

SMOLT MONITORING PROGRAM

ANNUAL REPORT 1985

PART I: ESTIMATION OF SURVIVAL

by

FISH PASSAGE CENTER

for

The Columbia Basin Fish and Wildlife  
Agencies and Tribes

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## ABSTRACT

The annual Smolt Monitoring Program is the result of implementation of Section 304(d)(2) of the Northwest Power Planning Council Fish and Wildlife Program. This is the second year of the annual systemwide program conducted by the Fish Passage Center (formally Water Budget Center).

Survival was monitored for specific marked groups of steelhead and spring chinook. Survival through the mid-Columbia from Winthrop Hatchery and the **Methow** River to below Priest Rapids Dam was estimated. Estimation of survival of marked groups of steelhead from Little Goose Dam to below Ice Harbor Dam was attempted. Serious problems were evident in the Snake River survival data.

A release strategy which avoids holding of control groups was tested with satisfactory results.

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## PART I: 1985 Smolt Survival Monitoring

### I. INTRODUCTION

The Smolt Monitoring Program is based on section 304 (d)(2) of the Fish and Wildlife Program of the Northwest Power Planning Council. This section calls for the state and federal fishery agencies and Columbia Basin Indian tribes to conduct a program to annually provide information on the migration characteristics of Columbia Basin salmon and steelhead stocks.

This program began under the aegis of the Fish and Wildlife Program in 1984. The fishery agencies and tribes elected to conduct the program under the direction of the Water Budget Center (now known as the Fish Passage Center) since a primary purpose of the program is to provide real time information to the Water Budget Managers to guide Water Budget management and other system operations for fish passage. Presently, the program monitors the smolt outmigration on a real time basis, and provides information for post season characterization of the outmigration. Information on adult passage is also collected to guide system operations. Data for the Smolt Monitoring Program is relayed to the Water Budget Managers and disseminated to interested parties through a computer system located at the Fish Passage Center (FPC), and as a series of weekly reports issued during the migration season.

This report describes the results of the smolt survival monitoring activities for 1985. Survival was monitored for steelhead and spring chinook in the mid-Columbia and steelhead in

the lower Snake River. Part II of the report describes the timing and magnitude of the outmigration, and reports the travel time for marked hatchery releases.

## II. STUDY DESIGN

The FPC survival monitoring program is designed to determine annual indices of smolt survival which can be statistically compared year-to-year. Because it is a monitoring program (in contrast to a research program) that is to be repeated annually, the program must be designed to fit into the overall fishery management program of the fishery agencies and tribes, and cause minimal disruption of normal hatchery practices. This places unique constraints on the study design and flexibility which might not be present in a research program of limited duration.

Smolt survival is monitored as part of the program by two indicators: first, the relative proportion of marks recovered at collector projects provides an index of smolt survival. The proportion is based on counts corrected for annual variation in powerhouse operations. The second indicator is an estimate of actual percent survival between points within the main reaches of the Columbia system. The first indicator is the easiest to obtain and is probably the most reliable since it is not as prone to experimental error. However, it may be more subject to annual variation in the quality of hatchery fish. The second indicator, the survival estimate, has-greater application to various problems including that of comparing survival year-to-year. The study design also permits initial mortality resulting from hatchery

quality to cancel out of the estimate. It is, however, subject to unavoidable study errors.

Theoretical considerations and techniques available for assessing smolt survival in the Columbia River are discussed in McKenzie et al. (1985) and McConnaha and Basham (1985). In the 1985 studies, as in the studies conducted in 1984, smolt survival was determined using the indirect methodology. In this procedure, a test group of marked fish is released at the top of the river reach of interest, and a control group is released near the bottom of the reach. Both mark groups are recovered at a downstream collection point, and survival between the test and control release points is determined as the ratio in the proportion recovered of the two groups.

