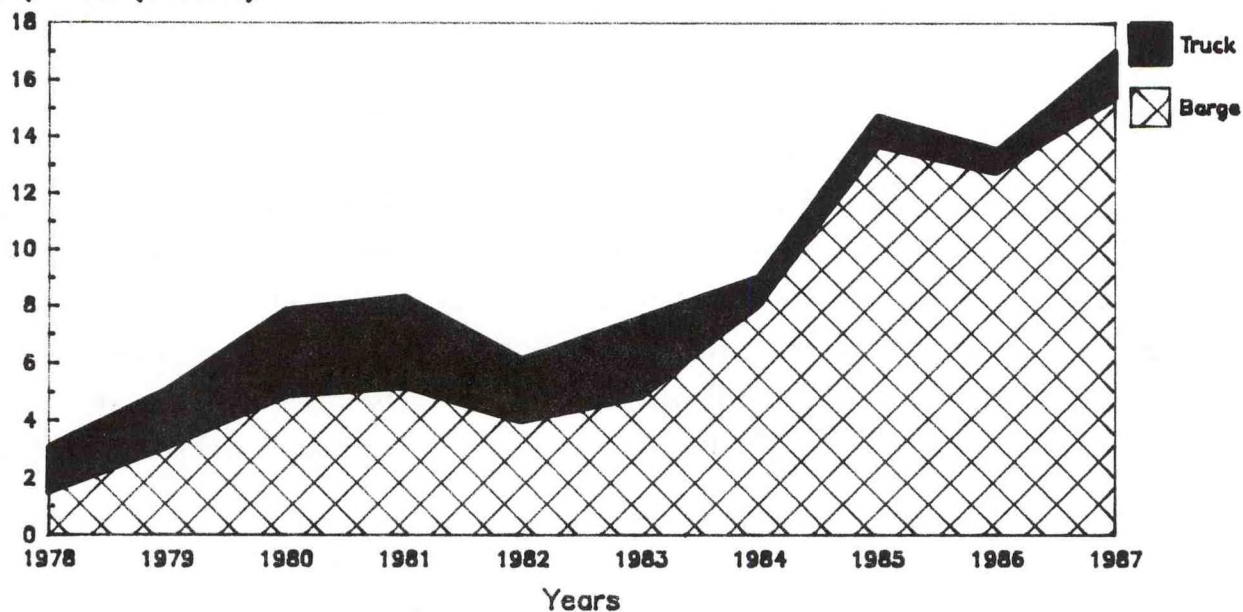


Figure 9. Transport summary of juvenile fish trucked or barged from Lower Granite, Little Goose, and McNary Dams, 1978 through 1987.

Fish Transported (Millions)



Wet Separators/Distribution Systems

Prior to the collection season, Lower Granite's sample tank was slightly modified to facilitate its use. The tank and pre-anesthetic compartments functioned well throughout the season.

Several modifications were made at the Little Goose facility. Air controlled valves were installed on all gatewell orifices, the barge loading lines were replaced, and the straight T pipe joints were replaced with sweep joints. New counting tunnels with passive integrated transponder (PIT) tag detectors were installed in the separator outlets.

A new, 3600-gallon sample tank replaced the old 2600-gallon tank at McNary. The new tank contains three compartments in which fish can be anesthetized prior to being handled. The system is similar to Lower Granite's except that fish at McNary must be netted from the compartments and placed in a chute leading to the handling room. Lower Granite's system utilizes gravity flow into the handling room.

Air controlled valves were installed on all north gatewell orifices at McNary. This modification reduced the amount of time and labor associated with cycling the orifices to remove debris.

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 the Snake River projects and only 2 minor mesh tears and one sheared pin were reported from McNary. Changing the mesh fasteners from the "Christmas tree" clips (Koski et al., 1985) to bar fasteners at McNary appears to have substantially reduced the potential for mesh failure.

JUVENILE OUTMIGRATION

The 1987 season began March 27 and ended October 29. Total juvenile collection at all projects was 19,821,789 of which 17,036,566 (86%) were transported (Tables 1-3). The fishery agencies and tribes continued the policy of bypassing the majority of yearling chinook back to the river, which resulted in 2,345,147 juveniles bypassed at McNary Dam and an additional 126,330 bypassed as control fish for transport evaluation. With the exception of 50,740 juveniles that were bypassed at Little Goose to prevent exceeding raceway capacity no fish were bypassed at Snake River projects because of low flows.

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.

Table 1. Juvenile fish transportation summary and dates of operation, 1987.

	Trucked	Barged	Total
<u>Lower Granite</u>			
March 28-July 31			
Chinook	56,931	2,409,664	2,466,595
Wild steelhead	23,430	527,176	550,606
Hatchery steelhead	201,496	2,251,160	2,452,656
Sockeye	34	752	786
Coho	0	22	22
Total	281,891	5,188,774	5,470,665
<u>Little Goose</u>			
April 2-July 9			
Chinook	15,834	971,888	987,722
Wild steelhead	2,819	133,252	136,071
Hatchery steelhead	20,143	758,510	778,653
Sockeye	49	6,538	6,587
Coho	0	993	993
Total	38,845	1,871,181	1,910,026
<u>McNary</u>			
March 27-October 29			
Yearling chinook	686,168	1,003,251	1,689,419
Subyearling chinook	426,725	6,238,323	6,665,048
Wild steelhead	69,011	103,650	172,661
Hatchery steelhead	132,509	385,011	517,520
Sockeye	37,834	391,668	429,502
Coho	8,375	173,264	181,639
Total	1,360,622	8,295,167	9,655,789
Grand Total	1,681,436	15,355,130	17,036,566

Table 2. Summary by dam of juvenile fish transported, 1978 - 1987.

	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

Table 3. Summary of juvenile fish trucked or barged from Lower Granite, Little Goose, and McNary Dams, 1978 - 1987.

	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	17,036,566

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.

Exception to the daily random sample criteria was permitted by the Columbia Basin Fish and Wildlife Authority in 1987 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.

TRANSPORT OPERATIONS - LOWER GRANITE DAM, 1987

FACILITY MODIFICATIONS

Although no major facility modifications occurred prior to the 1987 transport season at Lower Granite, numerous minor changes and equipment replacements were made to improve worker safety, increase accuracy of the juvenile counting system, and improve barge loading efficiency. Project workers replaced worn perforated plates above the porosity control gates and in the bottom of the juvenile separator hopper. Perforated plates were installed on raceway headscreens to prevent fish from jumping behind the barriers. The electronic counters and associated stainless steel tunnels were replaced with new counters and translucent tunnels.

The barge loading system was modified to insure safer and more efficient loading of all four barges. A series of Y-gates was placed on the loading dock and barge to divert fish to any of the barge compartments via 6-inch flex hoses. The Y-gate installations eliminated the need to move heavy, cumbersome flex hoses to individual barge compartments when direct loading.

The 24-hour sample period was changed from 1200-1200 to 0700-0700 so that expanded numbers of fish collected (daily collection estimates) more accurately represented actual periods of sample collection.

Additional facility and barge modifications included:

1. To improve safety, the gratings above the water in the juvenile bypass gallery were bolted to the steel support elements.
2. To reduce noise created by the water elimination plates in the distribution flume, workers placed weights under the plates. This addition effectively reduced vibration and the constant, low pitched "hum" was eliminated.

3. Additional walkways and handrails were installed to provide safer operating conditions for personnel.
4. An electronic motor was installed on the sample tank's fish crowding screen assembly. This allowed workers to process fish more quickly.
5. The PVC pipe connecting the sample tank to the marking/sampling building was replaced with translucent fiberglass. This modification allowed workers to closely observe fish passage and eliminated fish stranding in the pipe.
6. To improve fish condition and marking/sampling routine, a 1-horsepower chiller/aerator unit was installed in place of the two $\frac{1}{4}$ -horsepower units used in 1986. The additional cooling capacity was necessary to equilibrate temperature in the recirculation system with that of water coming in from the sample holding tank.
7. A new diesel engine was installed on barge #2817 before the 1987 transport season.
8. To facilitate loading, the handrails around each compartment on barges #2817 and #2127 were removed and aluminum grating was placed above the holding compartments.
9. To allow an increased period in which direct barge loading could take place, the tug contractor (Knappton Corporation) was requested to return fish barges to Lower Granite as quickly as possible.
10. Loading chutes were installed in each raceway to eliminate the need to transfer these heavy items from one raceway to another. Previously, only three movable chutes were available.

COLLECTION OF JUVENILES

Migration and Collection

An estimated 2,497,635 (45.3%) chinook were collected in 1987, compared to 1,676,980 and 1,786,252 in 1986 and 1985, respectively. The 1987 chinook collection was a record high because of increased hatchery production and no spill (Table 4).

Both the time of arrival and large numbers of chinook were unexpected based on previous collections during periods of low flow. During April, inflow at Lower Granite averaged only 42.3 kcfs and ranged from 25.5 to 91.5 kcfs (Figure 6). Despite flows that remained well below the recommended fisheries minimum, daily collection numbers reached 100,000 by April 22 and climbed to 300,000 by April 30 (Figure 10). Coincident with the dramatic in fish collection, the use of hydropower to meet peak loads resulted in extreme daily flow fluctuations. It appears, although no definitive analysis was made, that migrants reacted positively to extreme reservoir fluctuations, and travel time through the pool decreased substantially. In fact, the most obvious difference between 1987 and previous years at Lower Granite is that 80% of the chinook passed in less than half the time (Figure 11).

As flows increased through late April and the first week of May, fish collection also reached record levels. Reservoir turbidity increased dramatically on May 1 as a result of heavy, localized thunderstorms in the Palouse and Camas Prairie regions. Collections exceeding 300,000 occurred on four consecutive days and peaked on May 2 when a record 486,452 juveniles were collected. Peak collections of chinook and steelhead also occurred on May 2. Chinook dominated the collection prior to the peak, but their abundance dropped rapidly after the first week of May (Figure 10).

Steelhead became the dominant species on May 2 and remained so until transport operations terminated. An estimated 3,013,986 (54.6% of total fish collected) steelhead juveniles were collected during 1987 which, surprisingly, represented a 2.5% decline from the previous season. Approximately 22%

Table 4. Annual collection, bypass, and transport at Lower Granite, 1981-1987

Year	Chinook	Steelhead		Coho	Sockeye	Total
		Hatchery	Wild			
<u>Collection</u>						
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
<u>Bypass</u>						
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
<u>Truck</u>						
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
<u>Barge</u>						
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

Figure 10. Daily counts of juvenile yearling chinook, wild and hatchery steelhead collected during 1987 at Lower Granite Dam.

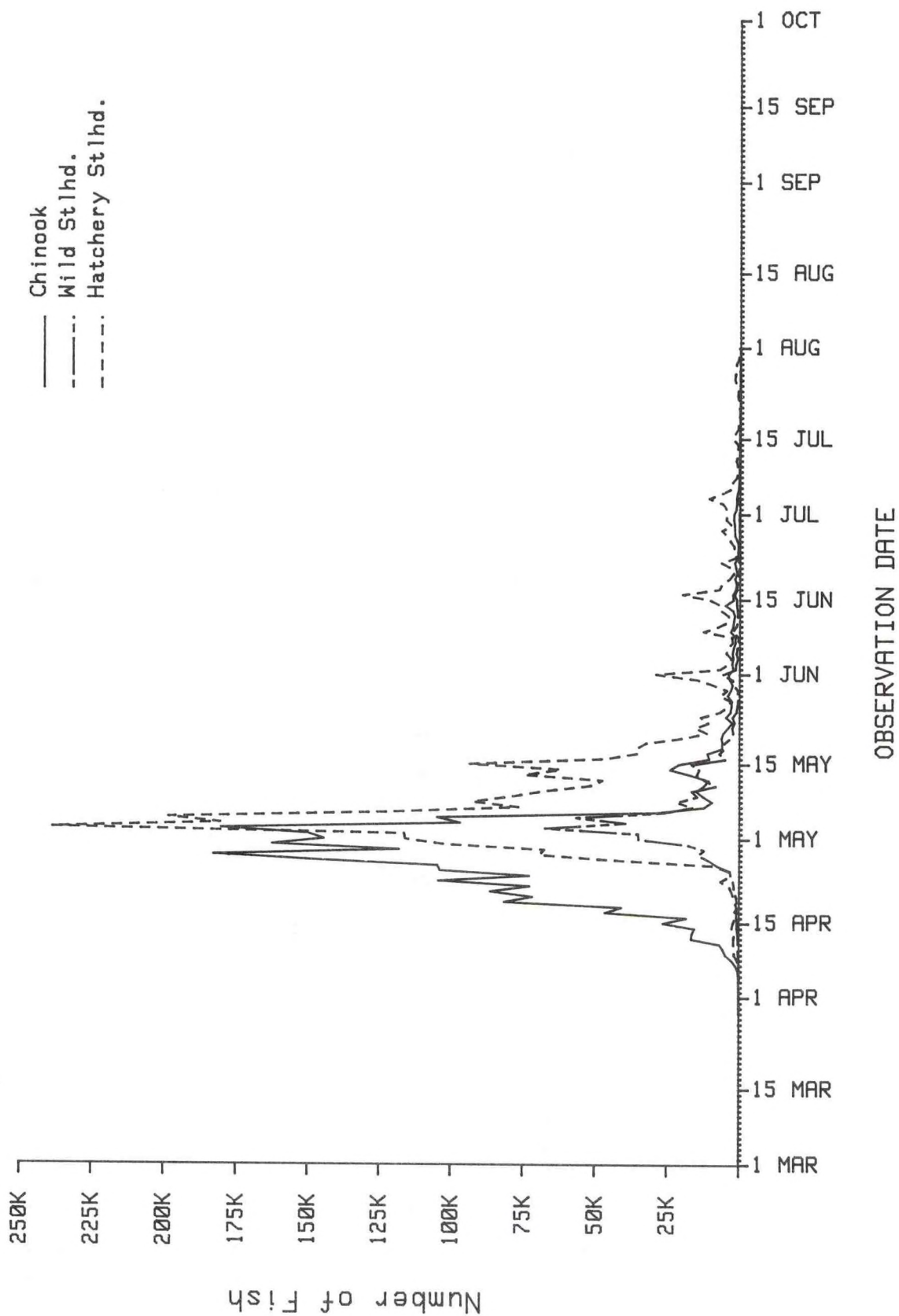
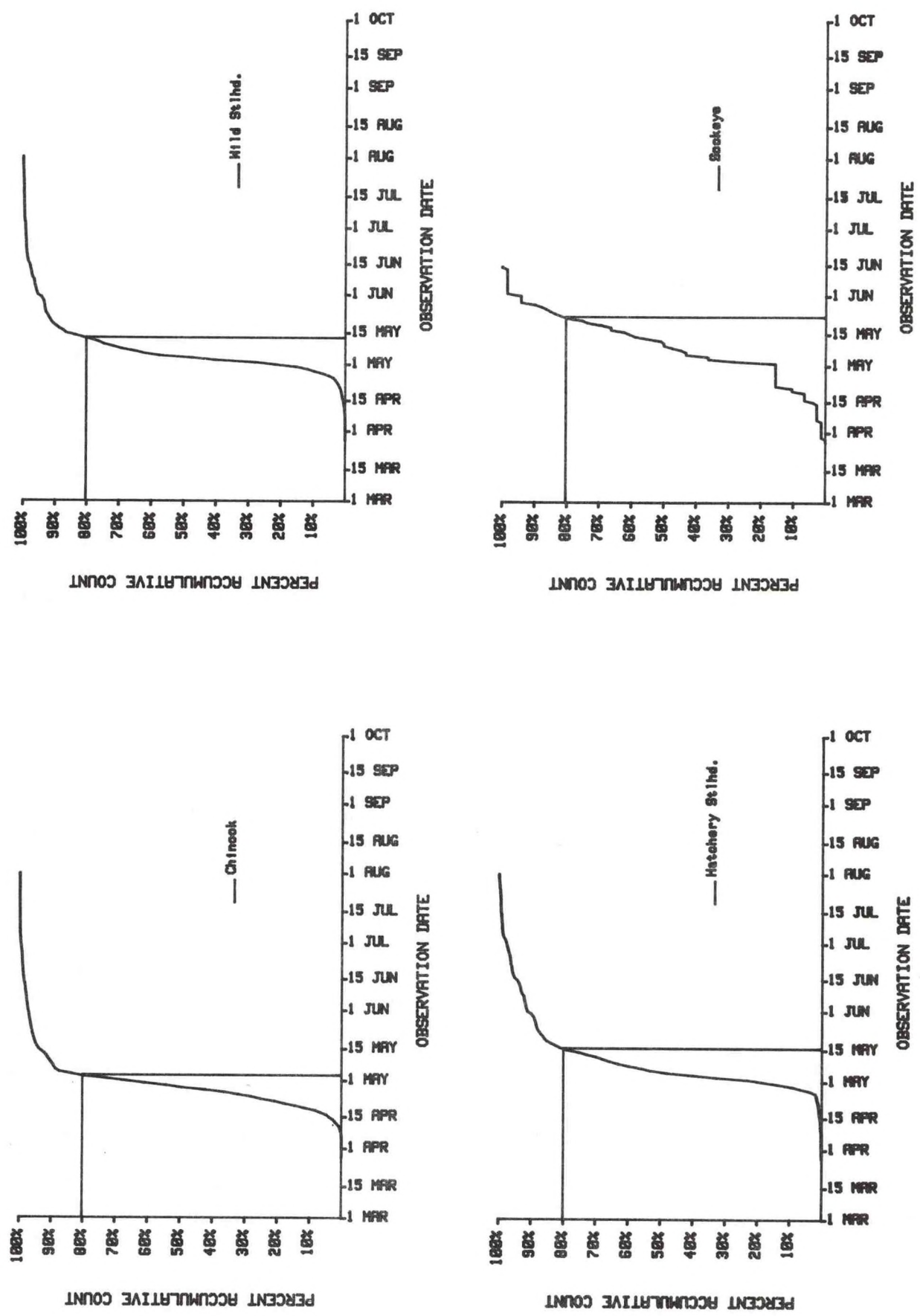


Figure 11. Time frame when 80 percent of yearling chinook, subyearling chinook, and steelhead were collected at Lower Granite Dam during 1987.



(550,947) of those collected were wild migrants, compared to 18% the previous year. Total steelhead collection was less than expected considering that an estimated 8 million hatchery and wild migrants were assumed to be in the river system upstream of Lower Granite Dam. Apparently, a sizeable proportion of the steelhead population fell victim to effects of the drought and either did not survive or failed to migrate through the entire reservoir. Eighty percent of the wild steelhead collected reached the dam by May 14 and 80% of hatchery juveniles by May 15 (Figure 11).

An estimated 791 sockeye migrants were collected during 1987, the lowest on record. This compares to 7,410 and 6,467 in 1986 and 1985, respectively. The reduced collection most likely reflects the low level of discharge from Dworshak reservoir because of the drought and a corresponding decrease in the number of kokanee migrating from the project.

Workers observed 6,947 adult steelhead (predominantly kelts) crossing the separator compared to a record 8,309 in 1986. A total of 129 adult chinook were also counted compared to 198 in 1986.

Transportation

An estimated 5,470,665 juveniles were transported. Of these, 281,891 (5.2%) were transported by trucks and 5,188,774 (94.8%) were barged. Daily truck and barge summaries are listed in Appendix tables 2 and 3. Marked fish used for transport evaluation were included in transport totals and accounted for 51,422 chinook, 12,573 hatchery steelhead, and 7,156 wild steelhead. All groups were fin clipped, freeze branded, and tagged with coded wire.

Truck transport started on March 29 and occurred every other day until April 2. Because collection numbers remained extremely low, a decision was made to hold fish for four days. The next, and final (early phase) truck departed on April 6 (Figure 8). Barging began on April 10 and continued every other day until April 26, at which time daily barging was initiated. This continued until May 23.

Sample fish were trucked on May 7 from Lower Granite to expedite the barge departure to Little Goose. Peak collection at the latter project exceeded the fish holding capacity, and all fish were bypassed (8 hours) until the barge arrived.

Alternate day barging resumed on May 25 and continued until June 4 when barging was terminated because of unusually low collection numbers. Juveniles were transported daily by truck from June 7 through June 19. An every other day schedule began on June 21 and continued through the remainder of the collection season, July 31. Collection spikes on June 16 and July 3 and 5 necessitated the use of two trucks. A total of 43 truck trips and 42 barge trips were made from Lower Granite Dam in 1987.

Approximately 3,271 (.06%) juveniles were transported during the early trucking phase, accounting for 0.10% of chinook and 0.02% of steelhead transported. Barging accounted for 97.7% of chinook, and for 91.8% and 95.7% percent of hatchery and wild steelhead, respectively.

During the late trucking phase, 278,620 juveniles (98.8% of those trucked) were hauled. Approximately 19.6% were chinook, and 72.2% hatchery steelhead, and 8.2% wild steelhead. These fish accounted for 2.3, 8.2, and 4.2% of chinook, hatchery and wild steelhead, respectively.

Bypass

No juveniles were bypassed during 1987. There were no major problems with either the collection system or juvenile separator equipment that have in the past warranted temporary bypass operations. Because of the below normal runoff, no fish were released to the river as controls for transport research.

FISH CONDITION

Descaling

Juvenile descaling rates were recorded daily at the facility sample tank. Descaling rates were not taken from gatewell samples during 1987. Descaling criteria used during the previous two seasons were used, except for the "type-9" category (Koski et al. 1986).

Steelhead descaling remained low however, late in the season many steelhead with regenerated scales were observed. Without the new growth these would have been considered descaled. Although regenerated scales have been observed occasionally in past seasons, the frequency of this in 1987 was notable (no quantitative records were kept). In addition, there was a fair amount of scattered and patchy scale loss on hatchery steelhead during the latter period of the migration. Hatchery steelhead descaling averaged 1.4%, the lowest seasonal average yet recorded. The increased incidence of regenerated scales was most likely an artifact of drought impacts (increased travel time) on the juvenile migration. Wild steelhead descaling rates averaged 1.0%, again, a record low for the facility. Scattered and patchy scale losses were rare on wild migrants, however, scale regeneration was observed. Weekly descaling rates are summarized in Table 5.

Table 5. Percent weekly descaling rates for juveniles sampled at Lower Granite Dam, 1987.

Date	Chinook	Steelhead	
		Hatchery	Wild
March 26 - April 1	18.9*	0.0	0.0*
April 2-8	3.9	0.0	3.2
April 9-15	2.1	1.3	0.8
April 16-22	3.6	2.7	0.8
April 23-29	3.3	2.1	1.0
April 30 - May 6	5.0	2.6	1.1
May 7-13	4.3	4.4	3.5
May 14-20	2.4	2.9	2.2
May 21-27	1.4	1.1	1.1
May 28-June 3	2.0	2.3	1.3
June 4-10	3.4	1.4	0.4
June 11-17	4.7	1.2	0.7
June 18-24	2.8	1.0	0.0
June 25-July 1	2.0	0.0	1.0
July 2-8	1.7	0.3	0.0
July 9-15	1.1	0.5	0.0
July 16-22	0.0*	0.6	0.0
July 23-29	0.0*	0.8	0.0
July 30-31	0.0*	0.0	0.0

* Sample Size of less than 100 fish.

Chinook descaling rates averaged 3.3% in 1987, slightly lower than last year's average of 3.7% (Table 6). Moderate occurrence of scattered and patchy descaling was noticed, and few chinook with regenerated scales were observed.

FISH CONDITION

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Juvenile descaling rates were recorded daily at the facility sample tank. Descaling rates were not taken from gatewell samples during 1987. Descaling criteria used during the previous two seasons were used, except for the "type-9" category (Koski et al. 1986).