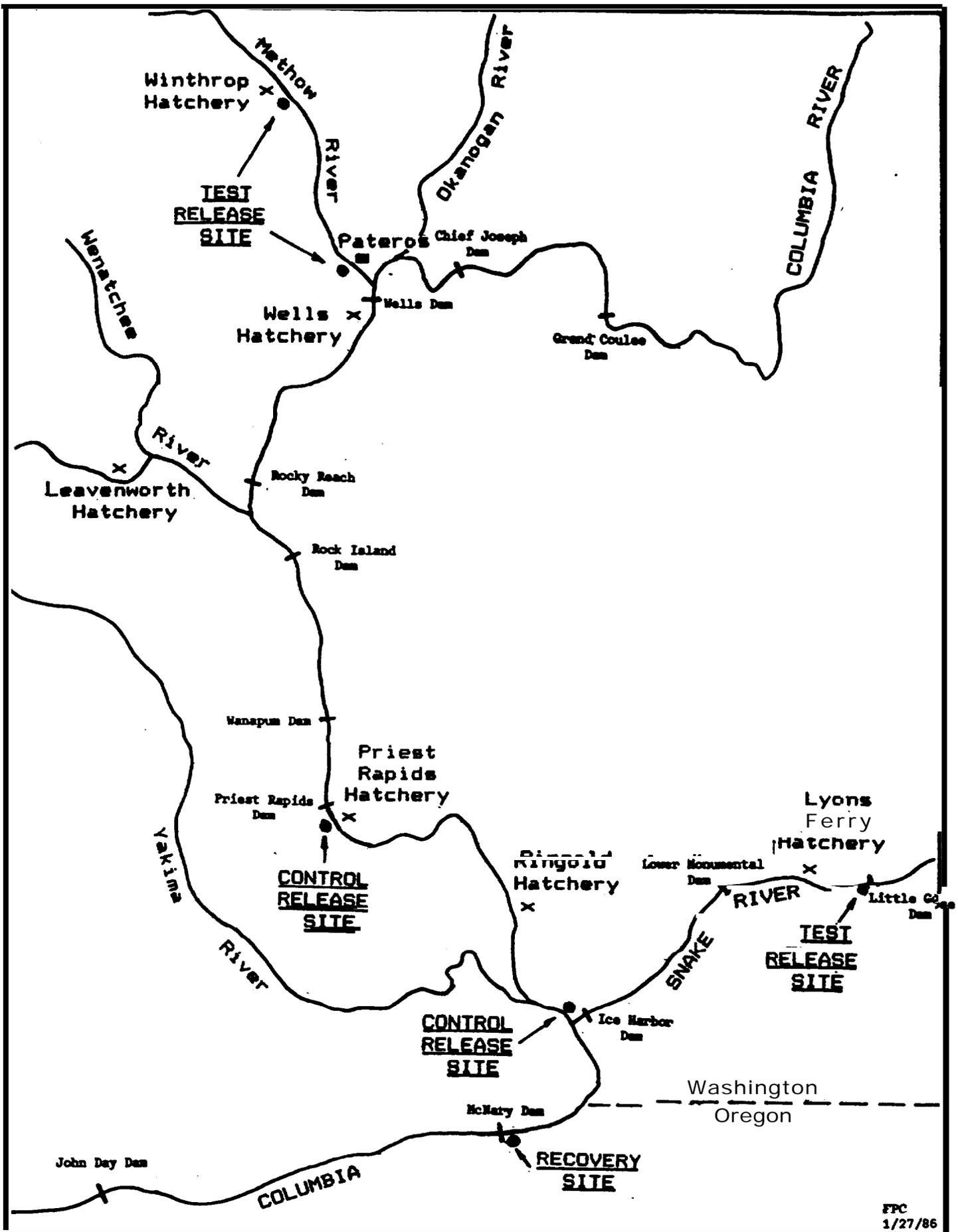
This technique has two major assumptions: 1) both groups are assumed to be collected at the recovery points at similar rates, and 2) both groups are assumed to be identical except in regard to the test condition, namely migration through the river reach of interest.

Because of logistical and practical considerations, it is impossible to fully meet both of these assumptions in any study design, and in fact, the two assumptions can be mutually exclusive. For instance, in order to meet the first assumption, the release of the control groups can be delayed relative to release of the test groups so that both migrate past the collection point simultaneously. While this helps to insure that both groups are collected at the same rate, additional stresses resulting from a longer holding period are placed on the control fish which are not

present in the test groups, thus violating the second assumption. These additional stresses can be significant. Evidence is available to suggest that the proportion recovered, and therefore survival, of sequentially released mark groups declines over time. This may be due to additional holding stresses on the later released fish (McConnaha and Basham, 1985). Because survival is measured as the ratio in proportion recovered of test and control groups, this factor may falsely increase the estimated survival of the test groups.

The 1985 program was designed to study the survival of steelhead reared at Wells Hatchery (WDG), spring chinook from Winthrop Hatchery (USFWS), and steelhead from Lyons Ferry Hatchery (WDG). The release site for the Wells Hatchery steelhead test groups was above Wells Dam near the town of Pateros, Washington (Figure 1). This release site was the same as that used for survival monitoring in 1984 (McConnaha and Basham, 1985) and by the mid-Columbia Studies Committee survival studies (McKenzie et al. 1984). Winthrop chinook test groups were released from the hatchery into the Methow River about 40 miles above the confluence with the Columbia River. Control groups for both Wells and Winthrop were released about one mile below Priest Rapids Dam. Test groups from the Lyons Ferry steelhead program were released about one mile below Little Goose Dam, and the control groups were released about a mile below Ice Harbor Dam.

In order to test the considerations discussed above, two release strategies were employed in 1985. To determine steelhead survival at Wells and Lyons Ferry hatcheries, a design was



**FIGURE 1:** Mid-Columbia and lower Snake River area, showing release sites for 1985 spring chinook and steelhead survival study.

employed similar to that used in past studies. **Release** of the controls was delayed some period after the release of the test groups so that both groups would be sampled at similar rates at McNary Dam. In order to spread out the passage of the controls past McNary Dam and thereby match the passage of the test groups, control groups from the Wells and Lyons Ferry fish were divided into three sub-lots which were released on subsequent days.

For spring chinook from Winthrop Hatchery, test and control groups were released simultaneously. This was because the required release point for the test groups was the hatchery which is located about 40 miles up the Methow River. It was felt that the amount of delay in the release of the controls necessary to achieve simultaneous migration past McNary was so great as to seriously decrease the accuracy of the result. For instance if three replicates were released four days apart and a twelve day travel time is assumed, the time between the release of the first test group and the last control group would be 20 days. In this case, replication would measure the variation resulting from the variable of holding stress and not on the survival variation resulting from river passage. These considerations aside, this study permitted the testing of the simultaneous release design which previously had not been employed in assessing smolt survival.

The original design of the 1985 program called for three replicates of paired test and control fish to be released for each of the facilities discussed above. Ideally, if the assumptions were sufficiently met by all replicates, this would permit the calculation of a standard error on the survival estimate. Fish

were provided to accomplish this objective for the spring chinook at Winthrop Hatchery and steelhead at Wells Hatchery. In fact, as will be discussed below, a marking error at Winthrop resulted in additional marked fish being available. However, sufficient fish were available at Lyons Ferry Hatchery for only two replicates.

### III. ANALYTICAL PROCEDURES

Survival was calculated for each replicate using the following formula adapted from McKenzie et al. (1985):

$$\hat{S} = \frac{(\sum I_{ti})/N_t}{(\sum I_{ci})/N_c}$$

$$I_{ti,ci} = R_{ti,ci} / (f_i L_i)$$

where,

- $\hat{S}$  = Estimated survival of the test group from the test group release point to the control group release point.
- $N_t, N_c$  = Number of marked fish in the initial release of the test and control groups respectively.
- $R_{ti}, R_{ci}$  = Number of test and control marks observed in the sample on day i.
- $I_{ti}, I_{ci}$  = Collection index of test and control groups on day i.
- $f_i$  = Proportion of time that the collection system at McNary is sampled on day i.
- $L_i$  = The proportion of the river flow passing through the **McNary** powerhouse on day i.