Steelhead descaling remained low however, late in the season many steelhead with regenerated scales were observed. Without the new growth these would have been considered descaled. Although regenerated scales have been observed occasionally in past seasons, the frequency of this in 1987 was notable (no quantitative records were kept). In addition, there was a fair amount of scattered and patchy scale loss on hatchery steelhead during the latter period of the migration. Hatchery steelhead descaling averaged 1.4%, the lowest seasonal average yet recorded. The increased incidence of regenerated scales was most likely an artifact of drought impacts (increased travel time) on the juvenile migration. Wild steelhead descaling rates averaged 1.0%, again, a record low for the facility. Scattered and patchy scale losses were rare on wild migrants, however, scale regeneration was observed. Weekly descaling rates are summarized in Table 5.

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May 7-13	4.3	4.4	3.5
May 14-20	2.4	2.9	2.2
May 21-27	1.4	1.1	1.1
May 28-June 3	2.0	2.3	1.3
June 4-10	3.4	1.4	0.4
June 11-17	4.7	1.2	0.7
June 18-24	2.8	1.0	0.0
June 25-July 1	2.0	0.0	1.0
July 2-8	1.7	0.3	0.0
July 9-15	1.1	0.5	0.0
July 16-22	0.0*	0.6	0.0
July 23-29	0.0*	0.8	0.0
July 30-31	0.0*	0.0	0.0

* Sample Size of less than 100 fish.

Chinook descaling rates averaged 3.3% in 1987, slightly lower than last year's average of 3.7% (Table 6). Moderate occurrence of scattered and patchy descaling was noticed, and few chinook with regenerated scales were observed.

Table 6. Average season percent descaling for juvenile chinook and steelhead sampled at Lower Granite Dam, 1981-1987.

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

Mortality

The overall mortality at Lower Granite facility in 1987 was up slightly from 1986, but was still considered low at 0.72% compared to 0.29% last year. Drought related impacts such as elevated water temperatures, protracted juvenile migration, and periods of unusually high raceway densities, contributed to the higher mortality. Because low runoff was predicted, and the likelihood that only a single Water Budget (NPPC 1984) release would be available for fish protection, hatchery managers in Idaho did not have the option to stagger chinook and steelhead releases. The chinook/steelhead ratio was approximately equal when the season collection peak occurred, and chinook migrants probably incurred higher levels of stress in facility raceways as a result. Species mortality rates for the season were 1.20% for chinook, 0.35% for hatchery steelhead and 0.06% for wild steelhead (Table 7). Combined steelhead mortality was 0.35%. Daily mortality rates increased toward the end of the season, and were most likely accentuated by the drought impacts. One hundred percent daily chinook mortality (N=12) occurred on July 19. Peak daily hatchery steelhead mortality (27.7%) occurred on the final day of the season, July 31.

Wild steelhead mortality peaked on July 1, at 20.2%. Daily mortality has probably always been underestimated, because some dead fish sink to the bottom of the raceways and can't be accounted for (similar situations occur on trucks and fish barges). Workers also questioned the accuracy of 1987's late season chinook mortality estimates. By mid-July many chinook were moribund and the steelhead, many of which were emaciated and visibly reverting to parr were consuming them before they could be counted.

It appears that low flows associated with severe drought may result in unusually high daily collection numbers when environmental changes trigger mass movement of juveniles accumulated in the reservoir. This phenomenon may also occur in normal runoff years when there are dramatic increases in flow, especially when combined with elevated turbidity such as occurred in 1981 (Basham et al. 1982).

Based on observations made during the peak collection period in 1987, the current raceway holding criteria may be insufficient to protect migrants when daily collections surpass 300,000 for a prolonged duration. With additional hatchery production coming on line in 1988, the likelihood of this situation recurring will be even greater. These events continue to point out the expressed need for additional barge capacity.

Table 7. Percent mortality at Lower Granite facility, 1980-1987.

Species	1987	1986	1985	1984	1983	1982	1981	1980
Chinook	1.2	0.3	0.3	0.5	0.7	0.8	0.7	0.6
Yearling		0.3	0.3	0.4				
Subyearling		2.3	2.3	0.7				
Steelhead	0.4	0.1	0.2	0.1	0.2	0.1	0.1	0.3
Hatchery	0.4	0.2	0.2					
Wild	0.1	0.1	0.1					

The mortality rate for trucked fish (chinook and steelhead combined) was 1.7%. Barged fish mortality rates were 1.2% for chinook and 0.1% for wild and hatchery steelhead combined. Mortality rates were based on counts made two-hours after loading.

FACILITY OPERATIONS AND MAINTENANCE

Debris/Trash Racks

Extremely low flows in the Snake River drainage resulted in a minimal accumulation of trash in the Lower Granite forebay. Floating trash that arrived during the season was quickly removed. Project personnel usually dipped trash from all gatewells once or twice per week during the peak collection period, and less than once a week from mid-June through the end of the season. By comparison, higher flows and associated debris in 1986 required at least semi-weekly to daily gatewell cleaning operations.

Trash racks were raked in conjunction with STS installation in early March, and again in Units 1-3 on April 21 and 22.

Gatewell orifices were checked at least twice daily during the season (as many as four times per day during periods of peak collection). Workers reported a noticeable reduction in clogging of the 8-inch orifice throughout the 1987 season, and they have never found the 12-inch orifices in Unit 4 clogged. These larger orifices were installed for a 1985-86 study that demonstrated their superiority over the 8-inch orifices. The project could not enlarge all orifices at that time because of inadequate collection channel capacity and the potential for gallery flooding. After conferring with fishery agencies and tribes, the Corps elected to install 10-inch orifice inserts instead. These modifications were originally scheduled for completion prior to the 1987 transport season, but design details were not completed in time.

Submersible Traveling Screens

No major modifications were made prior to the 1987 transport season. The STSs were installed in Units 1-4 on March 3, and in Units 5 and 6 on March 4. Screens were cycled (4 minutes on, 20 minutes off) for the entire collection season because average chinook length never dropped below the 115 mm trigger. Unit 4 was operated for research activities only from April 11 - May 4. The deflector screen used during STS research was removed from Unit 4 on May 5 and normal operation of the unit was resumed. On April 7, units 3, 4, and 5 were shut down to allow divers to inspect the installation of the research deflector screen in slot 4A. The only STS problem during the season occurred on March 23, when a power cable on the STS in slot 6C had to be replaced.

Video inspections of STSs were conducted on April 22, May 5, and July 27 for units 1 and 2; May 5 and July 27 for unit 3; and May 5 only for units 5 and 6. Because unit 4 was in use primarily for research, screen inspections were not necessary. No problems were found during video inspections.

Wet Separator/Distribution System

The juvenile separator operated without any major problems. Workers had a much easier time maintaining a constant gallery water level because the activator assemblies on both make-up water gates were modified in 1986. After the system was dewatered in 1986, it was discovered that the stillwell pipe that houses the water level indicator for the north make-up water gate had been sheared off. This caused the gate mechanism to attempt to adjust to the slightest fluctuation in gallery water level. The stillwells were replaced and a better tie-down method was used to secure the pipe. Both gates operated smoothly during the 1987 season.

Because of ongoing bypass flume research by the University of Idaho, project workers had to communicate closely with researchers during flume tests to maintain an even flow of water across the separator. Both the separator and the test flumes had the same water source (uninterrupted separator water flow

is important since juveniles will move out of the separator hopper if the water level drops, and this will bias the daily sample and collection estimates). Personnel used hand held radios to coordinate activities to minimize the water level fluctuations. Cooperation between the two groups was excellent and separator operation was unaffected.

Direct Barge Loading Operations

During 1987, only 31.9% of the barged fish were direct loaded (55.4% in 1986 and 74.0% in 1985). Considerably more fish could have been direct loaded had a third barge been brought into the every-other-day rotation at the beginning of the season. This was not done because of the uncertainty involved in a drought year. A major concern was the potential for a protracted migration that would have required an extended barging schedule. This initially resulted in a conservative approach to barging operations.

RECOMMENDATIONS FOR 1988

1. Lower Granite personnel should develop a contingency plan to use if high flows bring unusually high accumulations of floating debris and trash in 1988. Because the 10-inch orifice insert modification will not be ready for the upcoming season, increased debris levels can be expected to enter the collection system, cause severe orifice plugging, and possibly impact separator operation.
2. Consideration should be given to changing raceway loading criteria/operations when a daily collections exceed 300,000 for a period of time, particularly when large number of chinook are present. Until additional barges are available, changes in barge loading criteria may also be necessary during peak collection periods.
3. Schedule barging operations to hasten their return to Lower Granite.
4. The Fish Passage Center (FPC) and NPW should work together to obtain a single, daily collection estimate. The presently used methods are not in agreement, and result in different collection estimates.
5. Conduct a refresher course on juvenile descaling criteria for all concerned personnel (COE, state, researchers).
6. Install four new diesel engines on barges #2817 and #2127 (two on each).
7. Addition of two new barges to the current fleet would probably allow Lower Granite's raceway density to remain within criteria in the future.
8. If runoff conditions approach or surpass "normal" levels in 1988, the project should be prepared to deal with an unusually large accumulation of floating debris, and the adverse impacts that such an event will have on the collection system.
9. Orifice modifications should receive the highest priority.

TRANSPORT/BYPASS OPERATIONS - LITTLE GOOSE DAM, 1987

The 1987 juvenile fish transportation season at Little Goose Dam was successful from an operational standpoint although effects of previously-described drought conditions were evident.

FACILITY MODIFICATIONS

No major facility modifications were made at Little Goose, however, several minor improvements were made.

1. An air-actuated control valve for gatewell orifices was successfully tested in 1986, so a full complement was installed prior to the season.
2. The barge loading line was excavated and replaced with a pipe having beveled edges on all joints. The original pipe had squared edges that could injure fish. This may have been the reason that, in previous years some fish were observed swimming erratically immediately after being loaded on a barge.
3. All raceway exit line Ts were replaced. The new Ts had rounded inner curves instead of 90 degree bends and were constructed of fiberglass-wrapped PVC for extra strength. This eliminated recurrence of the ruptures experienced in 1986.
4. An additional 10-inch PVC line was attached to the distribution flume to allow fish to be routed directly into raceway #1. The lateral Y in the sample line previously used for this purpose was removed.
5. PIT tag detectors were installed in the electronic counting tunnels.

COLLECTION OF JUVENILES

Migration and Collection

Collection of juvenile fish began on April 1 and continued through July 8. The facilities were operated for maximum collection and transport of all species throughout the season because river flows remained below the 100 kcfs trigger that normally prompts bypass of yearling chinook.

A total of 1,983,321 juvenile salmonids comprised of 51.52% chinook, 40.94% hatchery steelhead, 7.15% wild steelhead, 0.05% coho, and 0.33% sockeye, were collected in 1987 (Table 8).

Total collection was 5.3% below 1986 levels and the lowest total since 1983 even though more than 17 million hatchery smolts were released into the Snake River system in 1987. Chinook, coho, and sockeye collection was actually higher than last year but both hatchery and wild steelhead numbers were considerably lower. This was unlike collection at Lower Granite where steelhead numbers were similar in 1986 and 1987. Several factors may have contributed to the low number collected at Little Goose, including increased collection at Lower Granite, poor reservoir passage conditions resulting from low river flows, and a higher than normal rate of residualization in Little Goose reservoir.

Natural river flow patterns, combined with management decisions to release hatchery steelhead early and provide water budget flows, resulted in an overall compression of the juvenile fish migration in 1987. Table 9 compares the weekly collection as a percentage of the total for 1981-1987. In 1987 there were only three weeks that had more than 10.0% of the total collection, whereas there were four to five weeks of such collection in all previous years. Less than 5.0% of the total collection occurred after May 19. In previous years, collection did not drop to such low levels until mid to late-June.

Table 8. Annual collection, bypass, and transport at Little Goose Dam, 1981-1987.

Year	Chinook	Steelhead		Coho	Sockeye	Total
		Hatchery	Wild			
<u>Collection</u>						
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
<u>Bypass</u>						
1981						0
1982						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
<u>Truck</u>						
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
<u>Barge</u>						
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

Table 9. Weekly collection as a percentage of total annual collection at Little Goose Dam, 1981-1987.

Dates	<u>Percent of Total Collection</u>						
	1981	1982	1983	1984	1985	1986	1987
Mar 26-Apr 1	----	----	----	----	0.1 ^{1/}	0.4 ^{1/}	----
Apr 2-8	----	----	0.7 ^{2/}	1.9 ^{1/}	0.1	1.7	0.1
Apr 9-15	0.1 ^{1/}	1.1	3.3 ^{2/}	3.1	1.2	3.6	0.3
Apr 16-22	0.1	4.7	0.1 ^{2/}	6.0	8.2	9.5	2.2
Apr 23-29	13.2	12.9	4.6 ^{2/}	13.5	21.2	16.2	15.1
Apr 30-May 6	39.7	11.4	4.6 ^{2/}	13.5	21.2	16.2	46.1
May 7-13	8.2	17.3	19.6	16.2	21.6	14.2	26.2
May 14-20	6.8	17.4	12.9	19.4	10.4	11.4	5.4
May 21-27	11.5	13.7	18.7	10.2	11.9	10.9	1.7
May 28-Jun 3	8.3	6.6	17.0	6.8	7.5	9.2	0.7
Jun 4-10	4.3	2.1	6.6	4.0	3.3	3.3	0.7
Jun 11-17	3.5	2.0	3.8	2.5	1.2	0.9	0.4
Jun 18-24	2.3	2.9	2.1	2.3	0.5	0.4	0.4
Jun 25-Jul 1	0.8	2.0	2.7	1.7	0.3	0.3	0.5
Jul 2-8	0.5	4.5	4.2	1.2	0.5	0.1 ^{1/}	0.3
Jul 9-15	0.6	0.8	----	0.7	0.5	----	0.1 ^{1/}
Jul 16-22	0.2	0.6	----	0.4	0.2	----	----

^{1/}Less than 7 days of collection in the week.

^{2/}Problems forced facility shut-down one or more days during week.

The peak daily fish collection (250,978) occurred on May 7 and was a record number for Little Goose (Appendix Table 5).

Chinook collection peaked on May 2 (131,755), a week later than in 1986 but similar to peak dates in 1985, 1982, and 1981 (Table 10).

Table 10. Summary of peak collection days for chinook, steelhead, and sockeye at Little Goose Dam, 1981-1987.

Year	Chinook	Steelhead	Sockeye	Total Collection
1981	May 5 (66,817) ^{1/}	May 5 (171,817)		May 5 (238,634)
1982	May 2 (20,723)	May 9 (37,619)	April 21 (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 ^{2/} (46,625)	June 8 (232)	April 26 (66,460)
1987	May 2 (131,755)	May 7 ^{3/} (170,244)	April 29 (2,764)	May 7 (250,978)

^{1/} Numbers in parentheses are collection totals for peak days.

^{2/} Hatchery steelhead peaked on May 10 (43,672) and wild steelhead peaked on April 29 (15,615).

^{3/} Hatchery and wild steelhead both peaked on May 7 (140,540 and 29,704, respectively).

Steelhead collection peaked on May 7 for both hatchery (140,540) and wild (29,704) fish. This timing was similar to most previous years despite the low flow conditions, early hatchery releases, and compressed outmigration. The ratio of hatchery to wild steelhead smolts was similar to ratios observed in 1985 and 1986.

Sockeye collection peaked on April 29 (2,764), however, no consistent year-to-year pattern has been observed.

Numbers of adult salmon and steelhead crossing the separator in 1987 were similar to previous years (Table 11).

Table 11. Summary of adult chinook and steelhead removed from the juvenile fish separator at Little Goose Dam, 1984-1987.

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

Transportation

A total of 1,910,026 juvenile fish (95.8% of total collection) was transported from Little Goose Dam in 1987. Most were barged (97.9%) (Figure 9). Daily truck and barge summaries are listed in Appendix Tables 6 and 7.

Two truckloads of fish were hauled (April 5 and 7) before barging began on April 10 (Figure 8). The barge schedule for Little Goose was the same as previously described for Lower Granite. On May 6, an upstream bound barge was loaded with fish to retain as much raceway capacity as possible in anticipation of a high overnight collection.

Trucking resumed on June 5 and continued every other day until the facility shut down on July 9.

Bypass

Because river flow was below the 100 kcfs minimum for bypass specified in the FTOT Annual Work Plan (Anonymous 1987), chinook salmon were not separated from steelhead. During the peak migration, on May 7, fish holding capacity was exceeded and all fish were bypassed for 8 hours until space was again available. A total of 50,740 fish were diverted back to the river (Table 12). The FTOT decided not to approve a higher holding rate because of the elevated chinook mortality at Lower Granite during a collection peak a few days earlier. No other fish were bypassed at Little Goose.

Table 12. Fish bypassed at Little Goose Dam, 1987.

Species	Number Bypassed	% of Total Collected
Chinook	15,866	1.6
Steelhead		
Hatchery	29,311	3.6
Wild	5,563	3.9
Total	50,740	2.6

FISH CONDITION

Descaling

Over the 1987 season descaling rates averaged 8.6% for chinook, 3.2% for hatchery steelhead, and 1.0% for wild steelhead (Table 13).

Table 13. Weighted average weekly descaling rates at Little Goose Dam, 1987.

Date	Chinook	Steelhead	
		Hatchery	Wild
Apr 2-8	12.2 ^{1/}	0.0 ^{1/}	1.8 ^{1/}
Apr 9-15	14.5	5.5	3.1 ^{1/}
Apr 16-22	7.7	7.6 ^{1/}	0.0 ^{1/}
Apr 23-29	9.8	4.9	3.0
Apr 30-May 6	8.8	4.3	1.2
May 7-13	6.3	2.4	0.0
May 14-20	7.4	5.1	3.4
May 21-27	1.9	2.3	2.9
May 28-Jun 3	0.6	1.7	0.0 ^{1/}
Jun 4-10	10.8	2.6	0.0 ^{1/}
Jun 11-17	9.8	1.1	3.6 ^{1/}
Jun 18-24	17.1	2.7	3.9 ^{1/}
Jun 25-Jul 1	5.8	0.4	0.0 ^{1/}
Jul 2-8	4.3	1.5 ^{1/}	0.0 ^{1/}
Jul 9	9.8 ^{1/}	9.7 ^{1/}	0.0 ^{1/}
Average	8.6	3.2	1.0

^{1/} Less than 100 fish sampled.

These rates were slightly lower than in 1986, reversing an upward trend observed for the last three years (Table 14). Low river flows and a lack of spill at Lower Granite Dam resulted in less debris at Little Goose in 1987

than in previous years. These conditions, as well as the scale regeneration discussed previously for Lower Granite, may have contributed to the lower observed descaling rates.

Table 14. Average percent descaling for chinook and steelhead collected at Little Goose Dam, 1981 - 1987.

Year	Chinook	Steelhead		Weighted Total
		Hatchery	Wild	
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 ^{1/}	7.9	3.4	1.5	3.1
1986	8.8	4.9	2.5	4.4
1987	8.6	3.2	1.0	2.9

^{1/} Descaling rates for 1985 - 1987 include the "9" classification.

The highest daily descaling rate for chinook was 24.7% on June 19. The highest daily rate for steelhead (hatchery and wild combined) was 8.6% on May 17. Gatewell dipping to determine pre-facility descaling was not conducted because of the lower observed descaling rates.

Mortality

Mortality rates for chinook (1.8%) and for hatchery and wild steelhead combined (0.5%) were higher than in 1986 (Table 15). Overall mortality at Little Goose was 1.1% compared with 0.4 in 1986.

Table 15 Percent mortality by species at Little Goose collection facility 1981- 1987.

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

Daily mortality for all combined species was highest (37.7%) on July 7. Daily mortality was highest for chinook (46.0%) on July 7, for hatchery steelhead (40.8%) on June 23, and for wild steelhead (26.9%) on July 4.

Poor reservoir passage conditions resulting from low flows may have contributed to the increased mortality. Also, Little Goose personnel observed many hatchery smolts in poor condition in the raceways. Many chinook exhibited external symptoms of disease (i.e. bacterial kidney disease) and many steelhead had fungal infections that appeared to result from external injuries received prior to their arrival at Little Goose. Workers did not attempt to quantify these observations.

Trucking mortality (chinook and steelhead combined) was 2.7%. Barging mortality was 1.1% for chinook and 0.1% for steelhead (hatchery and wild combined). These percentages are based on mortalities counted two hours after loading. Not all mortalities are noted during the truck and barge operations so the above-mentioned mortalities are approximations and are considered under-estimates.

FACILITY OPERATIONS AND MAINTENANCE

Debris/Trashracks

Low river flow and no spill at Lower Granite resulted in a minimal accumulation of debris in the Little Goose forebay. Trashracks were raked prior to the start of fish collection, which was sufficient for the entire season.

Gatewells were inspected daily for debris accumulation and cleaned as needed (approximately every 3 to 5 days).

Submersible Traveling Screens

Screens were installed in units 1 and 2 on March 4, in units 4 through 6 on March 23, and in unit 3 on March 24. They were operated in a cycling mode (4 minutes on and 20 minutes off) throughout the season.

Video inspections of STSs were conducted on May 11-12 (units 1,2, and part of 3), May 20-21 (rest of unit 3, and 4-6), June 9-10 (all units), and July 8 (units 1 and 2). No problems were observed during the 1987 season.

The STSs remained in operation until August 26 (units 1-4) and August 27 (units 5 and 6).

Collection System

Orifices were cycled on a regular basis, an operation facilitated by the newly-installed air operated valves. Orifice lights burned out on several occasions and were usually replaced within one day after being reported (one exception: 4-day delay).

Distribution/Sampling System

The electronic fish counters were unreliable, either not counting at all or counting incorrectly (range of accuracy 0.0 to 193.3% of actual hand counts). Counters were calibrated frequently and their accuracy was tested by several methods. The presence of PIT tag detectors had no apparent effect on counting tunnel accuracy. Post-season attempts by NMFS personnel to extensively overhaul the system appeared successful. Tests conducted in November, using Lyons Ferry Hatchery fish, resulted in accurate counts.

Replacing raceway exit line Ts and the barge loading line, appeared to alleviate erratic fish behavior observed during barge loading in 1986.

On May 2, an old-style barge that was near capacity had to be loaded using a reduced head on the raceways, no crowding, and a minimum of flush water to prevent it from overflowing. The procedure was successful but appeared to be more stressful to the fish. Normally, the barge pumps can be throttled back to accommodate additional flow from raceway loading line. A modified procedure will be developed to accommodate similar situations in the future.

RECOMMENDATIONS FOR 1988

1. Establish a standard procedure to monitor electronic fish counters to assure accuracy.
2. Initiate construction of permanent collection and holding facilities.
3. Install protective netting over raceways to prevent predation by birds.

TRANSPORT/BYPASS OPERATIONS - McNARY DAM, 1987

In terms of collection and transport, 1987 was a record year at McNary. A combination of larger numbers of outmigrants and extremely low flows that triggered maximized transportation earlier than in past years resulted in collection and transport of nearly one million more fish than were handled in 1985, the previous record year. Collection for transport continued through October 29 in an attempt to determine the magnitude of late-season outmigrant passage.

The low flows and associated high water temperatures in 1987 contributed to greater than normal subyearling chinook mortality. To a lesser extent, sockeye outmigrants were similarly affected. River flows in 1987 were substantially less than in 1986 and similar to those of 1977 -- a critically water-short year. Minimum flows of 220 kcfs, which trigger yearling chinook bypass at McNary (Anonymous 1987), occurred on only 20 days (April 30-May 19) and were primarily the result of artificial freshet conditions created by release of the Water Budget to stimulate smolt movement. Spill occurred on only 24 days during 1987, compared to 81 days in 1986.

FACILITY MODIFICATIONS

McNary's fish facility underwent several modifications in 1987, the largest of which was installation of a new sample holding tank. The new tank has greater capacity (3600 vs. 2600 gallons) and allows fish to be anesthetized prior to their entering the sorting room, where most handling occurs. The old tank's inability to safely hold the larger numbers necessary for research purposes and to allow adequate sampling of steadily increasing outmigrations, prompted its replacement.