Variance of the survival estimate was calculated using the observed sample data ( $R_t, R_c$ ), and the following binomial variance equation from McKenzie, et al. (1985).

$$\text{Var}(\hat{S}) = \text{Var} \left( R_t / p_c \right) \cdot \frac{1}{N_t^2}$$

where,

$\text{Var}(\hat{S}) =$  Variance of the estimated survival ( $\hat{S}$ ) of the test group from the test group release point to the control group release point.

$R_t = \sum R_{ti} =$  Sum of the test marks observed in the daily samples.

$p_c = \left( \sum R_{ci} \right) / N_c =$  Proportion of the control fish recovered.

The observed sample data were used to calculate the error terms **on** the estimated survival to avoid **artificially increasing** the basic statistic and giving a lower estimate of the error.

#### IV. METHODS

All fish for this program were marked using conventional freeze branding techniques (Mighell, 1969). Fish were marked by U.S. Fish and Wildlife Service personnel with monitoring and assistance from the Fish Passage Center. Employing normal hatchery practice, the spring chinook from Winthrop Hatchery were marked in the preceding fall, while the steelhead from Wells and Lyons Ferry hatcheries were marked just prior to release. Because of raceway space requirements, the marked control groups at Winthrop Hatchery were held at a lower density through the winter than were the test groups. As will be discussed further, this factor probably resulted in the Winthrop control groups being larger than the test groups at release.

Spring chinook from Winthrop Hatchery were branded in a fish marking trailer described by Ambrogetti (1976). Fish branded at Lyons Ferry and Wells Hatcheries were first brailed into an eight

foot rectangular fiberglass trough accessible from each branding station. The trough contained about 250 gallons of water with 100 ppm buffered tricaine methanesulfonate (MS-222). Exposure of fish to the anesthetic was done so as to be minimal and consistent. Following the loss of equilibrium, fish were netted by the branders and transferred to each branding station. Up to eight branding pots were used at one time. Fish were placed in 14-inch square plastic wash basins with two to three inches of anesthetic solution. Following each two hours of operation, all anesthetic was discarded and fresh water and anesthetic were added to all holding tanks. After marking, fish were placed into a 4-inch plastic pipe supplied with running water and guided into raceways where they were held until release. At Winthrop and Lyons Ferry hatcheries, these were normal concrete hatchery raceways. At Wells Hatchery, the branded fish were held in portable vinyl raceways prior to release.

Fish for paired test and control lots within a replicate were randomly selected from a common pool of fish and marked simultaneously. Either one or two marking pots contained the control brand, while the remainder held the test group brand. Markers were rotated among branding stations every two hours to assure that brand quality was uniform between test and control groups.

A total of 28 distinct mark codes were applied to spring chinook and steelhead as part of the 1985 survival monitoring program. Numbers of fish, mark codes, and release sites are provided in Table 1. Mark recapture data for these groups are presented in Appendix A. Mark codes are described in the format of

position/mark/rotation. The position codes are RA for right anterior and LA for left anterior portions of the fish. Rotation codes designate one of four possible rotations starting at zero degrees and incrementing 90 degrees for each of the subsequent three rotations. For instance the code **RA/7T/02** is the 7T brand rotated 90 degrees to the vertical and applied to the right anterior part of the fish. To facilitate the following discussion, these codes are simplified to a text code. In this code, the hatchery is designated by the initial two letters, "**Wi**" signifying Winthrop Hatchery, "**We**" signifying Wells Hatchery, and "**Ly**" signifying Lyons Ferry Hatchery. This is followed by a T or C representing test or control group, followed by the replicate number (1-3). When control groups were split into **sublots**, these groups receive the further designation of **a,b**, and c. For instance, the text code **LyC2b** is the second lot of the control group associated with the second test replicate from Lyons Ferry Hatchery. The cross reference of these text codes with the original freeze brand codes is also provided in Table 1.

Spring chinook test groups from Winthrop Hatchery were released at the hatchery and were not transported prior to release. The three test groups were released at four day intervals. Fish were released from the hatchery by removing the outlet screens and lowering the water level. After 24 hours any remaining fish were crowded and forced to exit. Control fish were transported by truck on the same day as the test release to below Priest Rapids Dam, a distance of 160 miles and a driving time of 3.5 hours. Fish were transported in a 1200 gallon tanker filled with recirculating

**TABLE 1:** 1985 Smolt Survival Freeze Brand Release Data

Hatchery: Winthrop  
 Species: Spring Chinook

<u>Brand</u>	<u>Code</u>	<u>Release Site</u>	<u>Release Date</u>	<u>No. Released</u>
LA-7C-3	<b>WiT1a</b>	Winthrop Hatchery	April 16	36,704
LA-7T-1	<b>WiT1b</b>	Winthrop Hatchery	April 16	5,890
LA-7F-1	<b>WiT1c</b>	Winthrop Hatchery	April 16	12,568
LA-7T-3	<b>WiC1</b>	Below Priest Rapids	April 16	12,695
LA-7C-1	<b>WiT2</b>	Winthrop Hatchery	April 20	35,186
RA-7T-3	<b>WiC2</b>	Below Priest Rapids	April 20	12,451
LA-7K-1	<b>WiT3</b>	Winthrop Hatchery	April 24	34,959
RA-7T-1	wic3	Below Priest Rapids	April 24	12,299

Hatchery: Wells  
 Species: Summer Steelhead

<u>Brand</u>	<u>Code</u>	<u>Release Site</u>	<u>Release Date</u>	<u>No. Released</u>
RA-7U-1	<b>WeT1</b>	<b>Pateros</b>	May 6	30,479
LA-7K-1	<b>WeC1a</b>	Below Priest Rapids	May 10	4,041
LA-7K-3	<b>WeC1b</b>	Below Priest Rapids	May 11	4,058
RA-7K-1	<b>WeC1c</b>	Below Priest Rapids	May 13	4,041
RA-7U-3	WeT2	<b>Pateros</b>	May 10	30,351
LD-7K-1	<b>WeC2a</b>	Below Priest Rapids	May 15	4,038
LD-7K-3	<b>WeC2b</b>	Below Priest Rapids	May 16	4,022
RD-7K-1	<b>WeC2c</b>	Below Priest Rapids	May 17	4,047
LA-7U-1	WeT3	<b>Pateros</b>	May 14	30,378
LD-7T-1	<b>WeC3a</b>	Below Priest Rapids	May 20	3,986
LD-7T-3	<b>WeC3b</b>	Below Priest Rapids	May 21	4,138
RD-7T-3	<b>WeC3c</b>	Below Priest Rapids	May 22	4,289

Hatchery: Lyons Ferry  
 Species: Summer Steelhead

<u>Brand</u>	<u>Code</u>	<u>Release Site</u>	<u>Release Date</u>	<u>No. Released</u>
RA-7N-1	<b>LyT1</b>	Below Little Goose	<b>May 6</b>	19,983
LA-7S-1	<b>LyC1a</b>	Below Ice Harbor	May 8	4,076
LA-7S-3	<b>LyC1b</b>	Below Ice Harbor	May 9	3,755
RA-7S-1	<b>LyC1c</b>	Below Ice Harbor	May 10	4,159
RA-7N-3	<b>LyT2</b>	Below Little Goose	May 10	19,906
LD-7S-1	<b>LyT2a</b>	Below Ice Harbor	May 13	4,050
LD-7S-3	<b>LyT2b</b>	Below Ice Harbor	May 13	4,020
RD-7S-1	<b>LyT2c</b>	Below Ice Harobr	May 14	4,219

hatchery water which was kept aerated with atmospheric air. Fish density in the transport truck was 0.7 pounds per gallon of water.