Three pre-anesthesia compartments were included in the new tank's design to allow application of anesthetic before netting and placing the fish in the flume leading to troughs in the sorting room. (The lack of head prevents fish being moved by gravity flow between the sample tank and sorting room).

Partially anesthetized fish undergo less stress than non-anesthetized fish during initial handling and transfer from the tank (they are completely anesthetized before being sorted and sampled). Pre-anesthetization also reduces the likelihood of descaling and other injury resulting from typical avoidance behavior under crowded conditions.

Two inclined aluminum plates were installed inside the fish counting tank to reduce potential of stranding fingerlings during water drawdown operations. A fourth counting tunnel was also installed.

In the powerhouse collection flume, compressed air-operated rams replaced the old hand-operated wheels on all northern orifice valves. Orifice cycling can now be expedited and risk of injury from turning the hand-operated valves has been greatly reduced. All aluminum water dissipation screens on the flume were replaced with stronger, more corrosion resistant stainless steel counterparts.

On STSSs, use of "Christmas tree" clips was discontinued because they were not capable of adequately securing screen mesh to the link bars. The previously used screw and washer fastening system was reincorporated in an attempt to reduce the sharply increased incidence of screen damage seen in 1986 (Koski et al. 1987).

Low tailwater elevations necessitated vertically extending the separator's auxiliary water supply pump intake by five feet to assure a continuous, optimum supply to fish separation facilities.

An observation room was built over the separator upwell to allow improved working conditions in inclement weather.

Safer, easier access from the powerhouse deck to the south end of the ice/trash sluiceway and powerhouse collection flume was provided by constructing a stairway.

A rigid mesh frame was placed over the upwell's open half, and the upwell corner braces were removed to alleviate impact-related injuries to fish entering the separator. All A-side separator bars can now be individually attached or removed (they were previously a unit) to facilitate change or replacement of damaged or unneeded bars. Covers were placed over the separator porosity unit's wings to prevent fish stranding.

Direct access from the fish truck loading "pit" to the loading flume was created by attaching a ladder between the two locations. Flush lines were installed in the raceway loading flume to prevent fish from stranding at the close of loading operations.

Other, minor in-season modifications addressed specific problems:

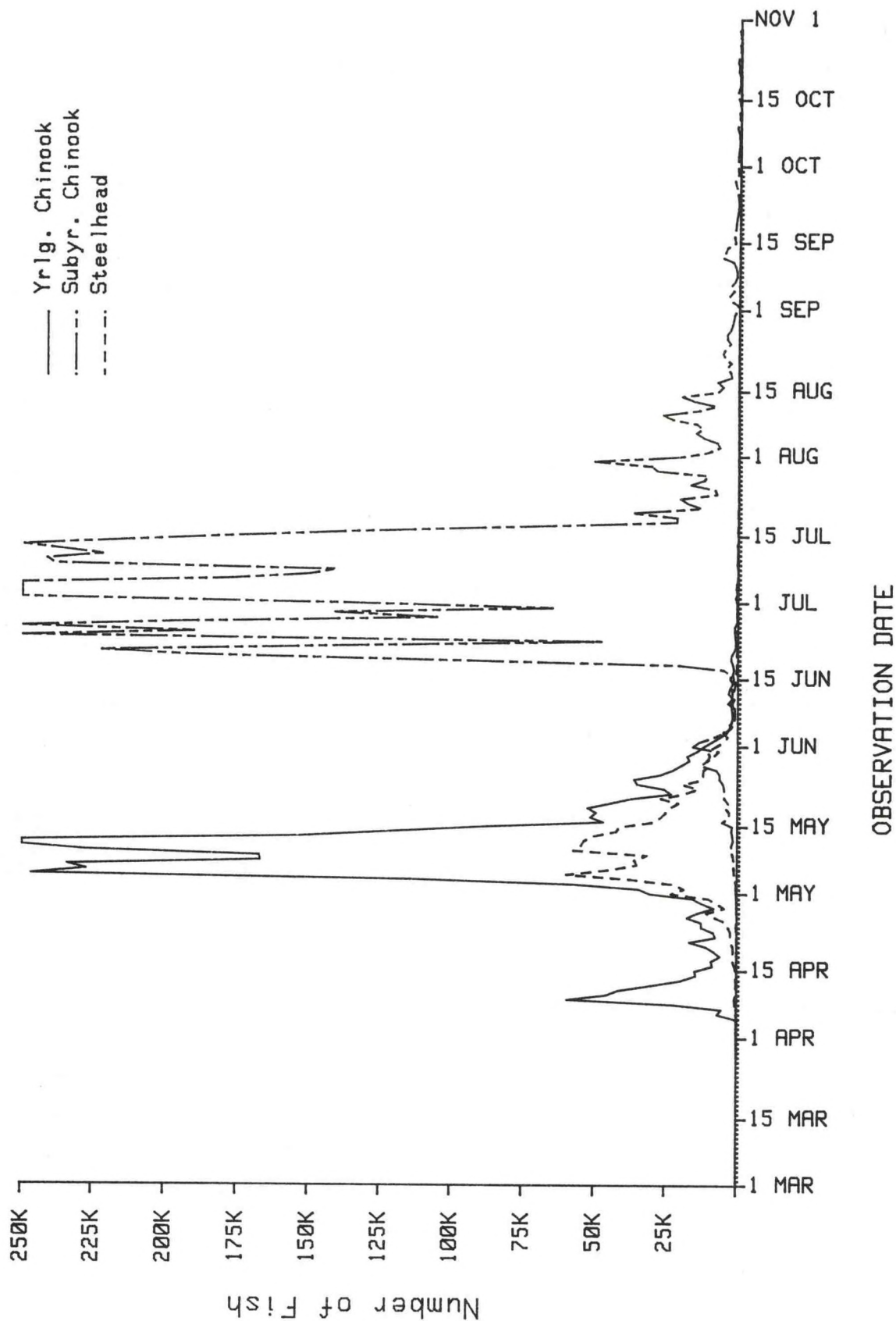
1. The downstream end of the raceway headbox was screened to prevent fish from jumping out;
2. Cover flaps were installed on the raceway head screens to prevent fish from jumping over the screens into the headbox;
3. The separator's outfall end was covered with netting to prevent small fish from being "evicted" by adult fish; and
4. To facilitate crowding fish in and removing debris from the sample tank, a hand-powered winch was installed.

COLLECTION OF JUVENILES

Collection

Collection began on March 26 and ceased October 29. Bypass continued until November 16 when all STSs were pulled and the bypass flume was dewatered. A record total of 12,326,034 juvenile fish was collected. Peak collections (Figure 12) occurred on May 10-11 (358,705-357,560) and July 1 (493,563), with yearling chinook predominant (76.5-78.2%) in the May peak and subyearling

Figure 12. Daily counts of yearling chinook, subyearling chinook and steelhead collected at McNary Dam, 1987.



chinook predominant (99.7%) in July's (Appendix Table 9). The largest numbers of wild steelhead, hatchery steelhead, yearling chinook, sockeye, and coho entered the collection system on 4, 9, 11, 28, and 30 May, respectively. Subyearling chinook constituted the largest percentage (57) of the total 1987 collection.

The time frame when 80% of the outmigration was collected at McNary Dam is shown in Figure 13.

The total collection of most species increased from that seen in 1986 (Table 16). Coho numbers were up substantially (181%); hatchery steelhead numbers climbed over 50%; and yearling chinook numbers increased almost 39%. The numbers of subyearling chinook collected was up by over 14%. Sockeye numbers declined for the second consecutive year and were down almost 23% from the 1986 count. Overall, the 1987 collection was about 21% greater than the previous year's.

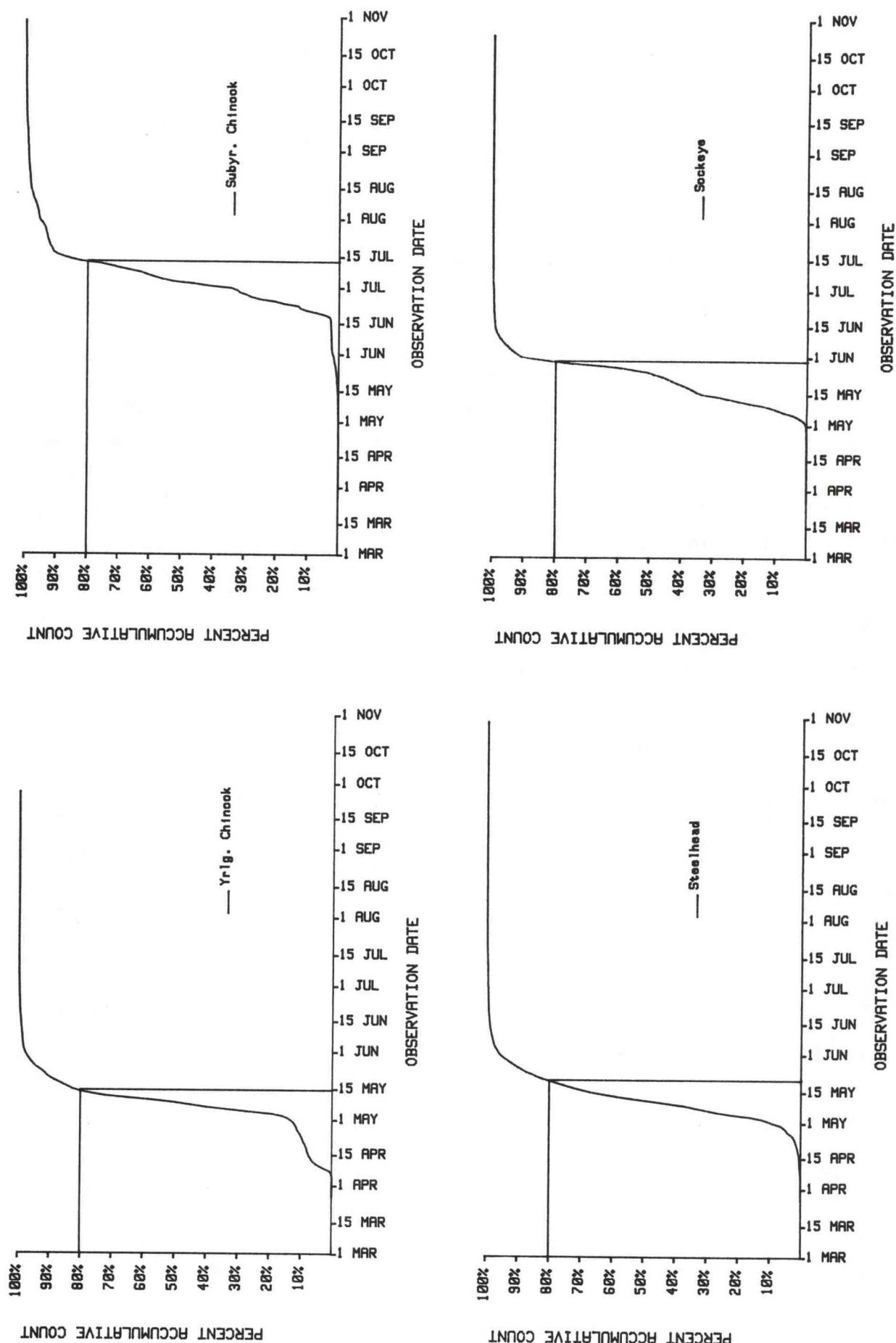
Table 16. Juvenile collection at McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	129	358	0	143	0	28	658
Apr	457,979	3,998	55,300	33,125	787	1,759	552,948
May	2,923,836	133,572	661,288	212,002	203,482	556,151	4,690,331
Jun	62,693	2,278,690	30,822	7,319	20,420	55,454	2,455,398
Jul	5,406	4,282,393	3,040	425	815	1,536	4,293,615
Aug	40	256,530	830	90	145	335	257,970
Sep	30	56,290	280	120	300	260	57,280
Oct	0	17,570	173	10	11	70	17,834
Total	3,450,113	7,029,401	751,733	253,234	225,960	615,593	12,326,034
% of Coll.	28	57	6.1	2.1	1.8	5	100

Bypass

River flows below the 220 kcfs minimum for bypass triggered maximized

Figure 13. Time frame when 80% of yearling chinook, subyearling chinook, steelhead, and sockeye were collected at McNary Dam, 1987.



transportation efforts during most of the 1987 outmigration period. However, a brief period (April 30-May 19) of above-minimum flows allowed bypass of 1,676,002 collected yearling chinook. Also, 68,291 marked subyearling and 58,039 marked yearling chinook were bypassed as controls for NMFS' transportation evaluation. A summary of fish bypassed is found in Table 17. Separation of fish by size was concluded on June 11 when subyearling chinook abundance became predominant in the collection.

Table 17. Juvenile fish bypassed at McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	0	0	0	0	0	0	0
Apr	1,024	0	0	0	0	0	1,024
May	1,730,995	23,080	230,763	79,815	43,362	160,795	2,273,810
Jun	2,022	28,390	0	0	0	0	30,412
Jul	0	32,689	0	0	0	0	32,689
Aug	0	7,212	0	0	0	0	7,212
Sep	0	0	0	0	0	0	0
Oct	0	0	0	0	0	0	0
Total	1,734,041	96,371	230,763	79,815	43,362	160,795	2,345,147
% of							
Bypass	73.9	4.1	9.8	3.4	1.9	6.9	100.0
% of							
Coll.	50.3	1.4	30.7	31.0	19.2	26.1	19

Transportation

A record total of 9,655,789 juvenile fish, 78.3% of those collected, were transported. Approximately 95% of the subyearling chinook collection, 80% of the coho, 70% of the sockeye, 68% of the steelhead, and 49% of the yearling chinook were transported.

Trucks hauled 1,360,622 fish (Table 18), about 11% of the total collected and 14% of the total transported. This represents a sharp increase over 1986's trucked fish numbers. The magnitude of outmigrant collection in May necessitated simultaneous use of trucks and barges when flows were at or below

minimum levels and transportation of all fish was occurring. On May 3 eight truckloads of fish left McNary, a record number in one 24 hour period. Because of the longer collection season, the truck transport season was also extended.

Barging from McNary began on April 11 and continued through July 27 (Figure 8). A total of 8,295,167 fish were barged, about 86% of the total transported (Table 19). Four barges were used during the spring collection peak; only two were needed at other times. Although the total number of fish barged in 1987 represents another record high figure, the percentage of total collection it reflects (67.3) is comparable to that of recent years (Table 20).

NMFS' transportation studies continued in 1987. The objective to mark at least 120,000 subyearling chinook was easily met and surpassed; a total of 136,667 were marked. The yearling chinook objective, also 120,000, was not met; a total of 96,571 were marked even though about 145,000 markable fish were handled. As in 1986, a collection peak of short duration coupled with FTOT criteria (Anonymous 1987) limiting the number held in the sample tank in any 24 hour period to twelve thousand fish (or fifteen hundred pounds) prevented additional fish from being held long enough to be marked.

Sampling

Almost 830,000 juvenile fish, 6.7% of total collection, were sampled at McNary in 1987 Table 21. No problems occurred until May 4, when a dramatic increase in collection overfilled the sample holding tank. It was later estimated (Wagner 1987) that over 25,000 fish were being held; more than twice the allowed capacity of 12,000.

When sample fish were first observed to exhibit symptoms of stress induced by overcrowding (loss of external mucus, subdued avoidance behavior, etc.) those remaining in the sample tank were immediately bypassed and the sampling rate was reduced to prevent subsequent overcrowding. Note: In response to the larger sample tank being stalled, the holding criteria has since been raised to 15,000 fish or 1800 pounds (Anonymous 1988).

Table 18. Truck transport from McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	128	357	0	143	0	28	656
Apr	139,002	866	1,614	1,092	0	59	142,633
May	546,973	2,874	129,527	67,554	7,925	37,053	791,906
Jun	0	0	0	0	0	0	0
Jul	0	114,341	151	5	0	39	114,536
Aug	37	237,885	808	88	142	328	239,288
Sep	28	52,686	251	118	297	258	53,638
Oct	0	17,716	158	10	11	69	17,964
Total	686,168	426,725	132,509	69,010	8,375	37,834	1,360,622
% of Truck	50.4	31.4	9.7	5.1	0.6	2.8	100
% of Coll.	19.9	6.1	17.6	27.3	3.7	6.1	11

Table 19. Barge transport from McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	0	0	0	0	0	0	0
Apr	315,059	2,983	53,515	31,978	785	1,685	406,005
May	614,619	84,187	292,048	62,815	143,515	311,395	1,508,579
Jun	67,803	2,100,926	36,516	8,426	28,053	76,952	2,318,676
Jul	5,770	4,050,227	2,932	430	912	1,636	4,061,907
Aug	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0
Oct	0	0	0	0	0	0	0
Total	1,003,251	6,238,323	385,011	103,650	173,264	391,668	8,295,167
% of Barge	12.1	75.2	4.6	1.3	2.1	4.7	100.0
% of Coll.	29.1	88.7	51.2	40.9	76.7	63.6	67.3

Table 20. Annual collection, bypass, and transport at McNary Dam, 1981-1987.

Year	Chinook		Steelhead ³		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
<u>Collection</u>							
1981	1,237,726	2,121,722		366,419	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
<u>Bypass</u>							
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 ¹
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
<u>Truck</u>							
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	69,011	8,375	37,834	1,360,622
<u>Barge</u>							
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 ²
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	103,650	173,264	391,668	8,295,167

^{1/} Includes 51,330 fish released in John Day Reservoir on May 26, 1982, due to sinking of the "Dutchess B.".

^{2/} Does not include the fish released in ^{1/} above.

^{3/} Steelhead were separated into hatchery and wild beginning in 1986.

Table 21. Juvenile fish sampled at McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	9	25	0	10	0	2	46
Apr	32,086	523	3,874	2,353	53	134	39,025
May	200,868	17,717	57,394	16,015	27,266	61,509	380,769
Jun	8,273	130,372	4,717	1,205	3,317	8,134	156,018
Jul	241	209,703	167	24	36	74	210,245
Aug	4	35,471	96	14	20	43	35,648
Sep	3	5,629	29	11	30	26	5,728
Oct	0	2,189	19	2	2	7	2,219
Total	241,484	401,629	66,296	19,634	30,726	69,929	829,698

FISH CONDITION

Descaling

Incidence of descaling, including the "type 9" (Koski et al. 1986) is summarized in Tables 22 and 23. Compared to that seen in previous years, generally lower levels of descaling were observed in 1987, probably because less debris was delivered by the reduced river flows. Previously described facility modifications also probably contributed to improved fish conditions. Descaling was highest (10.1%) on sockeye and lowest (1.1%) on subyearling chinook. Total monthly descaling was greatest in May (6.0%) and lowest in July (0.6%).

Mortality

Except for hatchery steelhead, mortality in 1987 increased beyond that seen in previous years (Table 24). Mortality in the sample tank increased also. Subyearling chinook and sockeye exhibited the largest increases. Total percentage system mortality is shown in Table 25.

Table 22. Comparison of annual descaling rates (percent) at McNary Dam, 1985 - 1987.

Year	Chinook		Steelhead	Coho	Sockeye
	Yearling	Subyearling			
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	4.4	4.4	10.9

Table 23. Monthly descaling rates (percent) at McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	0	0	0	0	0	0	0
Apr	6.39	0	1.52	3.97	0	0	3.73
May	6.39	0	4.61	3.78	4.45	8.51	5.95
Jun	5.58	0.22	6.46	5.50	4.31	16.62	5.40
Jul	0	0.60	0	0	0	0	0.61
Aug	0	1.12	0	0	0	0	1.12
Sep	0	1.92	0	0	0	0	1.92
Oct	0	3.22	0	0	0	0	3.22
Weighted Average	5.52	1.14	4.62	4.01	4.40	10.87	3.64

Table 24. Annual system and sample tank mortality rates (percent) at McNary Dam, 1984 - 1987.

Year	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
<u>System</u>							
1984	0.3	0.9		0.2	0.1	0.6	0.7
1985	0.4	2.7		0.5	0.3	1.1	1.8
1986	0.5	0.2	0.5	0.1	0.1	1.8	1.5
1987	0.8	3.8	0.5	0.2	0.4	4.1	2.6
<u>Sample Tank</u>							
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	0.8	0.5	0.5	6.0	2.4
1987	1.4	3.5	0.5	0.3	0.5	6.8	2.8

Table 25. Monthly system mortality rate (percent) at McNary Dam in 1987.

Month	Chinook		Steelhead		Coho	Sockeye	Total
	Yearling	Subyearling	Hatchery	Wild			
Mar	0.78	0.28	0.00	0.00	0.00	0.00	0.30
Apr	0.63	3.78	0.28	0.21	0.25	0.85	0.59
May	0.70	2.08	0.40	0.20	0.38	3.95	1.05
Jun	4.83	1.90	2.08	1.19	0.85	5.97	2.06
Jul	2.24	4.83	4.24	0.47	0.25	0.20	4.82
Aug	7.50	4.46	2.65	2.22	2.07	2.09	4.45
Sep	6.67	4.79	10.36	1.67	1.00	0.77	4.77
Oct	0.00	4.19	8.09	0.00	0.00	0.00	4.21
Weighted Average	0.77	3.81	0.48	0.23	0.42	4.11	2.64

The combination of low flows and associated warm temperatures in the forebay was again implicated as a major contributor to sub-yearling chinook mortalities. After peak daily mortalities of 9 to 10% were experienced on June 30 and July 1, northern units in the powerhouse were "flat loaded" as in past years (Koski et al. 1986) to achieve a more uniform water temperature in the powerhouse collection flume. This resulted in some relief. However, another mortality peak of about 9% occurred on July 11. It was theorized that start-up of previously off-line units 3 and 4 on the night of July 10 was at least partially responsible because either:

1. That action introduced higher temperature water from the forebay into a section of the powerhouse collection flume where generally cooler water was issuing from the non-operating unit (2, 5-7) orifices, causing thermal stress. Temperature differences of up to 7.5°F have been measured in orifice flows of non-operating versus operating units (Wagner 1987); or
2. The sudden start-up of units 3 and 4 forced fish that had been holding in the cooler water in the intakes, while the units were off-line, to enter the gatewells and, eventually, the powerhouse collection flume via the exit orifices. Operating these units would

quickly replace any cooler water with warmer forebay water, which may also have increased thermal stress.

This situation has not, however, been sufficiently researched to draw any definite conclusions.

Even after reducing the number of operating units to seven (unit 1 for adult fish attraction flows and units 8 - 13 for power generation), and "flat loading" them to minimize discharge fluctuations, mortality peaks were still apparent in the collection system each day about noon. This phenomenon has been observed over the past several years but is still not understood. Because it is regularly observed about mid-day in summer, some relation between solar angle and gateway orientation is suspected.

Physical Injury

As in previous years, operculum tears were observed on all species; head injuries were also noted, primarily on yearling chinook. Other wounds, thought to have been inflicted by avian, mammalian, and piscine predators, were also recorded. Punctures suspected to have been made by gulls and terns were seen most frequently on steelhead. Mink, occasionally active in McNary's forebay, are thought to be responsible for tooth and claw marks of apparently mammalian origin on steelhead. Subyearling chinook exhibited injuries possibly resulting from encounters with juvenile lamprey or parasitic copepods (Lernaea sp.) (Wagner 1987).

Fish Size

Fork length of sampled fish was measured throughout the season (Wagner 1987). Yearling chinook lengths ranged from 100 to 270 mm, with a mean length of 161. Subyearling chinook lengths varied from 45 to 205 mm and averaged 128. Steelhead lengths ranged from 130 to 350 mm, averaging 209. Coho with lengths of 100 to 345 mm were noted; the mean length was 160. Sockeye lengths ranged from 80 to 200 mm, and averaged 108.

"Buttoned up" chinook fry were again seen in 1987, although they were less numerous than in 1986. NMFS personnel recorded length frequencies for this group during a collection peak in late May. Fry lengths ranged from 35 to 85 mm, averaging 52.

FACILITY OPERATIONS AND MAINTENANCE

Debris Trashracks

Using McNary's modified trash rake, all units were initially cleaned by March 17. The trash rake was not able to remove large debris and raking was subsequently discontinued. Trashracks were stomped on May 18 and 19; priority units (4 - 10) were again stomped on September 24 and 25 in response to deteriorating fish condition.

The debris load was relatively small in 1987, but still presented some problems throughout the collection system. Forebay trash was removed between May 21 and 26.

Gatewell drawdown readings were taken weekly from March 30 to July 14 using the standard technique of running units to 80 MW and comparing water levels in the forebay and gatewells. After mid-July, readings were taken less frequently to avoid exacerbating temperature related conditions (fluctuating unit operations) contributing to juvenile fish mortalities. Drawdown criteria were not exceeded in 1987.

Submersible Traveling Screens

Screens were in place and operating in units 1 through 10 by March 11. Unit 11-13 STSs were installed on March 16, 17, and 31. Unit 14 did not operate in 1987. Thirty two screen mesh assemblies were rebuilt (mesh belts and fasteners replaced) prior to being installed.

All STSs operated in cyclic mode until May 30 when, in hopes of reducing sockeye descaling, continuous operation began. From June 2 to 23 screens were again cycled. Between June 23 and July 22 screens were operated continuously because mean length of fish entering the collection system was less than the 112 mm minimum required to allow cycling (Anonymous 1987). After July 22, when mean fish length was 115 mm or more, screens were again cycled.

A total of 67 STS video inspections were made between April 7 and October 27. In response to screen-related problems seen in 1986 (Koski et al. 1987) more frequent inspections -- at least three units per week (Anonymous 1987) -- occurred until mid-July. Inspection frequency was thereafter reduced to avoid starting and stopping units.

The aforementioned replacement of screen fasteners with mesh bars apparently helped to reduce screen damage in 1987. Only three screens required in-season repair, compared to 22 in 1986. A sheared drive-pin necessitated pulling the screen in slot 3BS on April 28. Screens in slots 7AN and 7BN were pulled and repaired when mesh tears were observed on June 20 and August 12, respectively.

Powerhouse Collection

No significant problems were found during the pre-season inspection. In early April, an additional weir-board was added to each flume exit to raise the water level and reduce turbulence.

On October 14, during a temporary flume dewatering, one stationary screen found to be broken was repaired. The post-season dewatering on November 17 revealed extensive wear on numerous stationary screen panels as well as worn caulking in the flume floor seams.

Orifice Maintenance

The hand-cranked valve stems on all north gatewell orifices were replaced

with air rams. As a result, daily orifice cycling of the entire powerhouse became easily possible. Only nine suspected debris blockages occurred in 1987, compared to 20 the year before.

Pinch Valve

One potential drawback to improved orifice maintenance capability, which may allow debris to be more readily flushed from the orifices, is that the same debris may be delivered to the pinch valve. Here, a debris block can affect all fish entering the separator rather than only those exiting a single, obstructed orifice. To avert this situation, the pinch valve was completely opened and closed at least once every six hours during the spring, the period of heaviest debris influx. Under "normal" operating conditions, the valve was set at eleven psi.

Separator

Several pump-related problems caused varying degrees of water loss to the separator in 1987. On March 30 and April 2 the auxiliary water supply was lost when the adult fish water supply pump failed and tailwater elevation dropped to a level below which the auxiliary pump intake could operate. On April 6 the intake was extended by five feet; the pump was back in service on April 7. The pump motor failed on April 29 and was out of service six days while repairs were made. During this time, the separator received only gravity flow, which forced operation with less than optimum water levels. A blown fuse caused the pump to shut down again on July 14. The fuse was replaced and no further problems were encountered.

The separator fish attraction bar water supply was lost on May 17 when the associated pump motor coupling required repair. Water supply resumed the next day.

Debris accumulation beneath the separator bars was again a problem. Cleaning was done sparingly to avoid forcing large groups of fish to suddenly

vacate the separator, as this might bias regularly collected fish sampling data.

On June 11, when subyearling chinook became predominant in the collection and separation into bypass and transport groups was no longer necessary, the partition between the A and B tanks was removed. At that time, the different diameter separator bars needed to separate large and small fish were replaced with bars of uniform size.

In the latter part of the collection season, when adult fallbacks more frequently entered the collection system, juvenile fish were often observed jumping out of the separator to avoid contact with the larger fish. Netting was placed along the separator's outfall to prevent loss.

Raceways

In late summer, smolts were observed jumping over the raceway headscreens into the headbox, and from there completely out of the raceway structure and onto the concrete below. On August 18 the headbox was emptied and screening was installed at the downstream end, the point from which most fish jumped. Cover flaps were also fastened to the headscreens.

RECOMMENDATIONS FOR 1988

1. Replace the hand winch used to operate the sample tank crowder with an electrically-operated winch.
2. Complete installation of the sample tank debris chute before 1988 collections begin.
3. Construct and install new raceway head and "flip-over" tail screens.
4. Extend the fish loading pipes associated with Ponds 8 and 9 to reduce fingerling impingement on water elimination screens.
5. Reduce the water elimination area (Johnson bar screen) on the separator to allow greater flexibility in adjusting water levels and to reduce impingement thereon.

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APPENDIX TABLES 1 - 12

Appendix Table 1.-- Daily Collection Counts of Chinook, Wild and Hatchery Steelhead, and Sockeye, Facility Mortalities, and Daily River Flows and Spills During 1987, at Lower Granite Dam.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
Mar 26	22	0	0	0	22	0	0.00	30,400	0	0.00
Mar 27	0	0	0	0	0	0	0.00	30,700	0	0.00
Mar 28	44	45	0	0	89	0	0.00	33,300	0	0.00
Mar 29	89	45	0	10	144	0	0.00	26,700	0	0.00
Mar 30	89	33	0	0	122	1	.82	29,300	0	0.00
Mar 31	100	55	0	0	155	1	.65	25,600	0	0.00
Apr 1	89	11	0	0	100	1	1.00	23,200	0	0.00
Apr 2	155	44	11	0	210	6	2.86	26,600	0	0.00
Apr 3	123	45	22	0	190	1	.53	29,200	0	0.00
Apr 4	198	77	44	0	319	0	0.00	30,300	0	0.00
Apr 5	430	44	11	0	485	7	1.44	30,300	0	0.00
Apr 6	1,230	44	177	11	1,462	10	.68	29,700	0	0.00
Apr 7	2,630	222	633	0	3,485	14	.40	37,400	0	0.00
Apr 8	4,810	290	1,733	0	6,833	21	.31	36,100	0	0.00
Apr 9	5,641	283	1,914	0	7,838	59	.75	39,200	0	0.00
Apr 10	6,893	255	1,965	0	9,113	67	.74	40,300	0	0.00
Apr 11	16,693	399	1,918	0	19,010	32	.17	42,200	0	0.00
Apr 12	16,402	517	1,667	0	18,586	26	.14	31,300	0	0.00
Apr 13	15,502	801	2,584	0	18,887	45	.24	41,600	0	0.00
Apr 14	26,480	756	2,165	9	29,410	193	.66	32,700	0	0.00
Apr 15	18,318	933	1,460	21	20,732	42	.20	32,200	0	0.00
Apr 16	46,616	928	1,827	0	49,371	130	.26	34,100	0	0.00
Apr 17	40,794	600	897	0	42,291	80	.19	43,200	0	0.00
Apr 18	81,474	846	1,458	0	83,778	383	.46	42,700	0	0.00
Apr 19	71,655	1,086	2,135	30	74,906	140	.19	42,200	0	0.00
Apr 20	86,284	1,751	2,685	0	90,720	454	.50	37,000	0	0.00
Apr 21	72,584	1,929	3,529	39	78,081	55	.07	41,700	0	0.00
Apr 22	104,335	2,263	6,529	22	113,149	205	.18	39,000	0	0.00
Apr 23	72,693	3,030	3,394	0	79,117	49	.06	35,800	0	0.00
Apr 24	103,779	3,308	3,930	0	111,017	181	.16	47,400	0	0.00
Apr 25	104,585	7,800	8,550	0	120,935	143	.12	56,500	0	0.00
Apr 26	147,755	10,581	42,445	0	200,781	806	.40	49,600	0	0.00
Apr 27	182,878	14,316	69,392	0	266,586	541	.20	53,650	0	0.00
Apr 28	117,826	12,334	67,502	0	197,662	2,543	1.29	72,600	0	0.00
Apr 29	162,457	18,444	101,977	0	282,878	749	.26	74,700	0	0.00
Apr 30	144,225	34,898	115,876	0	294,999	966	.33	100,100	100	.10
May 1	150,006	35,052	116,340	0	301,398	3,422	1.14	94,500	0	0.00
May 2	180,279	67,374	238,702	97	486,452	3,591	.74	90,000	0	0.00
May 3	96,604	39,288	180,366	63	316,321	8,441	2.67	80,600	0	0.00
May 4	104,774	56,505	198,397	0	359,676	2,529	.70	73,900	0	0.00
May 5	28,397	26,046	122,210	53	176,706	625	.35	65,100	0	0.00
May 6	12,260	16,161	76,454	0	104,875	73	.07	76,600	0	0.00
May 7	9,425	21,698	92,359	9	123,491	91	.07	93,100	0	0.00
May 8	12,559	14,532	78,961	21	106,073	72	.07	98,800	0	0.00
May 9	14,953	16,514	67,935	20	99,422	66	.07	74,500	0	0.00
May 10	12,347	8,186	51,590	0	72,123	47	.07	65,200	0	0.00
May 11	10,579	11,664	47,347	7	69,597	45	.06	72,700	0	0.00
May 12	16,772	14,778	74,505	32	106,087	103	.10	88,600	0	0.00

Appendix Table 1.-- Continued.

DATE	CHINDOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
May 13	23,968	13,949	61,757	30	99,704	129	.13	96,100	0	0.00
May 14	20,935	16,512	93,381	13	130,841	150	.11	97,000	0	0.00
May 15	10,400	4,782	46,334	12	61,528	59	.10	89,900	0	0.00
May 16	11,122	6,961	35,431	32	53,546	53	.10	76,100	0	0.00
May 17	5,997	5,194	35,732	0	46,923	70	.15	78,800	0	0.00
May 18	5,907	5,289	32,281	22	43,499	91	.21	67,700	0	0.00
May 19	6,260	3,162	19,446	35	28,903	67	.23	51,200	0	0.00
May 20	5,580	2,160	11,254	13	19,007	33	.17	44,300	0	0.00
May 21	4,028	2,530	15,252	35	21,845	51	.23	42,300	0	0.00
May 22	2,513	1,714	10,665	15	14,907	61	.41	40,600	0	0.00
May 23	4,705	2,430	13,441	14	20,590	115	.56	37,300	0	0.00
May 24	3,096	1,077	6,715	11	10,899	83	.76	32,800	0	0.00
May 25	2,826	718	4,227	10	7,781	188	2.42	36,400	0	0.00
May 26	2,665	466	2,898	11	6,040	64	1.06	34,700	0	0.00
May 27	4,152	844	6,759	16	11,771	106	.90	35,500	0	0.00
May 28	2,998	533	4,329	33	7,893	78	.99	39,500	0	0.00
May 29	2,419	2,087	9,092	0	13,598	118	.87	37,900	0	0.00
May 30	3,407	2,387	14,594	0	20,388	43	.21	34,300	0	0.00
May 31	3,909	6,062	28,966	0	38,937	148	.38	31,300	0	0.00
Jun 1	2,219	1,365	6,781	33	10,398	32	.31	46,400	0	0.00
Jun 2	2,642	1,233	3,975	0	7,850	91	1.16	40,200	0	0.00
Jun 3	2,220	623	2,853	0	5,696	47	.83	36,200	0	0.00
Jun 4	2,552	1,177	4,617	0	8,346	134	1.61	38,800	0	0.00
Jun 5	2,153	755	4,317	0	7,225	51	.71	32,700	0	0.00
Jun 6	1,498	599	2,508	0	4,605	28	.61	29,600	0	0.00
Jun 7	1,520	422	2,718	0	4,660	148	3.18	30,900	0	0.00
Jun 8	3,163	2,542	12,664	0	18,369	88	.48	32,700	0	0.00
Jun 9	2,330	1,266	7,259	0	10,855	69	.64	25,600	0	0.00
Jun 10	2,066	655	3,697	0	6,418	116	1.81	32,600	0	0.00
Jun 11	1,787	777	3,996	0	6,560	145	2.21	31,400	0	0.00
Jun 12	2,452	788	6,580	0	9,820	188	1.91	32,400	0	0.00
Jun 13	5,095	1,076	6,782	12	12,965	314	2.42	28,900	0	0.00
Jun 14	2,275	1,088	10,433	0	13,796	496	3.60	26,200	0	0.00
Jun 15	2,492	1,875	19,946	0	24,313	720	2.96	28,700	0	0.00
Jun 16	1,400	967	7,101	0	9,468	755	7.97	27,900	0	0.00
Jun 17	1,129	867	6,154	0	8,150	404	4.96	26,600	0	0.00
Jun 18	1,798	477	3,573	0	5,848	553	9.46	25,200	0	0.00
Jun 19	976	311	2,130	0	3,417	248	7.26	33,900	0	0.00
Jun 20	1,472	287	2,783	0	4,542	117	2.58	36,700	0	0.00
Jun 21	1,893	518	6,597	0	9,008	592	6.57	21,500	0	0.00
Jun 22	722	111	1,288	0	2,121	114	5.37	25,400	0	0.00
Jun 23	688	189	2,197	0	3,074	356	11.58	30,700	0	0.00
Jun 24	543	56	1,964	0	2,563	49	1.91	29,200	0	0.00
Jun 25	877	155	3,386	0	4,418	282	6.38	23,800	0	0.00
Jun 26	1,776	123	4,402	0	6,301	81	1.29	29,000	0	0.00
Jun 27	1,864	267	6,370	0	8,501	424	4.99	21,900	0	0.00
Jun 28	1,920	144	2,842	0	4,906	120	2.45	16,700	0	0.00
Jun 29	2,176	243	4,773	0	7,192	396	5.51	22,200	0	0.00

Appendix Table 1.-- Continued.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
Jun 30	2,054	188	4,496	0	6,738	139	2.06	16,800	0	0.00
Jul 1	1,309	89	4,816	0	6,214	393	6.32	21,000	0	0.00
Jul 2	1,154	233	5,970	0	7,357	138	1.88	22,300	0	0.00
Jul 3	1,188	555	10,787	0	12,530	535	4.27	21,200	0	0.00
Jul 4	821	533	6,125	0	7,479	124	1.66	12,400	0	0.00
Jul 5	477	145	2,376	0	2,998	498	16.61	12,000	0	0.00
Jul 6	344	310	2,629	0	3,283	31	.94	17,700	0	0.00
Jul 7	333	89	1,098	0	1,520	290	19.08	17,600	0	0.00
Jul 8	288	189	809	0	1,286	42	3.27	19,800	0	0.00
Jul 9	211	78	930	0	1,296	248	19.14	21,900	0	0.00
Jul 10	210	122	1,390	0	1,723	37	2.15	21,900	0	0.00
Jul 11	122	89	763	0	1,062	122	11.49	18,700	0	0.00
Jul 12	155	44	909	0	1,075	40	3.72	18,100	0	0.00
Jul 13	233	77	775	0	1,007	115	11.42	23,700	0	0.00
Jul 14	189	133	2,509	0	2,875	53	1.84	18,700	0	0.00
Jul 15	78	89	1,821	0	2,099	240	11.43	20,200	0	0.00
Jul 16	88	55	663	0	796	22	2.76	17,300	0	0.00
Jul 17	55	44	796	0	928	98	10.56	12,200	0	0.00
Jul 18	12	66	342	0	463	9	1.94	15,100	0	0.00
Jul 19	67	21	132	0	165	44	26.67	19,500	0	0.00
Jul 20	55	77	462	0	606	17	2.81	23,200	0	0.00
Jul 21	78	44	519	0	618	62	10.03	21,100	0	0.00
Jul 22	11	155	967	0	1,200	26	2.17	19,300	0	0.00
Jul 23	77	89	808	0	908	79	8.70	25,000	0	0.00
Jul 24	33	132	1,331	0	1,540	25	1.62	29,200	0	0.00
Jul 25	89	100	2,040	0	2,173	116	5.34	28,900	0	0.00
Jul 26	44	155	1,820	0	2,064	49	2.37	22,200	0	0.00
Jul 27	44	145	1,320	0	1,509	152	10.07	30,200	0	0.00
Jul 28	33	144	1,528	0	1,716	40	2.33	23,900	0	0.00
Jul 29	11	44	576	0	653	105	16.08	15,600	0	0.00
Jul 30	66	56	454	0	521	19	3.65	18,600	0	0.00
Jul 31		33	242	0	341	71	20.82	21,100	0	0.00
TOTAL	2,497,635	550,947	2,463,039	791	5,512,412	39,900	.72			

* An additional 22 coho were collected but not included in this appendix.

APPENDIX TABLE 2.-- 1987 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
29/ 3	155	90	0	10	255	155	90	0	10	255
30/ 3	0	0	0	0	0	155	90	0	10	255
31/ 3	188	87	0	0	275	343	177	0	10	530
1/ 4	0	0	0	0	0	343	177	0	10	530
2/ 4	238	54	11	0	303	581	231	11	10	833
3/ 4	0	0	0	0	0	581	231	11	10	833
4/ 4	0	0	0	0	0	581	231	11	10	833
5/ 4	0	0	0	0	0	581	231	11	10	833
6/ 4	1,963	210	254	11	2,438	2,544	441	265	21	3,271
7/ 4	0	0	0	0	0	2,544	441	265	21	3,271
8/ 4	0	0	0	0	0	2,544	441	265	21	3,271
9/ 4	0	0	0	0	0	2,544	441	265	21	3,271
10/ 4	0	0	0	0	0	2,544	441	265	21	3,271
11/ 4	0	0	0	0	0	2,544	441	265	21	3,271
12/ 4	0	0	0	0	0	2,544	441	265	21	3,271
13/ 4	0	0	0	0	0	2,544	441	265	21	3,271
14/ 4	0	0	0	0	0	2,544	441	265	21	3,271
15/ 4	0	0	0	0	0	2,544	441	265	21	3,271
16/ 4	0	0	0	0	0	2,544	441	265	21	3,271
17/ 4	0	0	0	0	0	2,544	441	265	21	3,271
18/ 4	0	0	0	0	0	2,544	441	265	21	3,271
19/ 4	0	0	0	0	0	2,544	441	265	21	3,271
20/ 4	0	0	0	0	0	2,544	441	265	21	3,271
21/ 4	0	0	0	0	0	2,544	441	265	21	3,271
22/ 4	0	0	0	0	0	2,544	441	265	21	3,271
23/ 4	0	0	0	0	0	2,544	441	265	21	3,271
24/ 4	0	0	0	0	0	2,544	441	265	21	3,271
25/ 4	0	0	0	0	0	2,544	441	265	21	3,271
26/ 4	0	0	0	0	0	2,544	441	265	21	3,271
27/ 4	0	0	0	0	0	2,544	441	265	21	3,271
28/ 4	0	0	0	0	0	2,544	441	265	21	3,271
29/ 4	0	0	0	0	0	2,544	441	265	21	3,271
30/ 4	0	0	0	0	0	2,544	441	265	21	3,271
1/ 5	0	0	0	0	0	2,544	441	265	21	3,271
2/ 5	0	0	0	0	0	2,544	441	265	21	3,271
3/ 5	0	0	0	0	0	2,544	441	265	21	3,271
4/ 5	0	0	0	0	0	2,544	441	265	21	3,271
5/ 5	0	0	0	0	0	2,544	441	265	21	3,271
6/ 5	0	0	0	0	0	2,544	441	265	21	3,271
7/ 5	1,013	2,415	10,182	1	13,611	3,557	2,856	10,447	22	16,882
8/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
9/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
10/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
11/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
12/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
13/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
14/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882
15/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882

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			
16/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
17/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
18/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
19/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
20/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
21/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
22/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
23/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
24/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
25/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
26/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
27/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
28/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
29/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
30/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
31/ 5	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
1/ 6	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
2/ 6	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
3/ 6	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
4/ 6	0	0	0	0	0	3,557	2,856	10,447	22	16,882			
5/ 6	2,139	754	4,281	0	7,174	5,696	3,610	14,728	22	24,056			
6/ 6	0	0	0	0	0	5,696	3,610	14,728	22	24,056			
7/ 6	2,970	1,020	5,099	0	9,089	8,666	4,630	19,827	22	33,145			
8/ 6	3,135	2,541	12,605	0	18,281	11,801	7,171	32,432	22	51,426			
9/ 6	2,302	1,266	7,218	0	10,786	14,103	8,437	39,650	22	62,212			
10/ 6	2,017	649	3,636	0	6,302	16,120	9,086	43,286	22	68,514			
11/ 6	2,017	774	3,929	0	6,415	17,832	9,860	47,215	22	74,929			
12/ 6	2,353	788	6,491	0	9,632	20,185	10,648	53,706	22	84,561			
13/ 6	4,926	1,074	6,639	12	12,651	25,111	11,722	60,345	34	97,212			
14/ 6	2,095	1,080	10,125	0	13,300	27,206	12,802	70,470	34	110,512			
15/ 6	2,384	1,869	19,340	0	23,593	29,590	14,671	89,810	34	134,105			
16/ 6	1,262	936	6,515	0	8,713	30,852	15,607	96,325	34	142,818			
17/ 6	1,034	860	5,853	0	7,747	31,886	16,467	102,178	34	150,565			
18/ 6	1,671	462	3,162	0	5,295	33,557	16,929	105,340	34	155,860			
19/ 6	902	294	1,973	0	3,169	34,459	17,223	107,313	34	159,029			
20/ 6	0	0	0	0	0	34,459	17,223	107,313	34	159,029			
21/ 6	3,175	775	8,891	0	12,841	37,634	17,998	116,204	34	171,870			
22/ 6	0	0	0	0	0	37,634	17,998	116,204	34	171,870			
23/ 6	1,261	270	3,195	0	4,726	38,895	18,268	119,399	34	176,596			
24/ 6	0	0	0	0	0	38,895	18,268	119,399	34	176,596			
25/ 6	1,312	201	5,137	0	6,650	40,207	18,469	124,536	34	183,246			
26/ 6	0	0	0	0	0	40,207	18,469	124,536	34	183,246			
27/ 6	3,444	372	10,481	0	14,297	43,651	18,841	135,017	34	197,543			
28/ 6	0	0	0	0	0	43,651	18,841	135,017	34	197,543			
29/ 6	3,952	363	7,267	0	11,582	47,603	19,204	142,284	34	209,125			
30/ 6	0	0	0	0	0	47,603	19,204	142,284	34	209,125			
1/ 7	3,213	259	8,948	0	12,420	50,816	19,463	151,232	34	221,545			
2/ 7	0	0	0	0	0	50,816	19,463	151,232	34	221,545			
3/ 7	2,167	770	16,277	0	19,214	52,983	20,233	167,509	34	240,759			