As the result of a marking error, two additional groups were marked at Winthrop Hatchery (Table 1). These groups were released at the same time as the first test group (WiTl). For calculation of survival, they were combined with WiTl. They are designated in the following discussion as WiTlb and WiTlc.

Steelhead test groups from Wells Hatchery were trucked to the release site on the Methow River a distance of about 12 miles from the hatchery and about a 45 minute drive. Test groups were released at four day intervals. Control groups were released four to five days after the test groups. The three sublots within the controls were released one day apart. Fish were transported in a 1500 gallon tanker to the release site below Priest Rapids Dam, a distance of 120 miles and two and a half hours driving time. Test fish were transported at a density of one pound per gallon while control fish were transported at a density of 0.67 pounds per gallon.

Lyons Ferry steelhead test groups were trucked to the release site below Little Goose Dam in a 2000 gallon tanker at a density of 0.9 pounds per gallon. The test group release site was about 10 miles from the hatchery or about 15 minutes driving time. The two test groups were released four days apart. Control groups were trucked to below Ice Harbor Dam, a distance of 55 miles and a driving time of 90 minutes. Control groups were released two days after the release of the test groups. Fish density in the transport truck was 0.5 pound per gallon. Sublots within the

control groups were to be released one day apart. However, problems resulting from securing transport personnel on Sunday forced the release of the first two lots of the second control to be released on the same day.

#### Brand Quality and Length

As part of the 1985 program, particular attention was focused on the quality and consistency of branding, particularly between groups. A facet of the assumption of equal sample rates on the test and control groups is that the brand readability is the same for the the two groups. Naturally, it is also advantageous that the readability be high.

To determine the relative readability of the various mark groups , samples of the marked fish were examined after marking, prior to release, and at the recovery sites. Branded fish were subjectively placed into one of six brand quality codes shown below:

#### FREEZE BRAND QUALITY CRITERIA

<u>Category</u>	<u>Definition</u>
1.	Brand is complete and legible.
2.	Brand is legible but defective in some manner. For example, a non-critical part of the brand is missing or the brand is not well developed and light.
3.	The brand is not legible..
4.	The brand rotation is wrong.
5.	No brand.
6.	The brand caused burning of the fish or has become ulcerated. This category was extended to include three levels: light, moderate and excessive.

Brand quality codes 4 and 5 were not useable when marked fish were mixed with unmarked fish or other mark groups as at a recovery site.

Prior to release, samples were obtained by dipnetting marked fish from the holding raceways. Samples of 200 test fish were examined and 100 control fish.

At the same time, fork lengths were taken on the fish to the nearest 5 mm. To assess if the branding operation was biased for fish length, length samples were also taken of unmarked fish from the hatchery raceways.

Subjective examination of the fish health and quality was also made. All holding mortalities were recorded and fish were checked for external signs of disease, fungus, or damage. In addition, fish removed for brand quality determination were examined for abnormal conditions and rated for descaling according to standard FTOT criteria.

## V. RESULTS

### Length.

Length is an important criteria in assessing the degree to which test and control groups were randomly selected from a common pool of fish, and whether the two groups were truly paired.

Length frequency data for the mark groups are summarized in Table 2. Comparison of the lengths of the test and control groups within a replicate was made using a standard t-test.

For samples of this size the critical value at an alpha level of 0.05 is 1.96 between 1.965 and 1.967. Using this criteria, the steelhead test and control groups were not significantly different in size for any of the replicates from Wells or Lyons Ferry hatcheries. However, spring chinook test and control groups from

Winthrop Hatchery differed significantly in size for the first and third replicates. Test and control groups did not differ significantly in size for the second Winthrop replicate. The control groups were all larger for the three Winthrop replicates. This is probably related to the fact that, after marking, the control groups at Winthrop were held over winter at a lesser density than were the test groups. The groups did not differ in size at the time of marking.