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
4/ 7	0	0	0	0	0	52,983	20,233	167,509	34	240,759
5/ 7	1,138	658	8,059	0	9,855	54,121	20,891	175,568	34	250,614
6/ 7	0	0	0	0	0	54,121	20,891	175,568	34	250,614
7/ 7	602	393	3,487	0	4,482	54,723	21,284	179,055	34	255,096
8/ 7	0	0	0	0	0	54,723	21,284	179,055	34	255,096
9/ 7	477	263	1,552	0	2,292	55,200	21,547	180,607	34	257,388
10/ 7	0	0	0	0	0	55,200	21,547	180,607	34	257,388
11/ 7	380	211	2,035	0	2,626	55,580	21,758	182,642	34	260,014
12/ 7	0	0	0	0	0	55,580	21,758	182,642	34	260,014
13/ 7	216	121	1,590	0	1,927	55,796	21,879	184,232	34	261,941
14/ 7	0	0	0	0	0	55,796	21,879	184,232	34	261,941
15/ 7	386	219	4,076	0	4,681	56,182	22,098	188,308	34	266,622
16/ 7	0	0	0	0	0	56,182	22,098	188,308	34	266,622
17/ 7	137	99	1,368	0	1,604	56,319	22,197	189,676	34	268,226
18/ 7	0	0	0	0	0	56,319	22,197	189,676	34	268,226
19/ 7	49	87	439	0	575	56,368	22,284	190,115	34	268,881
20/ 7	0	0	0	0	0	56,368	22,284	190,115	34	268,881
21/ 7	112	117	916	0	1,145	56,480	22,401	191,031	34	269,946
22/ 7	0	0	0	0	0	56,480	22,401	191,031	34	269,946
23/ 7	83	238	1,682	0	2,003	56,563	22,639	192,713	34	271,949
24/ 7	0	0	0	0	0	56,563	22,639	192,713	34	271,949
25/ 7	102	226	3,246	0	3,574	56,665	22,865	195,959	34	275,523
26/ 7	0	0	0	0	0	56,665	22,865	195,959	34	275,523
27/ 7	125	294	2,953	0	3,372	56,790	23,159	198,912	34	278,895
28/ 7	0	0	0	0	0	56,790	23,159	198,912	34	278,895
29/ 7	69	183	1,972	0	2,224	56,859	23,342	200,884	34	281,119
30/ 7	0	0	0	0	0	56,859	23,342	200,884	34	281,119
31/ 7	72	88	612	0	772	56,931	23,430	201,496	34	281,891

APPENDIX TABLE 3. --- 1987 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		Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total				
10/ 4	19,803	1,049	6,231	0	27,083	19,803	1,049	6,231	0		19,803	1,049	6,231	0	27,083				
11/ 4	0	0	0	0	0	19,803	0	0	0		19,803	1,049	6,231	0	27,083				
12/ 4	32,996	915	3,577	0	37,488	52,799	1,964	9,808	0		52,799	1,964	9,808	0	64,571				
13/ 4	0	0	0	0	0	52,799	0	0	0		52,799	1,964	9,808	0	64,571				
14/ 4	41,706	1,557	4,737	9	48,009	94,505	3,521	14,545	9		94,505	3,521	14,545	9	112,580				
15/ 4	0	0	0	0	0	94,505	0	0	0		94,505	3,521	14,545	9	112,580				
16/ 4	64,716	1,861	3,278	21	69,876	159,221	5,382	17,823	30		159,221	5,382	17,823	30	182,456				
17/ 4	0	0	0	0	0	159,221	0	0	0		159,221	5,382	17,823	30	182,456				
18/ 4	121,765	1,445	2,346	0	125,556	280,986	6,827	20,169	30		280,986	6,827	20,169	30	308,012				
19/ 4	0	0	0	0	0	280,986	0	0	0		280,986	6,827	20,169	30	308,012				
20/ 4	157,295	2,837	4,811	30	164,973	438,281	9,664	24,980	60		438,281	9,664	24,980	60	472,985				
21/ 4	0	0	0	0	0	438,281	0	0	0		438,281	9,664	24,980	60	472,985				
22/ 4	176,611	4,192	10,048	61	190,912	614,892	13,856	35,028	121		614,892	13,856	35,028	121	663,897				
23/ 4	0	0	0	0	0	614,892	0	0	0		614,892	13,856	35,028	121	663,897				
24/ 4	176,157	6,336	7,311	0	189,804	791,049	20,192	42,339	121		791,049	20,192	42,339	121	853,701				
25/ 4	0	0	0	0	0	791,049	0	0	0		791,049	20,192	42,339	121	853,701				
26/ 4	251,342	18,379	50,946	0	320,667	1,042,391	38,571	93,285	121		1,042,391	38,571	93,285	121	1,174,368				
27/ 4	182,309	14,316	69,370	0	265,995	1,224,700	52,887	162,655	121		1,224,700	52,887	162,655	121	1,440,363				
28/ 4	115,177	12,334	67,468	0	194,979	1,339,877	65,221	230,123	121		1,339,877	65,221	230,123	121	1,635,342				
29/ 4	161,606	18,443	101,940	0	281,989	1,501,483	83,664	332,063	121		1,501,483	83,664	332,063	121	1,917,331				
30/ 4	143,159	34,898	115,832	0	293,889	1,644,642	118,562	447,895	121		1,644,642	118,562	447,895	121	2,211,220				
1/ 5	146,623	35,052	116,251	0	297,926	1,791,265	153,614	564,146	121		1,791,265	153,614	564,146	121	2,509,146				
2/ 5	176,727	67,373	238,614	97	482,811	1,967,992	220,987	802,760	218		1,967,992	220,987	802,760	218	2,991,957				
3/ 5	88,222	39,288	180,282	63	307,855	2,056,214	260,275	983,042	281		2,056,214	260,275	983,042	281	3,299,812				
4/ 5	102,298	56,505	198,319	0	357,122	2,158,512	316,780	1,181,361	281		2,158,512	316,780	1,181,361	281	3,656,934				
5/ 5	27,793	26,046	122,164	53	176,056	2,186,305	342,826	1,303,525	334		2,186,305	342,826	1,303,525	334	3,832,990				
6/ 5	12,194	16,160	76,423	0	104,777	2,198,499	358,986	1,379,948	334		2,198,499	358,986	1,379,948	334	3,937,767				
7/ 5	8,361	19,283	82,034	8	109,686	2,206,860	378,269	1,461,982	342		2,206,860	378,269	1,461,982	342	4,047,453				
8/ 5	12,519	14,532	78,904	21	105,976	2,219,379	392,801	1,540,886	363		2,219,379	392,801	1,540,886	363	4,153,429				
9/ 5	14,921	16,514	67,880	20	99,335	2,234,300	409,315	1,608,766	383		2,234,300	409,315	1,608,766	383	4,252,764				
10/ 5	12,308	8,185	51,553	0	72,046	2,246,608	417,500	1,660,319	383		2,246,608	417,500	1,660,319	383	4,324,810				
11/ 5	10,545	11,663	47,314	7	69,529	2,257,153	429,163	1,707,633	390		2,257,153	429,163	1,707,633	390	4,394,339				
12/ 5	16,715	14,778	74,434	32	105,959	2,273,868	443,941	1,782,067	422		2,273,868	443,941	1,782,067	422	4,500,298				
13/ 5	23,923	13,948	61,649	30	99,550	2,297,791	457,889	1,843,716	452		2,297,791	457,889	1,843,716	452	4,599,848				
14/ 5	20,867	16,511	93,275	13	130,666	2,318,658	474,400	1,936,991	465		2,318,658	474,400	1,936,991	465	4,730,514				
15/ 5	10,368	4,782	46,282	12	61,444	2,329,026	479,182	1,983,273	477		2,329,026	479,182	1,983,273	477	4,791,958				
16/ 5	11,081	6,961	35,394	32	53,468	2,340,107	486,143	2,018,667	509		2,340,107	486,143	2,018,667	509	4,845,426				
17/ 5	5,961	5,194	35,673	0	46,828	2,346,068	491,337	2,054,340	509		2,346,068	491,337	2,054,340	509	4,892,254				
18/ 5	5,867	5,289	32,205	22	43,383	2,351,935	496,626	2,086,545	531		2,351,935	496,626	2,086,545	531	4,935,637				
19/ 5	6,231	3,157	19,389	34	28,811	2,358,166	499,783	2,105,934	565		2,358,166	499,783	2,105,934	565	4,964,448				
20/ 5	5,548	2,159	11,229	13	18,949	2,363,714	501,942	2,117,163	578		2,363,714	501,942	2,117,163	578	4,983,397				
21/ 5	4,001	2,528	15,205	35	21,769	2,367,715	504,470	2,132,368	613		2,367,715	504,470	2,132,368	613	5,005,166				
22/ 5	2,477	1,713	10,617	14	14,821	2,370,192	506,183	2,142,985	627		2,370,192	506,183	2,142,985	627	5,019,987				
23/ 5	4,675	2,426	13,336	13	20,450	2,374,867	508,609	2,156,321	640		2,374,867	508,609	2,156,321	640	5,040,437				
24/ 5	0	0	0	0	0	2,374,867	508,609	2,156,321	640		2,374,867	508,609	2,156,321	640	5,040,437				
25/ 5	5,848	1,794	10,698	19	18,359	2,380,715	510,403	2,167,019	659		2,380,715	510,403	2,167,019	659	5,058,796				
26/ 5	0	0	0	0	0	2,380,715	510,403	2,167,019	659		2,380,715	510,403	2,167,019	659	5,058,796				
27/ 5	6,745	1,309	9,510	27	17,591	2,387,460	511,712	2,176,529	686		2,387,460	511,712	2,176,529	686	5,076,387				

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
28/ 5	0	0	0	0	0	2,387,460	511,712	2,176,529	686	5,076,387
29/ 5	5,342	2,617	13,253	33	21,245	2,392,802	514,329	2,189,782	719	5,097,632
30/ 5	0	0	0	0	0	2,392,802	514,329	2,189,782	719	5,097,632
31/ 5	7,280	8,449	43,405	0	59,134	2,400,082	522,778	2,233,187	719	5,156,766
1/ 6	0	0	0	0	0	2,400,082	522,778	2,233,187	719	5,156,766
2/ 6	4,842	2,598	10,652	33	18,125	2,404,924	525,376	2,243,839	752	5,174,891
3/ 6	0	0	0	0	0	2,404,924	525,376	2,243,839	752	5,174,891
4/ 6	4,740	1,800	7,321	0	13,861	2,409,664	527,176	2,251,160	752	5,188,752

APPENDIX TABLE 4.-- 1987 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
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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 1987, at Little Goose Dam.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
Apr 2	1	0	1	0	2	0	0.00	26,500	0	0.00
Apr 3	2	4	2	0	8	0	0.00	29,900	0	0.00
Apr 4	3	2	2	0	7	1	14.29	29,400	0	0.00
Apr 5	7	6	2	0	15	0	0.00	28,600	0	0.00
Apr 6	12	9	11	0	32	0	0.00	35,000	0	0.00
Apr 7	7	2	2	0	11	0	0.00	37,400	0	0.00
Apr 8	17	32	9	0	58	2	3.45	36,400	0	0.00
Apr 9	22	13	16	0	51	1	1.96	39,000	0	0.00
Apr 10	30	4	20	2	56	3	5.36	41,400	0	0.00
Apr 11	55	16	50	0	121	2	1.65	43,800	0	0.00
Apr 12	573	64	223	0	860	1	.12	28,900	0	0.00
Apr 13	619	34	338	0	991	3	.30	43,200	0	0.00
Apr 14	790	79	216	0	1,085	3	.28	35,800	0	0.00
Apr 15	1,748	50	340	0	2,138	4	.19	32,100	0	0.00
Apr 16	1,353	73	124	0	1,550	2	.13	34,100	0	0.00
Apr 17	3,078	221	253	0	3,552	5	.14	39,500	0	0.00
Apr 18	4,174	126	430	44	4,774	11	.23	46,800	0	0.00
Apr 19	8,001	345	407	0	8,753	26	.30	44,200	0	0.00
Apr 20	8,955	386	280	0	9,621	20	.21	39,200	0	0.00
Apr 21	7,411	467	376	0	8,254	45	.55	44,500	0	0.00
Apr 22	7,428	183	358	58	8,027	54	.67	40,400	0	0.00
Apr 23	9,043	232	290	58	9,623	24	.25	35,500	0	0.00
Apr 24	10,939	504	504	48	11,995	42	.35	47,400	0	0.00
Apr 25	14,644	495	742	247	16,128	76	.47	55,700	0	0.00
Apr 26	25,749	1,852	1,128	0	28,729	182	.63	54,300	0	0.00
Apr 27	33,882	1,612	1,799	187	37,480	185	.49	55,300	0	0.00
Apr 28	42,656	2,233	5,376	101	50,366	218	.43	72,100	0	0.00
Apr 29	124,671	4,364	12,947	2,764	144,746	519	.36	75,100	0	0.00
Apr 30	131,329	8,554	25,829	1,677	167,389	1,685	1.01	100,600	0	0.00
May 1	124,942	11,587	55,229	1,351	193,109	1,321	.68	95,100	0	0.00
May 2	131,755	4,283	11,669	0	147,707	1,707	1.16	91,700	0	0.00
May 3	57,162	5,459	40,374	0	102,995	816	.79	85,600	0	0.00
May 4	24,511	10,294	60,786	0	95,591	661	.69	74,600	0	0.00
May 5	21,111	7,486	52,567	0	81,164	523	.64	67,000	0	0.00
May 6	30,678	10,526	84,718	0	125,922	577	.46	81,200	0	0.00
May 7	80,734	29,704	140,540	0	250,978	2,960	1.18	91,500	0	0.00
May 8	28,289	14,300	90,129	0	132,718	2,227	1.68	90,400	0	0.00
May 9	5,727	2,214	31,333	0	39,274	646	1.64	80,500	0	0.00
May 10	4,335	3,029	21,559	0	28,923	134	.46	62,900	0	0.00
May 11	1,948	3,185	20,637	0	25,770	86	.33	79,300	0	0.00
May 12	2,087	1,796	20,071	0	23,954	118	.49	85,900	0	0.00
May 13	3,984	1,381	11,970	0	17,335	115	.66	89,400	0	0.00
May 14	8,246	2,096	12,529	0	22,871	144	.63	98,800	0	0.00
May 15	8,124	1,759	14,787	0	24,670	228	.92	94,800	0	0.00
May 16	6,333	1,564	11,025	0	18,922	91	.48	72,600	0	0.00
May 17	5,091	815	9,117	0	15,023	100	.67	79,500	0	0.00
May 18	2,529	784	8,299	0	11,612	97	.84	76,800	0	0.00
May 19	1,919	496	4,917	0	7,332	74	1.01	48,300	0	0.00

Appendix Table 5.-- Continued.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
May 20	1,484	272	3,704	0	5,460	58	1.06	44,800	0	0.00
May 21	1,557	677	4,547	0	6,781	66	.97	43,200	0	0.00
May 22	543	359	4,055	47	5,004	99	1.98	42,100	0	0.00
May 23	538	314	2,551	0	3,403	108	3.17	37,800	0	0.00
May 24	428	311	1,904	0	2,643	121	4.58	31,300	0	0.00
May 25	451	194	1,516	0	2,161	151	6.99	47,200	0	0.00
May 26	988	766	4,818	0	6,572	150	2.28	39,900	0	0.00
May 27	1,837	443	4,633	0	6,913	169	2.44	35,500	0	0.00
May 28	1,724	187	1,479	0	3,390	126	3.72	35,300	0	0.00
May 29	2,101	55	884	0	3,040	137	4.51	36,200	0	0.00
May 30	1,140	0	693	0	1,833	65	3.55	30,700	0	0.00
May 31	293	39	470	0	802	85	10.60	31,400	0	0.00
Jun 1	308	42	515	0	865	60	6.94	48,200	0	0.00
Jun 2	729	34	312	0	1,075	58	5.40	39,800	0	0.00
Jun 3	829	311	2,279	0	3,419	127	3.71	36,700	0	0.00
Jun 4	864	190	1,278	0	2,332	187	8.02	33,100	0	0.00
Jun 5	794	166	769	0	1,729	159	9.20	34,800	0	0.00
Jun 6	717	123	578	0	1,418	94	6.63	29,400	0	0.00
Jun 7	540	30	435	0	1,005	183	18.21	30,300	0	0.00
Jun 8	937	157	1,607	0	2,701	174	6.44	34,700	0	0.00
Jun 9	1,588	357	1,657	0	3,602	440	12.22	25,500	0	0.00
Jun 10	894	88	424	0	1,406	217	15.43	32,400	0	0.00
Jun 11	1,044	117	397	0	1,558	194	12.45	31,500	0	0.00
Jun 12	607	73	462	0	1,142	89	7.79	35,200	0	0.00
Jun 13	492	53	616	0	1,161	194	16.71	27,400	0	0.00
Jun 14	478	74	465	0	1,017	104	10.23	25,600	0	0.00
Jun 15	388	126	1,217	13	1,744	163	9.35	28,000	0	0.00
Jun 16	351	117	541	0	1,009	130	12.88	27,600	0	0.00
Jun 17	381	127	446	0	954	152	15.93	26,700	0	0.00
Jun 18	172	45	824	9	1,050	122	11.62	26,100	0	0.00
Jun 19	322	74	892	13	1,301	178	13.68	35,600	0	0.00
Jun 20	954	134	1,225	0	2,313	97	4.19	41,500	0	0.00
Jun 21	593	129	1,234	0	1,956	235	12.01	19,900	0	0.00
Jun 22	393	94	487	0	974	84	8.62	27,600	0	0.00
Jun 23	220	49	159	0	428	100	23.36	28,400	0	0.00
Jun 24	163	42	223	0	428	56	13.08	28,900	0	0.00
Jun 25	263	41	662	0	966	95	9.83	25,900	0	0.00
Jun 26	667	27	1,046	0	1,740	77	4.43	28,300	0	0.00
Jun 27	292	141	913	0	1,346	173	12.85	23,600	0	0.00
Jun 28	273	55	507	0	835	114	13.65	15,300	0	0.00
Jun 29	266	32	339	0	637	118	18.52	24,000	0	0.00
Jun 30	1,169	97	1,284	16	2,566	91	3.55	17,300	0	0.00
Jul 1	818	70	872	0	1,760	126	7.16	20,500	0	0.00
Jul 2	808	110	587	0	1,505	132	8.77	20,700	0	0.00
Jul 3	624	114	328	0	1,066	161	15.10	20,800	0	0.00
Jul 4	417	26	183	0	626	221	35.30	12,100	0	0.00
Jul 5	394	16	115	0	525	106	20.19	12,100	0	0.00
Jul 6	304	20	118	0	442	136	30.77	18,200	0	0.00

Appendix Table 5.-- Continued.

DATE	CHINOOK	WILD STEELHEAD	HATCHERY STEELHEAD	SCKEYE	DAILY TOTAL	COLLECTION MORTALITY		RIVER FLOW IN CFS	SPILL	
						NUMBER	PERCENT		TOTAL	PERCENT
Jul 7	289	0	114	0	403	152	37.72	19,100	0	0.00
Jul 8	264	5	132	0	401	66	16.46	19,700	0	0.00
Jul 9	366	9	238	0	613	97	15.82	22,800	0	0.00
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TOTAL	1,021,760	141,852	812,065	6,635	1,982,312	22,536	1.14			

APPENDIX TABLE 6.-- 1987 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
6/ 4	13	13	7	0	33	13	13	7	0	33
7/ 4	0	0	0	0	0	13	13	7	0	33
8/ 4	27	27	18	0	72	40	40	25	0	105
9/ 4	0	0	0	0	0	40	40	25	0	105
10/ 4	0	0	0	0	0	40	40	25	0	105
11/ 4	0	0	0	0	0	40	40	25	0	105
12/ 4	0	0	0	0	0	40	40	25	0	105
13/ 4	0	0	0	0	0	40	40	25	0	105
14/ 4	0	0	0	0	0	40	40	25	0	105
15/ 4	0	0	0	0	0	40	40	25	0	105
16/ 4	0	0	0	0	0	40	40	25	0	105
17/ 4	0	0	0	0	0	40	40	25	0	105
18/ 4	0	0	0	0	0	40	40	25	0	105
19/ 4	0	0	0	0	0	40	40	25	0	105
20/ 4	0	0	0	0	0	40	40	25	0	105
21/ 4	0	0	0	0	0	40	40	25	0	105
22/ 4	0	0	0	0	0	40	40	25	0	105
23/ 4	0	0	0	0	0	40	40	25	0	105
24/ 4	0	0	0	0	0	40	40	25	0	105
25/ 4	0	0	0	0	0	40	40	25	0	105
26/ 4	0	0	0	0	0	40	40	25	0	105
27/ 4	0	0	0	0	0	40	40	25	0	105
28/ 4	0	0	0	0	0	40	40	25	0	105
29/ 4	0	0	0	0	0	40	40	25	0	105
30/ 4	0	0	0	0	0	40	40	25	0	105
1/ 5	0	0	0	0	0	40	40	25	0	105
2/ 5	0	0	0	0	0	40	40	25	0	105
3/ 5	0	0	0	0	0	40	40	25	0	105
4/ 5	0	0	0	0	0	40	40	25	0	105
5/ 5	0	0	0	0	0	40	40	25	0	105
6/ 5	0	0	0	0	0	40	40	25	0	105
7/ 5	0	0	0	0	0	40	40	25	0	105
8/ 5	0	0	0	0	0	40	40	25	0	105
9/ 5	0	0	0	0	0	40	40	25	0	105
10/ 5	0	0	0	0	0	40	40	25	0	105
11/ 5	0	0	0	0	0	40	40	25	0	105
12/ 5	0	0	0	0	0	40	40	25	0	105
13/ 5	0	0	0	0	0	40	40	25	0	105
14/ 5	0	0	0	0	0	40	40	25	0	105
15/ 5	0	0	0	0	0	40	40	25	0	105
16/ 5	0	0	0	0	0	40	40	25	0	105
17/ 5	0	0	0	0	0	40	40	25	0	105
18/ 5	0	0	0	0	0	40	40	25	0	105
19/ 5	0	0	0	0	0	40	40	25	0	105
20/ 5	0	0	0	0	0	40	40	25	0	105
21/ 5	0	0	0	0	0	40	40	25	0	105
22/ 5	0	0	0	0	0	40	40	25	0	105
23/ 5	0	0	0	0	0	40	40	25	0	105

APPENDIX TABLE 6.-- Continued

DAILY #'s TRUCKED

ACCUM. #'s TRUCKED

	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
24/ 5	0	0	0	0	0	40	40	25	0	105
25/ 5	0	0	0	0	0	40	40	25	0	105
26/ 5	0	0	0	0	0	40	40	25	0	105
27/ 5	0	0	0	0	0	40	40	25	0	105
28/ 5	0	0	0	0	0	40	40	25	0	105
29/ 5	0	0	0	0	0	40	40	25	0	105
30/ 5	0	0	0	0	0	40	40	25	0	105
31/ 5	0	0	0	0	0	40	40	25	0	105
1/ 6	0	0	0	0	0	40	40	25	0	105
2/ 6	0	0	0	0	0	40	40	25	0	105
3/ 6	0	0	0	0	0	40	40	25	0	105
4/ 6	0	0	0	0	0	40	40	25	0	105
5/ 6	0	0	0	0	0	40	40	25	0	105
6/ 6	538	120	544	0	1,202	578	160	569	0	1,307
7/ 6	0	0	0	0	0	578	160	569	0	1,307
8/ 6	977	140	976	0	2,093	1,555	300	1,545	0	3,400
9/ 6	0	0	0	0	0	1,555	300	1,545	0	3,400
10/ 6	2,039	503	3,148	0	5,690	3,594	803	4,693	0	9,090
11/ 6	0	0	0	0	0	3,594	803	4,693	0	9,090
12/ 6	1,583	198	758	0	2,539	5,177	1,001	5,451	0	11,629
13/ 6	0	0	0	0	0	5,177	1,001	5,451	0	11,629
14/ 6	833	119	991	0	1,943	6,010	1,120	6,442	0	13,572
15/ 6	0	0	0	0	0	6,010	1,120	6,442	0	13,572
16/ 6	686	206	1,598	12	2,502	6,696	1,326	8,040	12	16,074
17/ 6	0	0	0	0	0	6,696	1,326	8,040	12	16,074
18/ 6	558	223	870	1	1,652	7,254	1,549	8,910	13	17,726
19/ 6	0	0	0	0	0	7,254	1,549	8,910	13	17,726
20/ 6	448	114	1,526	20	2,108	7,702	1,663	10,436	33	19,834
21/ 6	0	0	0	0	0	7,702	1,663	10,436	33	19,834
22/ 6	1,455	258	2,265	0	3,978	9,157	1,921	12,701	33	23,812
23/ 6	0	0	0	0	0	9,157	1,921	12,701	33	23,812
24/ 6	497	124	467	0	1,088	9,654	2,045	13,168	33	24,900
25/ 6	0	0	0	0	0	9,654	2,045	13,168	33	24,900
26/ 6	472	82	944	0	1,498	10,126	2,127	14,112	33	26,398
27/ 6	0	0	0	0	0	10,126	2,127	14,112	33	26,398
28/ 6	767	164	1,708	0	2,639	10,893	2,291	15,820	33	29,037
29/ 6	0	0	0	0	0	10,893	2,291	15,820	33	29,037
30/ 6	440	80	709	0	1,229	11,333	2,371	16,529	33	30,266
1/ 7	0	0	0	0	0	11,333	2,371	16,529	33	30,266
2/ 7	1,902	176	2,071	16	4,165	13,235	2,547	18,600	49	34,431
3/ 7	0	0	0	0	0	13,235	2,547	18,600	49	34,431
4/ 7	1,132	201	742	0	2,075	14,367	2,748	19,342	49	36,506
5/ 7	0	0	0	0	0	14,367	2,748	19,342	49	36,506
6/ 7	561	39	249	0	849	14,928	2,787	19,591	49	37,355
7/ 7	0	0	0	0	0	14,928	2,787	19,591	49	37,355
8/ 7	419	19	213	0	651	15,347	2,806	19,804	49	38,006
9/ 7	487	13	339	0	839	15,834	2,819	20,143	49	38,845

APPENDIX TABLE 7.-- 1987 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			
11/ 4	86	40	69	0	195	86	40	69	0	195			
12/ 4	0	0	0	0	0	86	40	69	0	195			
13/ 4	971	91	450	0	1,512	1,057	131	519	0	1,707			
14/ 4	0	0	0	0	0	1,057	131	519	0	1,707			
15/ 4	2,107	123	559	0	2,789	3,164	254	1,078	0	4,496			
16/ 4	0	0	0	0	0	3,164	254	1,078	0	4,496			
17/ 4	3,131	172	345	0	3,648	6,295	426	1,423	0	8,144			
18/ 4	0	0	0	0	0	6,295	426	1,423	0	8,144			
19/ 4	9,687	421	773	42	10,923	15,982	847	2,196	42	19,067			
20/ 4	0	0	0	0	0	15,982	847	2,196	42	19,067			
21/ 4	16,439	773	663	0	17,875	32,421	1,620	2,859	42	36,942			
22/ 4	0	0	0	0	0	32,421	1,620	2,859	42	36,942			
23/ 4	15,763	560	708	84	17,115	48,184	2,180	3,567	126	54,057			
24/ 4	0	0	0	0	0	48,184	2,180	3,567	126	54,057			
25/ 4	21,374	820	945	175	23,314	69,558	3,000	4,512	301	77,371			
26/ 4	0	0	0	0	0	69,558	3,000	4,512	301	77,371			
27/ 4	47,781	2,788	2,288	225	53,082	117,339	5,788	6,800	526	130,453			
28/ 4	44,703	2,251	4,157	169	51,280	162,042	8,039	10,957	695	181,733			
29/ 4	53,933	2,216	6,032	840	63,021	215,975	10,255	16,989	1,535	244,754			
30/ 4	139,337	6,469	19,360	2,611	167,777	355,312	16,724	36,349	4,146	412,531			
1/ 5	80,286	6,200	24,092	963	111,541	435,598	22,924	60,441	5,109	524,072			
2/ 5	162,019	11,185	46,123	1,254	220,581	597,617	34,109	106,564	6,363	744,653			
3/ 5	113,007	5,885	28,585	128	147,605	710,624	39,994	135,149	6,491	892,258			
4/ 5	43,332	7,454	48,811	0	99,597	753,956	47,448	183,960	6,491	991,855			
5/ 5	21,491	8,746	54,639	0	84,876	775,447	56,194	238,599	6,491	1,076,731			
6/ 5	19,478	6,911	50,644	0	77,033	794,925	63,105	289,243	6,491	1,153,764			
7/ 5	36,613	13,302	90,685	0	140,600	831,538	76,407	379,928	6,491	1,294,364			
8/ 5	60,086	23,265	109,338	0	192,689	891,624	99,672	489,266	6,491	1,487,053			
9/ 5	14,509	9,752	67,976	0	92,237	906,133	109,424	557,242	6,491	1,579,290			
10/ 5	8,120	4,127	42,065	0	54,312	914,253	113,551	599,307	6,491	1,633,612			
11/ 5	3,048	2,846	19,478	0	25,372	917,301	116,397	618,785	6,491	1,658,974			
12/ 5	1,773	2,517	18,805	0	23,095	919,074	118,914	637,590	6,491	1,682,069			
13/ 5	3,210	1,884	19,455	0	24,549	922,284	120,798	657,045	6,491	1,706,618			
14/ 5	5,382	1,584	11,448	0	18,414	927,666	122,382	668,493	6,491	1,725,032			
15/ 5	8,443	2,022	13,950	0	24,415	936,109	124,404	682,443	6,491	1,749,447			
16/ 5	6,842	1,554	12,244	0	20,640	942,951	125,958	694,687	6,491	1,770,087			
17/ 5	5,936	1,300	10,407	0	17,643	948,887	127,258	705,094	6,491	1,787,730			
18/ 5	4,108	808	8,811	0	13,727	952,995	128,066	713,905	6,491	1,801,457			
19/ 5	2,260	666	6,864	0	9,790	955,255	128,732	720,769	6,491	1,811,247			
20/ 5	1,559	375	3,966	0	5,900	956,814	129,107	724,735	6,491	1,817,147			
21/ 5	1,631	443	4,295	0	6,369	958,445	129,550	729,030	6,491	1,823,516			
22/ 5	1,255	611	4,883	24	6,773	959,700	130,161	733,913	6,515	1,830,289			
23/ 5	476	308	2,984	23	3,791	960,176	130,469	736,897	6,538	1,834,080			
24/ 5	477	306	2,172	0	2,955	960,653	130,775	739,069	6,538	1,837,035			
25/ 5	0	0	0	0	0	960,653	130,775	739,069	6,538	1,837,035			
26/ 5	805	462	2,992	0	4,259	961,458	131,237	742,061	6,538	1,841,294			
27/ 5	0	0	0	0	0	961,458	131,237	742,061	6,538	1,841,294			
28/ 5	3,381	1,180	9,240	0	13,801	964,839	132,417	751,301	6,538	1,855,095			

APPENDIX TABLE 7.-- Continued

DAILY #'s BARBED					ACCUM. #'s BARBED				
Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Daily Total	Chinook	Wild Steelhead	Hatchery Steelhead	Sockeye	Accum. Total
29/ 5	0	0	0	0	964,839	132,417	751,301	6,538	1,855,095
30/ 5	3,569	161	1,955	5,685	968,408	132,578	753,256	6,538	1,860,780
31/ 5	0	0	0	0	968,408	132,578	753,256	6,538	1,860,780
1/ 6	931	61	1,003	1,995	969,339	132,639	754,259	6,538	1,862,775
2/ 6	0	0	0	0	969,339	132,639	754,259	6,538	1,862,775
3/ 6	880	88	771	1,739	970,219	132,727	755,030	6,538	1,864,514
4/ 6	0	0	0	0	970,219	132,727	755,030	6,538	1,864,514
5/ 6	1,669	525	3,480	5,674	971,888	133,252	758,510	6,538	1,870,188

APPENDIX TABLE 8.-- 1987 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
7/ 5		4,419	1,549	8,163	0	14,131	4,419	1,549	8,163	0	14,131
8/ 5		11,447	4,014	21,148	0	36,609	15,866	5,563	29,311	0	50,740

Appendix Table 9.-- Daily Collection Counts of Chinook, Coho, Steelhead, and Sockeye, Facility Mortalities, and Daily River Flows and Spills During 1987, at McNary Dam.

DATE	YEARLING CHINOOK	SUB-YEARLING CHINOOK	COHO	STEELHEAD	SCKEYE	DAILY TOTAL	COLLECTION MORTALITY		RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
							NUMBER	PERCENT			
Mar 27	0	29	0	0	14	43	0	0.00	137,200	0	0.00
Mar 28	29	0	0	57	0	86	1	1.16	128,300	0	0.00
Mar 29	43	43	0	29	0	115	0	0.00	111,700	0	0.00
Mar 30	14	100	14	14	0	128	1	.78	118,300	0	0.00
Mar 31	43	186	0	43	14	286	0	0.00	117,000	0	0.00
Apr 1	9	211	0	21	9	250	0	0.00	113,900	0	0.00
Apr 2	29	147	0	33	7	216	11	5.09	119,100	0	0.00
Apr 3	29	57	0	14	0	100	3	3.00	116,600	0	0.00
Apr 4	371	171	0	43	0	585	4	.68	134,600	0	0.00
Apr 5	6,914	100	0	200	29	7,243	20	.28	102,500	0	0.00
Apr 6	5,386	100	0	343	14	5,843	39	.67	120,600	0	0.00
Apr 7	22,000	14	0	757	0	22,771	171	.75	137,900	0	0.00
Apr 8	59,500	43	0	829	0	60,372	349	.58	150,400	0	0.00
Apr 9	45,700	57	0	471	0	46,228	378	.82	157,000	0	0.00
Apr 10	41,271	0	0	657	0	41,928	361	.86	145,000	0	0.00
Apr 11	30,043	29	0	271	0	30,343	236	.78	136,600	0	0.00
Apr 12	19,700	71	0	329	0	20,100	100	.50	118,600	0	0.00
Apr 13	14,386	14	14	343	0	14,743	94	.64	136,800	0	0.00
Apr 14	14,686	157	14	429	7,354	15,286	90	.59	146,100	0	0.00
Apr 15	8,571	114	0	914	0	9,599	79	.82	100,000	0	0.00
Apr 16	9,014	57	14	1,500	14	10,599	33	.31	160,400	0	0.00
Apr 17	5,914	186	0	1,571	29	7,700	36	.47	164,500	0	0.00
Apr 18	8,057	57	0	1,357	0	9,471	25	.26	138,600	0	0.00
Apr 19	10,900	57	29	1,486	14	12,486	65	.52	142,200	0	0.00
Apr 20	16,657	114	0	2,286	43	19,100	58	.30	131,200	0	0.00
Apr 21	7,571	157	0	2,357	29	10,114	55	.54	118,200	0	0.00
Apr 22	8,300	257	29	2,357	43	10,986	30	.27	156,500	0	0.00
Apr 23	12,500	371	29	3,114	129	16,143	79	.49	135,600	0	0.00
Apr 24	12,586	157	14	3,771	57	16,585	88	.53	144,400	0	0.00
Apr 25	17,571	86	43	7,543	71	25,314	85	.34	150,600	0	0.00
Apr 26	13,886	214	29	10,757	43	24,929	78	.31	137,800	0	0.00
Apr 27	8,014	157	29	4,429	129	12,758	98	.77	145,700	0	0.00
Apr 28	12,371	200	100	7,086	414	20,171	118	.58	129,600	0	0.00
Apr 29	15,514	214	86	10,043	114	25,971	174	.67	176,300	0	0.00
Apr 30	30,529	429	371	23,114	571	55,014	329	.60	235,700	38,600	16.38
May 1	34,414	500	214	18,471	1,414	55,013	418	.76	235,300	37,100	15.77
May 2	57,484	305	621	21,937	2,621	82,968	731	.88	230,600	32,100	13.92
May 3	114,074	895	1,905	37,274	5,642	159,790	1,467	.92	228,700	29,600	12.94
May 4	246,924	1,152	3,709	59,785	7,354	318,924	2,971	.93	200,300	1,600	.80
May 5	227,103	1,256	2,821	44,513	8,744	284,437	2,760	.97	246,800	49,800	20.18
May 6	233,978	1,422	2,111	35,067	16,289	288,867	1,096	.38	256,600	60,400	23.54
May 7	166,776	1,345	1,121	35,879	11,914	217,035	754	.35	239,300	38,200	15.96
May 8	167,133	1,667	1,644	31,489	12,022	213,955	836	.39	262,000	50,000	19.03
May 9	227,812	2,448	1,464	57,265	16,728	305,717	1,170	.38	265,000	48,600	18.34
May 10	274,582	2,155	1,102	54,662	26,204	358,705	1,040	.29	230,500	18,700	8.11
May 11	279,529	1,558	1,307	53,704	21,462	357,560	1,030	.29	245,500	47,600	19.39
May 12	153,082	1,800	1,882	50,900	20,513	228,177	901	.39	266,500	71,700	26.90
May 13	121,232	2,176	4,704	42,256	20,528	190,896	887	.46	271,300	71,600	26.39

Appendix Table 9. -- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
May 14	88,840	1,867	10,937	41,027	30,760	173,481	998	.58	271,600	74,600	27.47
May 15	46,912	5,414	7,650	29,236	11,461	100,673	489	.49	291,600	101,800	34.91
May 16	51,520	3,244	7,629	26,705	6,924	96,022	571	.59	274,700	87,500	31.85
May 17	49,467	2,840	7,473	25,027	8,467	93,274	713	.76	238,500	51,000	21.38
May 18	52,430	4,280	7,730	23,740	10,190	98,370	603	.61	236,300	53,200	22.51
May 19	44,270	3,310	9,210	20,620	10,790	88,200	1,041	1.18	229,800	53,600	23.32
May 20	36,871	4,656	11,047	26,729	10,066	89,369	1,143	1.28	171,600	0	0.00
May 21	23,120	4,660	9,967	19,100	9,053	65,900	1,204	1.83	196,900	17,700	8.99
May 22	25,705	4,820	12,090	13,795	10,265	66,675	1,375	2.06	182,500	13,000	7.12
May 23	35,040	5,115	12,295	19,175	15,945	87,570	1,841	2.10	191,000	15,500	8.12
May 24	36,100	6,333	11,453	12,120	11,987	77,993	1,186	1.52	179,100	0	0.00
May 25	26,867	6,387	11,913	12,007	25,567	82,741	1,657	2.00	186,400	0	0.00
May 26	22,513	7,533	11,806	11,813	26,820	80,485	3,634	4.52	182,800	0	0.00
May 27	19,670	12,845	11,270	10,150	40,760	94,695	4,774	5.04	199,800	0	0.00
May 28	16,815	10,767	6,631	10,697	55,678	100,588	3,756	3.73	197,000	7,700	3.91
May 29	17,573	8,355	8,819	9,673	40,963	85,383	3,432	4.02	204,500	0	0.00
May 30	14,133	6,667	12,960	10,647	33,207	77,614	3,062	3.95	203,400	0	0.00
May 31	11,867	15,800	7,947	7,827	25,813	69,254	1,633	2.36	162,100	0	0.00
Jun 1	9,167	13,460	2,140	5,007	6,493	36,267	1,132	3.12	176,900	0	0.00
Jun 2	6,393	8,527	2,647	3,573	6,247	27,387	612	2.23	193,900	0	0.00
Jun 3	3,833	4,730	3,463	5,007	5,550	22,583	660	2.92	199,000	0	0.00
Jun 4	2,853	2,410	2,280	3,920	5,340	16,803	696	4.14	173,100	0	0.00
Jun 5	2,186	1,571	729	2,271	4,114	10,871	607	5.58	176,500	0	0.00
Jun 6	1,771	1,043	1,000	1,757	5,100	10,671	309	2.90	198,500	0	0.00
Jun 7	1,900	1,157	886	1,743	3,657	9,343	507	5.43	189,900	0	0.00
Jun 8	2,214	1,100	1,043	1,700	3,400	9,457	236	2.50	192,100	0	0.00
Jun 9	2,286	3,471	1,214	2,029	3,786	12,786	369	2.89	187,300	0	0.00
Jun 10	1,829	1,986	557	1,229	2,043	7,644	318	4.16	196,000	0	0.00
Jun 11	3,307	1,993	632	1,775	2,770	10,477	435	4.15	175,000	0	0.00
Jun 12	2,857	2,157	457	1,271	1,557	8,299	283	3.41	157,500	0	0.00
Jun 13	1,943	1,443	200	843	1,514	5,943	318	5.35	115,200	0	0.00
Jun 14	1,457	2,671	257	829	871	6,085	84	1.38	129,700	0	0.00
Jun 15	1,871	2,471	214	829	400	5,785	170	2.94	129,300	0	0.00
Jun 16	1,440	5,090	230	400	250	7,410	137	1.85	122,300	0	0.00
Jun 17	1,810	21,240	140	300	180	23,670	397	1.68	157,900	0	0.00
Jun 18	2,429	104,586	500	1,057	500	109,072	1,504	1.38	145,800	0	0.00
Jun 19	2,296	192,557	417	487	313	196,070	2,967	1.51	126,800	0	0.00
Jun 20	1,360	222,180	200	320	220	224,280	2,274	1.01	129,400	0	0.00
Jun 21	860	139,020	100	80	260	140,320	2,041	1.45	102,800	0	0.00
Jun 22	772	47,808	21	63	42	48,706	608	1.25	103,300	0	0.00
Jun 23	1,079	310,230	113	145	64	311,631	2,732	.88	128,900	0	0.00
Jun 24	1,260	189,440	200	360	180	191,440	1,633	.85	141,600	0	0.00
Jun 25	1,300	352,480	160	320	220	354,480	5,051	1.42	118,500	0	0.00
Jun 26	400	193,980	160	140	80	194,760	3,748	1.92	114,000	0	0.00
Jun 27	460	104,680	160	100	20	105,420	1,029	.98	134,900	0	0.00
Jun 28	420	141,040	60	260	80	141,860	2,054	1.45	96,100	0	0.00
Jun 29	440	64,440	140	240	60	65,220	3,066	4.70	109,400	0	0.00
Jun 30	500	139,729	100	186	143	140,658	14,607	10.38	136,600	0	0.00

Appendix Table 9.-- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL SPILL	PERCENT
Aug 18	0	3,000	0	60	0	3,060	156	5.10	102,800	0	0.00
Aug 19	0	4,420	0	20	0	4,440	165	3.72	83,000	0	0.00
Aug 20	0	2,820	0	20	20	2,860	170	5.94	113,600	0	0.00
Aug 21	0	4,940	0	40	40	5,020	282	5.62	111,500	0	0.00
Aug 22	0	5,700	0	20	0	5,720	124	2.17	108,100	0	0.00
Aug 23	0	4,760	0	0	0	4,760	131	2.75	90,300	0	0.00
Aug 24	0	3,020	0	30	10	3,060	80	2.61	84,700	0	0.00
Aug 25	0	4,220	0	20	40	4,280	94	2.20	112,900	0	0.00
Aug 26	0	4,240	0	10	0	4,250	98	2.31	110,600	0	0.00
Aug 27	0	3,010	0	10	10	3,030	76	2.51	102,100	0	0.00
Aug 28	0	2,440	20	30	0	2,490	76	3.05	116,300	0	0.00
Aug 29	0	2,030	30	30	10	2,100	119	5.67	112,600	0	0.00
Aug 30	0	1,790	20	40	20	1,870	87	4.65	90,700	0	0.00
Aug 31	0	830	0	20	0	850	88	10.35	88,100	0	0.00
Sep 1	0	550	10	20	0	530	68	11.72	103,400	0	0.00
Sep 2	0	2,940	70	10	20	3,040	87	2.86	108,200	0	0.00
Sep 3	0	3,580	10	10	10	3,610	127	3.52	110,800	0	0.00
Sep 4	10	2,020	10	0	10	2,050	87	4.24	108,300	0	0.00
Sep 5	0	3,110	10	10	20	3,150	96	3.05	85,600	0	0.00
Sep 6	0	1,650	10	0	20	1,680	112	6.67	70,400	0	0.00
Sep 7	0	980	0	10	10	1,000	127	12.70	80,400	0	0.00
Sep 8	0	1,050	10	20	0	1,080	72	6.67	87,400	0	0.00
Sep 9	0	1,520	10	0	0	1,530	61	3.99	99,900	0	0.00
Sep 10	0	2,270	0	50	0	2,320	95	4.09	106,100	0	0.00
Sep 11	0	6,190	30	10	0	6,230	158	2.54	113,400	0	0.00
Sep 12	0	5,090	10	20	0	5,120	144	2.81	133,800	0	0.00
Sep 13	0	4,420	40	20	0	4,480	141	3.15	96,100	0	0.00
Sep 14	0	1,640	0	50	0	1,690	112	6.63	112,600	0	0.00
Sep 15	0	1,990	10	10	10	2,020	135	6.68	116,200	0	0.00
Sep 16	0	2,140	20	10	10	2,180	149	6.79	105,400	0	0.00
Sep 17	0	1,570	0	10	10	1,590	80	5.03	120,900	0	0.00
Sep 18	0	1,420	20	20	20	1,480	132	8.92	101,300	0	0.00
Sep 19	0	1,260	0	10	0	1,270	103	8.11	103,400	0	0.00
Sep 20	10	920	10	10	0	950	165	17.37	93,100	0	0.00
Sep 21	0	740	0	0	0	740	116	15.68	92,100	0	0.00
Sep 22	0	510	0	10	10	530	101	19.06	121,300	0	0.00
Sep 23	0	740	0	20	10	770	48	6.23	133,200	0	0.00
Sep 24	0	880	10	10	30	930	45	4.84	96,200	0	0.00
Sep 25	0	930	10	20	30	990	25	2.53	101,700	0	0.00
Sep 26	10	1,590	0	0	20	1,620	36	2.22	106,400	0	0.00
Sep 27	0	1,980	0	30	10	2,020	32	1.58	82,200	0	0.00
Sep 28	0	870	0	10	10	890	28	3.15	102,900	0	0.00
Sep 29	0	830	0	0	0	830	51	6.14	116,500	0	0.00
Sep 30	0	910	0	0	0	910	29	3.19	109,700	0	0.00
Oct 1	0	910	0	10	10	930	119	12.80	125,000	0	0.00
Oct 2	0	910	0	10	10	930	38	4.09	132,800	0	0.00
Oct 3	0	750	0	30	0	780	71	9.10	99,600	0	0.00
Oct 4	0	480	10	0	0	490	54	11.02	87,900	0	0.00