#### Fish and Brand Quality

Winthrop chinook mark groups were observed to be in excellent condition at release. Over the holding period between marking and release (189 - 199 days) mortalities were observed to total 1.46% for all groups combined. Individually the group did not differ appreciably from this mean. This level of mortality was considered normal for the hatchery. Fish were normal in appearance at release except for an approximate 10% incidence of "sunburn", a whitening of the epidermis along the dorsal surface.

Legibility of the Winthrop brands was judged to be 91% - 98%. No adjustment of the data was made for this factor. Burning of the fish resulting from the freeze branding was not observed in the Winthrop fish.

The average mortality of marked groups of Wells steelhead between marking and release (a period of a few days) was 0.35%. a large proportion of which was due to fish which jumped out of the raceways. Mortalities in individual mark groups ranged from 0.05% to 1.34%.

In general, fish health at Wells was good at release. However, tail and fin rot was significant, and increased in the

TABLE 2: Summary of length data and t-test comparison for 1985 survival monitoring groups.

Hatchery	Code	Average Length (mm)	n	t
Winthrop	WIT1	127.0	382	
	WiC1	135.3	176	9.783*
Winthrop	WiT2	131.8	200	
	WiC2	133.4	176	1.144
Winthrop	WiT3	130.2	217	
	WiC3	135.9	201	5.771*
Wells	WeT1	197.4	173	
	WeC1	196.3	316	0.669
Wells	WeT2	199.6	176	
	WeC2	197.2	318	1.395
Wells	WeT3	193.5	200	
	WeC3	191.9	318	0.962
Lyons Ferry	LyT1	202.2	200	
	LyC1	201.8	299	0.205
Lyons Ferry	LyT2	205.7	199	
	LyC2	207.0	300	0.713

\* Significant difference compared to t (0.05, d.f. >350)

later release groups, especially the second and third control groups.

Brand legibility was generally high in the Wells fish, although more variable than the Winthrop fish. Legibility ranged from 87% in one **sublot** of the first control (WeCla) to 100%. No adjustment of the data was made for this factor.

A significant result of the branding at Wells was the high incidence of burning and ulceration caused by the branding process. This is an important factor, since it could affect the survival estimates, especially if it affected test and control groups differentially.

Listed below is the incidence of burning observed in the marked fish at Wells Hatchery:

<u>Group</u>	<u>Incidence of Burning</u>
<b>WeT1</b>	24.3%
<b>WeC1a</b>	10.7%
<b>WeC1b</b>	15.2%
<b>WeC1c</b>	15.2%
WeT2	4.6%
<b>WeC2a</b>	19.6%
<b>WeC2b</b>	38.3%
<b>WeC2c</b>	22.1%
WeT3	18.5%
<b>WeC3a</b>	30.0%
<b>WeC3b</b>	5.2%
<b>WeC3c</b>	29.4%

Burning ranged from 4.6% to 38.3% for fish observed at the hatchery. For the second and third replicates, the controls had appreciably higher incidence of burning than did the test groups. This phenomenon increased as the fish progressed downstream. Marked Wells fish at **McNary** were observed to have the following incidence of burning:

<u>Group</u>	<u>Incidence of Burning</u>
<b>WeT1</b>	17.4%
<b>WeC1a</b>	66.7%
<b>WeC1b</b>	33.3%
<b>WeC1c</b>	72.2%
WeT2	57.8%
<b>WeC2a</b>	72.7%
<b>WeC2b</b>	91.3%
<b>WeC2c</b>	66.7%

(No data were collected at **McNary** for the third replicate)

These data indicate that the incidence of burning increased as the fish moved downstream, probably as a result of the greater time period which allowed the burns to develop. In addition, the difference between test and control groups increased, especially for the first replicate. This time factor may also explain the difference in burning observed between test and control fish at the hatchery. Although every effort was made to insure that test and controls were chosen and marked randomly, the controls were held longer in the hatchery after marking, which may have allowed the burns to develop to a greater extent.