Appendix Table 9.-- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL	SPILL PERCENT
Jul 1	940	491,868	134	352	269	493,563	45,684	9.26	119,200	0	0.00
Jul 2	500	332,700	233	567	133	334,133	12,852	3.85	121,200	0	0.00
Jul 3	767	460,967	67	133	300	462,234	20,447	4.42	101,800	0	0.00
Jul 4	533	250,967	33	0	233	251,766	14,483	5.75	88,200	0	0.00
Jul 5	233	178,233	0	67	33	178,566	11,612	6.50	78,900	0	0.00
Jul 6	133	149,700	0	33	0	149,866	4,873	3.25	78,800	0	0.00
Jul 7	100	140,340	20	120	0	140,580	6,203	4.41	121,200	0	0.00
Jul 8	486	238,871	0	100	14	239,471	12,751	5.32	127,600	0	0.00
Jul 9	286	241,500	71	71	43	241,971	8,422	3.48	128,600	0	0.00
Jul 10	275	221,275	50	50	0	221,650	5,035	2.27	125,400	0	0.00
Jul 11	250	236,200	100	125	25	236,700	21,385	9.03	113,600	0	0.00
Jul 12	450	423,900	0	200	25	424,575	17,440	4.11	98,300	0	0.00
Jul 13	75	212,550	25	150	50	212,850	3,955	1.86	105,600	0	0.00
Jul 14	125	176,125	0	175	25	176,450	4,953	2.81	126,400	0	0.00
Jul 15	125	133,250	25	300	75	133,775	3,751	2.80	125,100	0	0.00
Jul 16	14	76,786	14	129	29	76,972	880	1.14	116,300	0	0.00
Jul 17	57	21,514	29	129	14	21,743	283	1.30	99,800	0	0.00
Jul 18	43	21,414	0	157	57	21,671	412	1.90	110,200	0	0.00
Jul 19	14	37,414	0	186	57	37,671	390	1.04	86,900	0	0.00
Jul 20	0	12,771	0	43	14	12,828	176	1.37	88,300	0	0.00
Jul 21	0	17,743	0	71	14	17,828	316	1.77	126,900	0	0.00
Jul 22	0	20,443	0	14	14	20,471	426	2.08	103,300	0	0.00
Jul 23	0	7,614	0	14	29	7,657	499	6.52	107,200	0	0.00
Jul 24	0	8,400	0	29	0	8,429	309	3.67	123,100	0	0.00
Jul 25	0	16,929	14	71	29	17,043	652	3.83	103,500	0	0.00
Jul 26	0	12,071	0	14	14	12,099	350	2.89	81,200	0	0.00
Jul 27	0	10,843	0	0	0	10,843	311	2.87	98,200	0	0.00
Jul 28	0	28,660	0	35	0	28,695	2,590	9.03	110,900	0	0.00
Jul 29	0	30,440	0	30	10	30,480	1,146	3.76	117,600	0	0.00
Jul 30	0	50,575	0	50	10	50,635	3,629	7.17	104,200	0	0.00
Jul 31	0	20,330	0	50	20	20,400	856	4.20	109,000	0	0.00
Aug 1	20	10,810	10	40	0	10,880	490	4.50	104,100	0	0.00
Aug 2	0	6,710	0	50	20	6,780	248	3.66	89,100	0	0.00
Aug 3	0	7,590	0	50	0	7,640	446	5.84	103,000	0	0.00
Aug 4	0	12,260	5	25	15	12,305	699	5.68	109,300	0	0.00
Aug 5	0	14,980	10	35	10	15,035	445	2.96	103,300	0	0.00
Aug 6	0	12,640	0	15	30	12,685	336	2.65	119,500	0	0.00
Aug 7	0	14,735	10	40	15	14,800	682	4.61	126,200	0	0.00
Aug 8	0	23,160	10	100	10	23,280	1,908	8.20	108,000	0	0.00
Aug 9	20	26,550	0	40	30	26,640	1,838	6.90	101,100	0	0.00
Aug 10	0	13,760	0	15	5	13,780	578	4.19	98,900	0	0.00
Aug 11	0	7,705	5	15	5	7,730	434	5.61	119,000	0	0.00
Aug 12	0	15,560	20	25	5	15,610	302	1.93	115,800	0	0.00
Aug 13	0	19,865	5	50	40	19,960	660	3.31	92,400	0	0.00
Aug 14	0	7,325	0	50	0	7,375	195	2.64	106,100	0	0.00
Aug 15	0	5,500	0	20	0	5,520	202	3.66	99,300	0	0.00
Aug 16	0	7,540	0	0	0	7,540	130	1.72	83,900	0	0.00
Aug 17	0	2,620	0	0	0	2,620	131	5.00	81,200	0	0.00

Appendix Table 9.-- Continued.

DATE	YEARLING CHINOOK	SUBYEARLING CHINOOK	COHO	STEELHEAD	SOCKEYE	DAILY TOTAL	COLLECTION MORTALITY NUMBER	PERCENT	RIVER FLOW IN CFS	TOTAL SPILL	PERCENT
Oct 5	0	390	0	10	0	400	42	10.50	113,900	0	0.00
Oct 6	0	530	0	0	0	530	54	10.19	127,500	0	0.00
Oct 7	0	630	0	20	0	650	22	3.38	128,300	0	0.00
Oct 8	0	1,190	0	10	10	1,210	41	3.39	116,700	0	0.00
Oct 9	0	760	0	0	10	770	31	4.03	121,500	0	0.00
Oct 10	0	440	0	10	0	450	35	7.78	100,300	0	0.00
Oct 11	0	490	0	0	0	490	43	8.78	84,000	0	0.00
Oct 12	0	240	0	10	10	260	20	7.69	105,500	0	0.00
Oct 13	0	250	0	0	0	250	25	10.00	144,000	0	0.00
Oct 14	0	620	0	0	0	620	13	2.10	159,500	0	0.00
Oct 15	0	1,470	0	10	10	1,490	39	2.62	128,200	0	0.00
Oct 16	0	900	0	20	0	920	11	1.20	104,500	0	0.00
Oct 17	0	320	0	0	0	320	8	2.50	105,800	0	0.00
Oct 18	0	330	0	10	0	340	10	2.94	98,900	0	0.00
Oct 19	0	330	0	0	0	330	8	2.42	185,400	0	0.00
Oct 20	0	880	0	10	0	890	10	1.12	108,100	0	0.00
Oct 21	0	640	0	0	0	640	0	0.00	143,200	0	0.00
Oct 22	0	1,160	0	10	0	1,170	13	1.11	124,300	0	0.00
Oct 23	0	800	0	0	0	800	9	1.13	126,000	0	0.00
Oct 24	0	340	0	10	10	360	7	1.94	121,700	0	0.00
Oct 25	0	180	0	0	0	180	10	5.56	102,200	0	0.00
Oct 26	0	490	0	0	0	490	3	.61	109,800	0	0.00
Oct 27	0	210	0	0	0	210	8	3.81	110,800	0	0.00
Oct 28	0	280	0	0	0	280	4	1.43	121,900	0	0.00
Oct 29	0	650	1	3	0	654	3	.46	115,400	0	0.00

TOTAL 3,450,113 7,029,401 225,960 1,004,967 615,593 12,326,034 325,098 2.64

APPENDIX TABLE 10. --- 1987 TRUCK TRANSPORTATION REPORT
AT MCNARY

DAILY #'s TRUCKED

ACCUM. #'s TRUCKED

	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
28/ 3	28	29	0	57	14	128	28	29	0	57	14	128
29/ 3	0	0	0	0	0	0	28	29	0	57	14	128
30/ 3	0	0	0	0	0	0	28	29	0	57	14	128
31/ 3	100	328	0	86	14	528	128	357	0	143	28	656
1/ 4	0	0	0	0	0	0	128	357	0	143	28	656
2/ 4	0	0	0	0	0	0	128	357	0	143	28	656
3/ 4	62	406	0	68	16	552	190	763	0	211	44	1,208
4/ 4	0	0	0	0	0	0	190	763	0	211	44	1,208
5/ 4	0	0	0	0	0	0	190	763	0	211	44	1,208
6/ 4	12,615	367	0	583	43	13,608	12,805	1,130	0	794	87	14,816
7/ 4	21,829	14	0	757	0	22,600	34,634	1,144	0	1,551	87	37,416
8/ 4	59,153	42	0	829	0	60,024	93,787	1,186	0	2,380	87	97,440
9/ 4	45,343	37	0	470	0	45,850	139,130	1,223	0	2,850	87	143,290
10/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
11/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
12/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
13/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
14/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
15/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
16/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
17/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
18/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
19/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
20/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
21/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
22/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
23/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
24/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
25/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
26/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
27/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
28/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
29/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
30/ 4	0	0	0	0	0	0	139,130	1,223	0	2,850	87	143,290
1/ 5	33,761	397	214	18,434	1,389	54,195	172,891	1,620	214	21,284	1,476	197,485
2/ 5	55,833	50	621	21,896	2,570	80,970	228,724	1,670	835	43,180	4,046	278,455
3/ 5	86,404	411	1,169	20,605	3,623	112,212	315,128	2,081	2,004	63,785	7,669	390,667
4/ 5	167,105	686	2,727	45,827	5,931	222,276	482,233	2,767	4,731	109,612	13,600	612,943
5/ 5	64,538	107	1,077	22,214	4,622	92,558	546,771	2,874	5,808	131,826	18,222	705,501
6/ 5	37,717	0	481	10,333	3,390	51,921	584,488	2,874	6,289	142,159	21,612	757,422
7/ 5	27,132	310	604	14,429	4,124	46,599	611,620	3,184	6,893	156,588	25,736	804,921
8/ 5	19,469	334	572	11,969	2,507	34,851	631,089	3,518	7,465	168,557	28,243	838,872
9/ 5	38,106	489	299	23,537	5,642	68,073	669,195	4,007	7,764	192,094	33,885	906,945
10/ 5	16,908	90	161	7,837	3,255	28,251	686,103	4,097	7,925	199,931	37,140	935,196
11/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
12/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
13/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
14/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196

APPENDIX TABLE 10.--- Continued

DAILY #'s TRUCKED										ACCUM. #'s TRUCKED		
	Yr-lg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yr-lg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
15/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
16/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
17/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
18/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
19/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
20/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
21/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
22/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
23/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
24/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
25/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
26/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
27/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
28/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
29/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
30/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
31/ 5	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
1/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
2/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
3/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
4/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
5/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
6/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
7/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
8/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
9/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
10/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
11/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
12/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
13/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
14/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
15/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
16/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
17/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
18/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
19/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
20/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
21/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
22/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
23/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
24/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
25/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
26/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
27/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
28/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
29/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
30/ 6	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
1/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
2/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196

APPENDIX TABLE 10. -- Continuum

DAILY #'s TRUCKED

ACCU. #'s TRUCKED

	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
3/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
4/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
5/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
6/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
7/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
8/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
9/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
10/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
11/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
12/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
13/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
14/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
15/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
16/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
17/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
18/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
19/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
20/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
21/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
22/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
23/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
24/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
25/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
26/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
27/ 7	0	0	0	0	0	0	686,103	4,097	7,925	199,931	37,140	935,196
28/ 7	0	24,087	0	35	0	24,122	686,103	28,184	7,925	199,966	37,140	959,318
29/ 7	0	27,087	0	25	9	27,121	686,103	55,271	7,925	199,991	37,149	986,439
30/ 7	0	44,423	0	49	10	44,482	686,103	99,694	7,925	200,040	37,159	1,030,921
31/ 7	0	18,744	0	47	20	18,811	686,103	118,438	7,925	200,087	37,179	1,049,732
1/ 8	20	10,322	10	38	0	10,390	686,123	128,760	7,935	200,125	37,179	1,060,122
2/ 8	0	6,463	0	49	20	6,532	686,123	135,223	7,935	200,174	37,199	1,066,654
3/ 8	0	6,800	0	49	0	6,849	686,123	142,023	7,935	200,223	37,199	1,073,503
4/ 8	0	10,763	5	22	13	10,803	686,123	152,786	7,940	200,245	37,212	1,084,306
5/ 8	0	13,635	10	35	10	13,690	686,123	166,421	7,950	200,280	37,222	1,097,996
6/ 8	0	11,478	0	14	30	11,522	686,123	177,899	7,950	200,294	37,252	1,109,518
7/ 8	0	13,115	10	39	14	13,178	686,123	191,014	7,960	200,333	37,266	1,122,696
8/ 8	0	21,255	10	97	10	21,372	686,123	212,269	7,970	200,430	37,276	1,144,068
9/ 8	17	24,715	0	40	30	24,802	686,140	236,984	7,970	200,470	37,306	1,168,870
10/ 8	0	12,366	0	14	5	12,385	686,140	249,350	7,970	200,484	37,311	1,181,255
11/ 8	0	6,749	5	15	5	6,774	686,140	256,099	7,975	200,499	37,316	1,188,029
12/ 8	0	14,408	19	25	5	14,457	686,140	270,507	7,994	200,524	37,321	1,202,486
13/ 8	0	18,001	5	49	38	18,093	686,140	288,508	7,999	200,573	37,359	1,220,579
14/ 8	0	7,131	0	49	0	7,180	686,140	295,639	7,999	200,622	37,359	1,227,759
15/ 8	0	5,298	0	20	0	5,318	686,140	300,937	7,999	200,642	37,359	1,233,077
16/ 8	0	0	0	0	0	0	686,140	300,937	7,999	200,642	37,359	1,233,077
17/ 8	0	9,899	0	0	0	9,899	686,140	310,836	7,999	200,642	37,359	1,242,976
18/ 8	0	0	0	0	0	0	686,140	310,836	7,999	200,642	37,359	1,242,976
19/ 8	0	7,102	0	77	0	7,179	686,140	317,938	7,999	200,719	37,359	1,250,155
20/ 8	0	0	0	0	0	0	686,140	317,938	7,999	200,719	37,359	1,250,155

APPENDIX TABLE 10. --- Continued

DAILY #'s TRUCKED										ACQJM. #'s TRUCKED				
Yr-lg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yr-lg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total			
21/ 8	0	7,311	59	58	7,428	686,140	325,249	7,999	200,778	37,417	1,257,583			
22/ 8	0	0	0	0	0	686,140	325,249	7,999	200,778	37,417	1,257,583			
23/ 8	0	10,206	19	0	10,225	686,140	335,455	7,999	200,797	37,417	1,267,808			
24/ 8	0	0	0	0	0	686,140	335,455	7,999	200,797	37,417	1,267,808			
25/ 8	0	7,066	50	50	7,166	686,140	342,521	7,999	200,847	37,467	1,274,974			
26/ 8	0	0	0	0	0	686,140	342,521	7,999	200,847	37,467	1,274,974			
27/ 8	0	7,078	18	10	7,106	686,140	349,599	7,999	200,865	37,477	1,282,080			
28/ 8	0	0	0	0	0	686,140	349,599	7,999	200,865	37,477	1,282,080			
29/ 8	0	4,278	59	10	4,395	686,140	353,877	8,047	200,924	37,487	1,286,475			
30/ 8	0	0	0	0	0	686,140	353,877	8,047	200,924	37,487	1,286,475			
31/ 8	0	2,446	59	20	2,545	686,140	356,323	8,067	200,983	37,507	1,289,020			
1/ 9	0	0	0	0	0	686,140	356,323	8,067	200,983	37,507	1,289,020			
2/ 9	0	3,336	29	20	3,465	686,140	359,659	8,147	201,012	37,527	1,292,485			
3/ 9	0	0	0	0	0	686,140	359,659	8,147	201,012	37,527	1,292,485			
4/ 9	9	5,389	8	20	5,446	686,149	365,048	8,167	201,020	37,547	1,297,931			
5/ 9	0	0	0	0	0	686,149	365,048	8,167	201,020	37,547	1,297,931			
6/ 9	0	4,555	9	39	4,622	686,149	369,603	8,186	201,029	37,586	1,302,553			
7/ 9	0	0	0	0	0	686,149	369,603	8,186	201,029	37,586	1,302,553			
8/ 9	0	1,836	25	10	1,881	686,149	371,439	8,196	201,054	37,596	1,304,434			
9/ 9	0	0	0	0	0	686,149	371,439	8,196	201,054	37,596	1,304,434			
10/ 9	0	0	0	0	0	686,149	371,439	8,196	201,054	37,596	1,304,434			
11/ 9	0	9,671	55	0	9,766	686,149	381,110	8,236	201,109	37,596	1,314,200			
12/ 9	0	0	0	0	0	686,149	381,110	8,236	201,109	37,596	1,314,200			
13/ 9	0	9,228	38	0	9,315	686,149	390,338	8,285	201,147	37,596	1,323,515			
14/ 9	0	1,528	50	0	1,578	686,149	391,866	8,285	201,197	37,596	1,325,093			
15/ 9	0	0	0	0	0	686,149	391,866	8,285	201,197	37,596	1,325,093			
16/ 9	0	3,852	15	20	3,917	686,149	395,718	8,315	201,212	37,616	1,329,010			
17/ 9	0	0	0	0	0	686,149	395,718	8,315	201,212	37,616	1,329,010			
18/ 9	0	2,782	28	29	2,858	686,149	398,500	8,334	201,240	37,645	1,331,868			
19/ 9	0	0	0	0	0	686,149	398,500	8,334	201,240	37,645	1,331,868			
20/ 9	9	1,913	20	0	1,952	686,158	400,413	8,344	201,260	37,645	1,333,820			
21/ 9	0	0	0	0	0	686,158	400,413	8,344	201,260	37,645	1,333,820			
22/ 9	0	1,034	9	10	1,053	686,158	401,447	8,344	201,269	37,645	1,333,820			
23/ 9	0	0	0	0	0	686,158	401,447	8,344	201,269	37,645	1,333,820			
24/ 9	0	1,528	29	40	1,607	686,158	402,975	8,354	201,298	37,695	1,336,480			
25/ 9	0	0	0	0	0	686,158	402,975	8,354	201,298	37,695	1,336,480			
26/ 9	0	0	0	0	0	686,158	402,975	8,354	201,298	37,695	1,336,480			
27/ 9	10	4,409	48	60	4,537	686,168	407,384	8,364	201,346	37,755	1,341,017			
28/ 9	0	0	0	0	0	686,168	407,384	8,364	201,346	37,755	1,341,017			
29/ 9	0	1,625	6	10	1,641	686,168	409,009	8,364	201,352	37,765	1,342,658			
30/ 9	0	0	0	0	0	686,168	409,009	8,364	201,352	37,765	1,342,658			
1/10	0	1,676	7	9	1,692	686,168	410,685	8,364	201,359	37,765	1,342,658			
2/10	0	0	0	0	0	686,168	410,685	8,364	201,359	37,774	1,344,350			
3/10	0	0	0	0	0	686,168	410,685	8,364	201,359	37,774	1,344,350			
4/10	0	1,979	38	10	2,037	686,168	412,664	8,374	201,397	37,784	1,346,387			
5/10	0	0	0	0	0	686,168	412,664	8,374	201,397	37,784	1,346,387			
6/10	0	824	10	0	834	686,168	413,488	8,374	201,407	37,784	1,347,221			
7/10	0	0	0	0	0	686,168	413,488	8,374	201,407	37,784	1,347,221			
8/10	0	1,758	29	10	1,797	686,168	415,246	8,374	201,436	37,794	1,349,018			

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
9/10	0	0	0	0	0	686,168	415,246	8,374	201,436	37,794	1,349,018
10/10	0	0	0	0	0	686,168	415,246	8,374	201,436	37,794	1,349,018
11/10	0	1,583	8	10	1,601	686,168	416,829	8,374	201,444	37,804	1,350,619
12/10	0	0	0	0	0	686,168	416,829	8,374	201,444	37,804	1,350,619
13/10	0	447	8	10	465	686,168	417,276	8,374	201,452	37,814	1,351,084
14/10	0	0	0	0	0	686,168	417,276	8,374	201,452	37,814	1,351,084
15/10	0	2,038	10	10	2,058	686,168	419,314	8,374	201,462	37,824	1,353,142
16/10	0	0	0	0	0	686,168	419,314	8,374	201,462	37,824	1,353,142
17/10	0	0	0	0	0	686,168	419,314	8,374	201,462	37,824	1,353,142
18/10	0	1,523	28	0	1,551	686,168	420,837	8,374	201,490	37,824	1,354,693
19/10	0	0	0	0	0	686,168	420,837	8,374	201,490	37,824	1,354,693
20/10	0	1,192	10	0	1,202	686,168	422,029	8,374	201,500	37,824	1,355,895
21/10	0	0	0	0	0	686,168	422,029	8,374	201,500	37,824	1,355,895
22/10	0	1,788	9	0	1,797	686,168	423,817	8,374	201,509	37,824	1,357,692
23/10	0	0	0	0	0	686,168	423,817	8,374	201,509	37,824	1,357,692
24/10	0	0	0	0	0	686,168	423,817	8,374	201,509	37,824	1,357,692
25/10	0	1,296	8	10	1,314	686,168	425,113	8,374	201,517	37,834	1,359,006
26/10	0	0	0	0	0	686,168	425,113	8,374	201,517	37,834	1,359,006
27/10	0	689	0	0	689	686,168	425,802	8,374	201,517	37,834	1,359,695
28/10	0	0	0	0	0	686,168	425,802	8,374	201,517	37,834	1,359,695
29/10	0	923	3	0	927	686,168	426,725	8,375	201,520	37,834	1,360,622

APPENDIX TABLE 11.-- 1987 BARGE TRANSPORTATION REPORT
AT MCNARY

DAILY #'s BARGED										ACCUH. #'s BARGED			
	Yr.lg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yr.lg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total	
11/ 4	70,721	29	0	924	0	71,674	70,721	29	0	924	0	71,674	
12/ 4	0	0	0	0	0	0	70,721	29	0	924	0	71,674	
13/ 4	33,895	85	0	669	0	34,649	104,616	114	0	1,593	0	106,323	
14/ 4	0	0	0	0	0	0	104,616	114	0	1,593	0	106,323	
15/ 4	23,088	271	14	1,343	0	24,716	127,704	385	14	2,936	0	131,039	
16/ 4	0	0	0	0	0	0	127,704	385	14	2,936	0	131,039	
17/ 4	14,865	241	13	3,068	43	18,230	142,569	626	27	6,004	43	149,269	
18/ 4	0	0	0	0	0	0	142,569	626	27	6,004	43	149,269	
19/ 4	18,872	111	29	2,842	13	21,867	161,441	737	56	8,846	56	171,136	
20/ 4	0	0	0	0	0	0	161,441	737	56	8,846	56	171,136	
21/ 4	24,063	260	0	4,632	71	29,026	185,504	997	56	13,478	127	200,162	
22/ 4	0	0	0	0	0	0	185,504	997	56	13,478	127	200,162	
23/ 4	20,559	625	58	5,463	172	26,877	206,063	1,622	114	18,941	299	227,039	
24/ 4	0	0	0	0	0	0	206,063	1,622	114	18,941	299	227,039	
25/ 4	29,851	229	57	11,292	127	41,556	235,914	1,851	171	30,233	426	268,595	
26/ 4	0	0	0	0	0	0	235,914	1,851	171	30,233	426	268,595	
27/ 4	21,708	354	58	15,137	172	37,429	257,622	2,205	229	45,370	598	306,024	
28/ 4	12,209	184	100	7,057	412	19,962	269,831	2,389	329	52,427	1,010	325,986	
29/ 4	15,168	197	85	10,007	113	25,570	284,999	2,586	414	62,434	1,123	351,556	
30/ 4	30,060	397	371	23,059	562	54,449	315,059	2,983	785	85,493	1,685	406,005	
1/ 5	0	0	0	0	0	0	315,059	2,983	785	85,493	1,685	406,005	
2/ 5	0	0	0	0	0	0	315,059	2,983	785	85,493	1,685	406,005	
3/ 5	23,653	129	733	16,587	1,982	43,084	338,712	3,112	1,518	102,080	3,667	449,089	
4/ 5	68,906	355	836	11,135	976	82,208	407,618	3,467	2,354	113,215	4,643	531,297	
5/ 5	0	0	0	0	0	0	407,618	3,467	2,354	113,215	4,643	531,297	
6/ 5	12,946	0	174	3,335	1,212	17,667	420,564	3,467	2,528	116,550	5,855	548,964	
7/ 5	0	0	0	0	0	0	420,564	3,467	2,528	116,550	5,855	548,964	
8/ 5	0	0	0	0	0	0	420,564	3,467	2,528	116,550	5,855	548,964	
9/ 5	0	0	0	0	0	0	420,564	3,467	2,528	116,550	5,855	548,964	
10/ 5	123,808	119	215	12,688	4,224	41,054	444,372	3,586	2,743	129,238	10,079	590,418	
11/ 5	72,992	300	302	22,829	7,732	104,155	517,364	3,886	3,045	152,067	17,811	694,173	
12/ 5	30,336	235	499	22,601	5,535	59,206	547,700	4,121	3,544	174,668	753,379	863,255	
13/ 5	15,258	538	914	17,857	4,537	39,104	562,958	4,659	4,458	192,525	27,883	792,483	
14/ 5	14,082	197	3,416	17,411	8,311	43,417	577,040	4,856	7,874	209,936	36,194	835,900	
15/ 5	10,157	654	1,813	13,408	1,323	27,355	587,197	5,510	9,687	223,344	37,517	863,255	
16/ 5	14,351	683	1,992	14,513	890	32,429	601,548	6,193	11,679	237,857	38,407	895,684	
17/ 5	15,435	858	2,428	14,317	1,147	34,185	616,983	7,051	14,107	252,174	39,554	929,869	
18/ 5	18,267	764	2,339	13,127	1,533	36,030	635,250	7,815	16,446	265,301	41,087	965,899	
19/ 5	39,801	2,965	8,275	20,514	9,436	80,991	675,051	10,780	24,721	285,815	50,523	1,046,890	
20/ 5	34,355	4,639	10,998	26,614	9,520	86,126	709,406	15,419	35,719	312,429	60,043	1,133,016	
21/ 5	21,637	4,638	9,935	18,967	8,515	63,690	731,043	20,057	45,654	331,396	68,556	1,196,706	
22/ 5	23,907	4,743	12,032	13,673	9,550	63,905	754,950	24,800	57,686	345,069	78,106	1,260,611	
23/ 5	32,320	5,015	12,226	19,035	14,905	83,501	787,270	29,815	69,912	364,104	93,011	1,344,104	
24/ 5	33,920	6,242	11,408	12,043	11,505	75,118	821,190	36,057	81,320	376,147	104,516	1,419,230	
25/ 5	0	0	0	0	0	0	821,190	36,057	81,320	376,147	104,516	1,419,230	
26/ 5	44,778	13,339	23,589	23,529	49,612	154,847	865,968	49,396	104,909	399,676	154,128	1,574,077	
27/ 5	0	0	0	0	0	0	865,968	49,396	104,909	399,676	154,128	1,574,077	
28/ 5	34,448	23,012	17,790	20,574	89,737	185,561	900,416	72,408	122,699	420,250	243,865	1,759,638	

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
29/ 5	0	0	0	0	0	0	900,416	72,408	122,699	420,250	243,865	1,759,638
30/ 5	29,262	14,762	21,600	20,106	69,215	154,945	929,678	87,170	144,299	440,356	313,080	1,914,583
31/ 5	0	0	0	0	0	0	929,678	87,170	144,299	440,356	313,080	1,914,583
1/ 6	18,822	29,035	10,011	12,630	30,863	101,361	948,500	116,205	154,310	452,986	343,943	2,015,944
2/ 6	0	0	0	0	0	0	948,500	116,205	154,310	452,986	343,943	2,015,944
3/ 6	8,971	13,150	6,079	8,459	11,127	47,786	957,471	129,355	160,389	461,445	355,070	2,063,730
4/ 6	0	0	0	0	0	0	957,471	129,355	160,389	461,445	355,070	2,063,730
5/ 6	4,278	3,927	2,975	6,037	8,681	25,898	961,749	133,282	163,364	467,482	363,751	2,089,628
6/ 6	0	0	0	0	0	0	961,749	133,282	163,364	467,482	363,751	2,089,628
7/ 6	3,356	2,164	1,877	3,444	8,357	19,198	965,105	135,446	165,241	470,926	372,108	2,108,826
8/ 6	0	0	0	0	0	0	965,105	135,446	165,241	470,926	372,108	2,108,826
9/ 6	4,236	4,558	2,249	3,683	6,912	21,638	969,341	140,004	167,490	474,609	379,020	2,130,464
10/ 6	0	0	0	0	0	0	969,341	140,004	167,490	474,609	379,020	2,130,464
11/ 6	3,502	3,116	961	2,380	3,756	13,715	972,843	143,120	168,451	476,989	382,776	2,144,179
12/ 6	0	0	0	0	0	0	972,843	143,120	168,451	476,989	382,776	2,144,179
13/ 6	5,812	4,335	859	2,643	3,645	17,294	978,655	147,455	169,310	479,632	386,421	2,161,473
14/ 6	0	0	0	0	0	0	978,655	147,455	169,310	479,632	386,421	2,161,473
15/ 6	3,176	5,121	464	1,641	1,214	11,616	981,831	152,576	169,774	481,273	387,635	2,173,089
16/ 6	0	0	0	0	0	0	981,831	152,576	169,774	481,273	387,635	2,173,089
17/ 6	3,063	26,054	366	673	390	30,546	984,894	178,630	170,140	481,946	388,025	2,203,635
18/ 6	0	0	0	0	0	0	984,894	178,630	170,140	481,946	388,025	2,203,635
19/ 6	4,583	287,153	911	1,524	803	294,974	989,477	485,783	171,051	483,470	388,828	2,498,609
20/ 6	0	0	0	0	0	0	989,477	485,783	171,051	483,470	388,828	2,498,609
21/ 6	2,117	354,978	299	388	476	358,258	991,594	820,761	171,350	483,858	389,304	2,856,867
22/ 6	0	0	0	0	0	0	991,594	820,761	171,350	483,858	389,304	2,856,867
23/ 6	1,808	348,903	134	190	103	351,138	993,402	1,169,664	171,484	484,048	389,407	3,208,005
24/ 6	0	0	0	0	0	0	993,402	1,169,664	171,484	484,048	389,407	3,208,005
25/ 6	2,497	527,488	354	650	389	531,378	995,899	1,697,152	171,838	484,698	389,796	3,739,383
26/ 6	333	188,007	158	118	80	188,696	996,232	1,885,159	171,996	484,816	389,876	3,928,079
27/ 6	430	103,690	159	94	18	104,391	996,662	1,988,849	172,155	484,910	389,894	4,032,470
28/ 6	408	139,002	59	257	80	139,806	997,070	2,127,851	172,214	485,167	389,974	4,172,276
29/ 6	411	60,245	138	131	58	60,983	997,481	2,188,096	172,352	485,298	390,032	4,233,259
30/ 6	0	0	0	0	0	0	997,481	2,188,096	172,352	485,298	390,032	4,233,259
1/ 7	1,393	564,908	232	524	410	567,467	998,874	2,753,004	172,584	485,822	390,442	4,800,726
2/ 7	482	317,445	232	561	133	318,853	999,356	3,070,449	172,816	486,383	390,575	5,119,579
3/ 7	761	440,533	67	126	300	441,787	1,000,117	3,510,982	172,883	486,509	390,875	5,561,366
4/ 7	528	236,489	33	0	233	237,283	1,000,645	3,747,471	172,916	486,509	391,108	5,798,649
5/ 7	232	166,624	0	65	33	166,954	1,000,877	3,914,095	172,916	486,574	391,141	5,965,603
6/ 7	129	143,271	0	30	0	143,430	1,001,006	4,057,366	172,916	486,604	391,141	6,109,033
7/ 7	98	131,876	20	117	0	132,111	1,001,104	4,189,242	172,936	486,721	391,141	6,241,144
8/ 7	479	223,039	0	94	14	223,626	1,001,583	4,412,281	172,936	486,815	391,155	6,464,770
9/ 7	281	230,688	71	67	43	231,150	1,001,864	4,642,969	173,007	486,882	391,198	6,695,920
10/ 7	271	214,127	50	42	0	214,490	1,002,135	4,857,096	173,057	486,924	391,198	6,910,410
11/ 7	243	214,824	100	123	25	215,315	1,002,378	5,071,920	173,157	487,047	391,223	7,125,725
12/ 7	449	406,464	0	197	25	407,135	1,002,827	5,478,384	173,157	487,244	391,248	7,532,860
13/ 7	68	206,311	25	141	50	206,595	1,002,895	5,684,695	173,182	487,385	391,298	7,739,455
14/ 7	120	169,847	0	172	25	170,164	1,003,015	5,854,542	173,182	487,557	391,323	7,909,619
15/ 7	117	128,411	25	287	75	128,915	1,003,132	5,982,953	173,207	487,844	391,398	8,038,534
16/ 7	10	74,907	14	122	29	75,082	1,003,142	6,057,860	173,221	487,966	391,427	8,113,616

APPENDIX TABLE 11. --- Continued

DAILY #'s BARGED						ACCU. #'s BARGED					
Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
17/ 7	52	20,643	29	14	20,865	1,003,194	6,078,503	173,250	488,093	391,441	8,134,481
18/ 7	0	0	0	0	0	1,003,194	6,078,503	173,250	488,093	391,441	8,134,481
19/ 7	57	58,034	335	114	58,540	1,003,251	6,136,537	173,250	488,428	391,555	8,193,021
20/ 7	0	0	0	0	0	1,003,251	6,136,537	173,250	488,428	391,555	8,193,021
21/ 7	0	29,181	108	28	29,317	1,003,251	6,165,718	173,250	488,536	391,583	8,222,338
22/ 7	0	0	0	0	0	1,003,251	6,165,718	173,250	488,536	391,583	8,222,338
23/ 7	0	26,476	17	42	26,535	1,003,251	6,192,194	173,250	488,553	391,625	8,248,873
24/ 7	0	0	0	0	0	1,003,251	6,192,194	173,250	488,553	391,625	8,248,873
25/ 7	0	24,174	94	29	24,311	1,003,251	6,216,368	173,264	488,647	391,654	8,273,184
26/ 7	0	0	0	0	0	1,003,251	6,216,368	173,264	488,647	391,654	8,273,184
27/ 7	0	21,955	14	14	21,983	1,003,251	6,238,323	173,264	488,661	391,668	8,295,167

APPENDIX TABLE 12.-- 1987 BYPASS REPORT
AT MCNARY

DAILY #'S BYPASSED										ACCUM. #'S BYPASSED									
	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total		Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
21/ 4	75	0	0	0	0	75	75	0	0	0	0	75		0	0	0	0	0	0
22/ 4	32	0	0	0	0	32	107	0	0	0	0	107		0	0	0	0	0	0
23/ 4	111	0	0	0	0	111	218	0	0	0	0	218		0	0	0	0	0	0
24/ 4	170	0	0	0	0	170	388	0	0	0	0	388		0	0	0	0	0	0
25/ 4	0	0	0	0	0	0	388	0	0	0	0	388		0	0	0	0	0	0
26/ 4	0	0	0	0	0	0	388	0	0	0	0	388		0	0	0	0	0	0
27/ 4	82	0	0	0	0	82	470	0	0	0	0	470		0	0	0	0	0	0
28/ 4	91	0	0	0	0	91	561	0	0	0	0	561		0	0	0	0	0	0
29/ 4	227	0	0	0	0	227	788	0	0	0	0	788		0	0	0	0	0	0
30/ 4	236	0	0	0	0	236	1,024	0	0	0	0	1,024		0	0	0	0	0	0
1/ 5	400	0	0	0	0	400	1,424	0	0	0	0	1,424		0	0	0	0	0	0
2/ 5	1,267	0	0	0	0	1,267	2,691	0	0	0	0	2,691		0	0	0	0	0	0
3/ 5	3,027	0	0	0	0	3,027	5,718	0	0	0	0	5,718		0	0	0	0	0	0
4/ 5	8,143	27	144	2,747	408	11,469	13,861	27	144	2,747	408	17,187		27	144	1,888	24,959	4,459	206,306
5/ 5	159,963	1,149	1,744	22,212	4,051	189,119	173,824	1,176	1,888	24,959	4,459	206,306		1,176	1,888	3,332	46,259	16,082	424,489
6/ 5	182,396	1,420	1,444	21,300	11,623	218,183	356,220	2,596	3,332	46,259	16,082	424,489		2,596	3,332	6,810	67,623	23,787	594,171
7/ 5	139,065	1,031	517	21,364	7,705	169,682	495,285	3,627	3,849	67,623	23,787	594,171		3,627	3,849	4,921	87,081	33,117	772,439
8/ 5	147,088	1,320	1,072	19,458	9,330	178,268	642,373	4,947	4,921	87,081	33,117	772,439		4,947	4,921	6,086	120,684	43,833	1,008,913
9/ 5	189,039	1,951	1,165	33,603	10,716	236,474	831,412	6,898	6,086	120,684	43,833	1,008,913		6,898	6,086	7,815	185,504	75,933	1,549,648
10/ 5	233,118	1,941	724	34,032	18,545	288,360	1,064,530	8,839	7,815	185,504	75,933	1,549,648		8,839	7,815	9,198	213,722	90,684	1,717,718
11/ 5	205,773	1,254	1,005	30,788	13,555	252,375	1,270,303	10,093	9,198	213,722	90,684	1,717,718		10,093	9,198	12,987	238,017	106,314	1,868,623
12/ 5	122,156	1,562	1,383	28,218	14,751	168,070	1,392,459	11,655	12,987	238,017	106,314	1,868,623		11,655	12,987	20,556	261,530	128,265	1,997,889
13/ 5	105,557	1,634	3,789	24,295	15,630	150,905	1,498,016	13,289	20,556	261,530	128,265	1,997,889		13,289	20,556	26,389	277,279	138,296	2,070,518
14/ 5	74,366	1,667	7,569	23,513	21,951	129,066	1,572,382	14,956	26,389	277,279	138,296	2,070,518		14,956	26,389	32,017	289,401	144,167	2,133,540
15/ 5	36,463	4,753	5,833	15,749	10,031	72,829	1,608,845	19,709	32,017	289,401	144,167	2,133,540		19,709	32,017	37,056	300,029	151,297	2,191,916
16/ 5	36,842	2,559	5,628	12,122	5,871	63,022	1,645,687	22,268	42,443	310,578	159,775	2,253,653		22,268	42,443	43,362	310,578	160,795	2,259,821
17/ 5	33,612	1,977	5,039	10,628	7,120	58,376	1,679,299	24,245	43,362	310,578	160,795	2,259,821		24,245	43,362	43,362	310,578	160,795	2,261,920
18/ 5	33,886	3,507	5,387	10,549	8,488	61,737	1,713,105	27,752	43,362	310,578	160,795	2,261,920		27,752	43,362	43,362	310,578	160,795	2,262,926
19/ 5	3,901	328	919	0	1,020	6,168	1,717,006	28,080	43,362	310,578	160,795	2,262,926		28,080	43,362	43,362	310,578	160,795	2,264,321
20/ 5	2,099	0	0	0	0	2,099	1,719,105	28,080	43,362	310,578	160,795	2,264,321		28,080	43,362	43,362	310,578	160,795	2,266,549
21/ 5	1,006	0	0	0	0	1,006	1,720,111	28,080	43,362	310,578	160,795	2,266,549		28,080	43,362	43,362	310,578	160,795	2,268,238
22/ 5	1,395	0	0	0	0	1,395	1,721,506	28,080	43,362	310,578	160,795	2,268,238		28,080	43,362	43,362	310,578	160,795	2,270,282
23/ 5	2,228	0	0	0	0	2,228	1,723,734	28,080	43,362	310,578	160,795	2,270,282		28,080	43,362	43,362	310,578	160,795	2,271,326
24/ 5	1,689	0	0	0	0	1,689	1,725,423	28,080	43,362	310,578	160,795	2,271,326		28,080	43,362	43,362	310,578	160,795	2,272,028
25/ 5	2,044	0	0	0	0	2,044	1,727,467	28,080	43,362	310,578	160,795	2,272,028		28,080	43,362	43,362	310,578	160,795	2,273,518
26/ 5	1,044	0	0	0	0	1,044	1,728,511	28,080	43,362	310,578	160,795	2,273,518		28,080	43,362	43,362	310,578	160,795	2,274,834
27/ 5	702	0	0	0	0	702	1,729,213	28,080	43,362	310,578	160,795	2,274,834		28,080	43,362	43,362	310,578	160,795	2,275,471
28/ 5	490	0	0	0	0	490	1,729,703	28,080	43,362	310,578	160,795	2,275,471		28,080	43,362	43,362	310,578	160,795	2,276,383
29/ 5	726	0	0	0	0	726	1,730,429	28,080	43,362	310,578	160,795	2,276,383		28,080	43,362	43,362	310,578	160,795	2,276,856
30/ 5	832	0	0	0	0	832	1,731,261	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
31/ 5	758	0	0	0	0	758	1,732,019	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
1/ 6	637	0	0	0	0	637	1,732,656	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
2/ 6	297	0	0	0	0	297	1,732,953	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
3/ 6	615	0	0	0	0	615	1,733,568	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
4/ 6	473	0	0	0	0	473	1,734,041	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
5/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
6/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856
7/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856		28,080	43,362	43,362	310,578	160,795	2,276,856

APPENDIX TABLE 12.-- Continued

DAILY #'S BYPASSED

ACCUM. #'S BYPASSED

	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	Yrly. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
8/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
9/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
10/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
11/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
12/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
13/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
14/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
15/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
16/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
17/ 6	0	0	0	0	0	0	1,734,041	28,080	43,362	310,578	160,795	2,276,856
18/ 6	0	2,177	0	0	0	2,177	1,734,041	30,257	43,362	310,578	160,795	2,279,033
19/ 6	0	3,520	0	0	0	3,520	1,734,041	33,777	43,362	310,578	160,795	2,282,553
20/ 6	0	2,027	0	0	0	2,027	1,734,041	35,804	43,362	310,578	160,795	2,284,580
21/ 6	0	0	0	0	0	0	1,734,041	35,804	43,362	310,578	160,795	2,284,580
22/ 6	0	792	0	0	0	792	1,734,041	36,596	43,362	310,578	160,795	2,285,372
23/ 6	0	5,067	0	0	0	5,067	1,734,041	41,663	43,362	310,578	160,795	2,290,439
24/ 6	0	3,091	0	0	0	3,091	1,734,041	44,754	43,362	310,578	160,795	2,293,530
25/ 6	0	4,767	0	0	0	4,767	1,734,041	49,521	43,362	310,578	160,795	2,298,297
26/ 6	0	2,316	0	0	0	2,316	1,734,041	51,837	43,362	310,578	160,795	2,300,613
27/ 6	0	0	0	0	0	0	1,734,041	51,837	43,362	310,578	160,795	2,300,613
28/ 6	0	0	0	0	0	0	1,734,041	51,837	43,362	310,578	160,795	2,300,613
29/ 6	0	1,171	0	0	0	1,171	1,734,041	53,008	43,362	310,578	160,795	2,301,784
30/ 6	0	3,462	0	0	0	3,462	1,734,041	56,470	43,362	310,578	160,795	2,305,246
1/ 7	0	3,001	0	0	0	3,001	1,734,041	59,471	43,362	310,578	160,795	2,308,247
2/ 7	0	2,428	0	0	0	2,428	1,734,041	61,899	43,362	310,578	160,795	2,310,675
3/ 7	0	0	0	0	0	0	1,734,041	61,899	43,362	310,578	160,795	2,310,675
4/ 7	0	0	0	0	0	0	1,734,041	61,899	43,362	310,578	160,795	2,310,675
5/ 7	0	0	0	0	0	0	1,734,041	61,899	43,362	310,578	160,795	2,310,675
6/ 7	0	1,563	0	0	0	1,563	1,734,041	63,462	43,362	310,578	160,795	2,312,238
7/ 7	0	2,266	0	0	0	2,266	1,734,041	65,728	43,362	310,578	160,795	2,314,504
8/ 7	0	3,094	0	0	0	3,094	1,734,041	68,822	43,362	310,578	160,795	2,317,598
9/ 7	0	2,399	0	0	0	2,399	1,734,041	71,221	43,362	310,578	160,795	2,319,997
10/ 7	0	2,125	0	0	0	2,125	1,734,041	73,346	43,362	310,578	160,795	2,322,122
11/ 7	0	0	0	0	0	0	1,734,041	73,346	43,362	310,578	160,795	2,322,122
12/ 7	0	0	0	0	0	0	1,734,041	73,346	43,362	310,578	160,795	2,322,122
13/ 7	0	2,300	0	0	0	2,300	1,734,041	75,646	43,362	310,578	160,795	2,324,422
14/ 7	0	1,333	0	0	0	1,333	1,734,041	76,979	43,362	310,578	160,795	2,325,755
15/ 7	0	1,109	0	0	0	1,109	1,734,041	78,088	43,362	310,578	160,795	2,326,864
16/ 7	0	1,010	0	0	0	1,010	1,734,041	79,098	43,362	310,578	160,795	2,327,874
17/ 7	0	595	0	0	0	595	1,734,041	79,693	43,362	310,578	160,795	2,328,469
18/ 7	0	0	0	0	0	0	1,734,041	79,693	43,362	310,578	160,795	2,328,469
19/ 7	0	0	0	0	0	0	1,734,041	79,693	43,362	310,578	160,795	2,328,469
20/ 7	0	440	0	0	0	440	1,734,041	80,133	43,362	310,578	160,795	2,328,909
21/ 7	0	407	0	0	0	407	1,734,041	80,540	43,362	310,578	160,795	2,329,316
22/ 7	0	487	0	0	0	487	1,734,041	81,027	43,362	310,578	160,795	2,329,803
23/ 7	0	181	0	0	0	181	1,734,041	81,208	43,362	310,578	160,795	2,329,984
24/ 7	0	200	0	0	0	200	1,734,041	81,408	43,362	310,578	160,795	2,330,184
25/ 7	0	0	0	0	0	0	1,734,041	81,408	43,362	310,578	160,795	2,330,184
26/ 7	0	0	0	0	0	0	1,734,041	81,408	43,362	310,578	160,795	2,330,184

APPENDIX TABLE 12.-- Continued

DAILY #'S BYPASSED

ACCUM. #'S BYPASSED

	YrIg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Daily Total	YrIg. Chinook	Subyr. Chinook	Coho	Steelhead	Sockeye	Accum. Total
27/ 7	0	298	0	0	0	298	1,734,041	81,706	43,362	310,578	160,795	2,330,482
28/ 7	0	1,983	0	0	0	1,983	1,734,041	83,689	43,362	310,578	160,795	2,332,465
29/ 7	0	2,213	0	0	0	2,213	1,734,041	85,902	43,362	310,578	160,795	2,334,678
30/ 7	0	2,524	0	0	0	2,524	1,734,041	88,426	43,362	310,578	160,795	2,337,202
31/ 7	0	733	0	0	0	733	1,734,041	89,159	43,362	310,578	160,795	2,337,935
1/ 8	0	0	0	0	0	0	1,734,041	89,159	43,362	310,578	160,795	2,337,935
2/ 8	0	0	0	0	0	0	1,734,041	89,159	43,362	310,578	160,795	2,337,935
3/ 8	0	345	0	0	0	345	1,734,041	89,504	43,362	310,578	160,795	2,338,280
4/ 8	0	803	0	0	0	803	1,734,041	90,307	43,362	310,578	160,795	2,339,083
5/ 8	0	900	0	0	0	900	1,734,041	91,207	43,362	310,578	160,795	2,339,983
6/ 8	0	827	0	0	0	827	1,734,041	92,034	43,362	310,578	160,795	2,340,810
7/ 8	0	940	0	0	0	940	1,734,041	92,974	43,362	310,578	160,795	2,341,750
8/ 8	0	0	0	0	0	0	1,734,041	92,974	43,362	310,578	160,795	2,341,750
9/ 8	0	0	0	0	0	0	1,734,041	92,974	43,362	310,578	160,795	2,341,750
10/ 8	0	817	0	0	0	817	1,734,041	93,791	43,362	310,578	160,795	2,342,567
11/ 8	0	522	0	0	0	522	1,734,041	94,313	43,362	310,578	160,795	2,343,089
12/ 8	0	851	0	0	0	851	1,734,041	95,164	43,362	310,578	160,795	2,343,940
13/ 8	0	1,207	0	0	0	1,207	1,734,041	96,371	43,362	310,578	160,795	2,345,147