No procedural explanation is available to explain the high incidence of burning in all of the Wells fish. Marking procedures, supervisory personnel, and in some cases marking personnel were identical at all three hatcheries. The phenomena could be the result of factors inherent in the Wells fish, or perhaps the degree of smoltification or physiological condition.

General condition of the marked steelhead at Lyons Ferry was normal at release. It is noteworthy that, in comparison to the other hatcheries, considerable culling of precocious males and undersized fish was required during the marking process.

Brand legibility of the Lyons Ferry fish at release ranged from 98% - 100%. No burning of the branded area was observed.

#### Travel Time.

Travel time of the mark groups was calculated to examine for differences in the groups which might reflect bias in the survival estimates, and to determine the approximate date of passage at hydroelectric projects. These dates were used to determine the environmental conditions affecting survival.

Travel time was determined from the points of release to McNary Dam for all groups, and, for the mid-Columbia test groups, over the Smolt Monitoring Program indexing area (Table 3). The latter is located from Rock Island Dam to McNary Dam in the mid-Columbia. The indexing areas are designed to determine travel time some distance below the initial release points so that initial hatchery mortalities and delays have occurred.

Marked differences in travel time and speed between species and between stocks are apparent in the data in Table 3. The spring chinook test groups from Winthrop Hatchery required an average of 32.2 days to migrate from the hatchery to McNary Dam. The steelhead test groups from Wells Hatchery, on the other hand, required only an average of 14.7 days to migrate from **Pateros** to McNary. These differences also are apparent in the speed., which factors out the difference in distance traveled. The Winthrop chinook test groups migrated at an average speed of 8.8 miles per **day**, while the Wells steelhead test group traveled at a speed of 15.9 miles/day.

Comparison of travel speed within the indexing area (Rock

Island to McNary) should eliminate any effect of initial migrational delays or of the migration through the **Methow** River in the case of the Winthrop chinook. The migrational speed of both the chinook and steelhead was much greater in the indexing area than over the mid-Columbia reach as a whole. This is probably the result of initial delays in the migration of the mark groups soon after release. In addition, the two species did not show the marked difference in migration rate in the indexing area that was seen over the whole reach. The three test groups from both species averaged similar travel speeds of 23.7 miles per day for Winthrop spring chinook, and 21.0 miles per day for Wells steelhead through the indexing area. Speeds of the three chinook test groups ranged from 17.9 to 26.9. The steelhead test groups exhibited a wider range of speeds, from 17.9 miles per day to 32.3 miles per day. Reasons for the extremely high rate of travel for the first steelhead test group (**WeT1**) are not apparent.

In comparison to the test groups, the control groups released below Priest Rapids Dam migrated at a slower speed. The Winthrop chinook controls migrated to McNary in an average time of 20.7 days for a rate of 5.2 miles per day. The Wells steelhead control groups migrated appreciably faster, covering the reach in an average of 6.6 days and a rate of 16.7 miles per day.

Differences in travel time and speed were also apparent between the two steelhead stocks. This difference could also reflect differences resulting from differences in the physical environment. The Lyons Ferry steelhead test groups required 15.5 days to migrate from the Little Goose **tailrace** to McNary, for

TABLE 3: Travel time of 1985 survival mark groups.

Group	McNary Median Passage Date	Travel <sup>a</sup> Time (days)	Speed <sup>a</sup> (mi/day)	Index <sup>b</sup> Travel Time	Index <sup>b</sup> Speed <sup>b</sup> (mi/day)
=====					
WiT1a	19-May	33	8.5	6	26.9
WiT1b	21-May	35	8.1	6	26.9
WiT1c	19-May	33	8.5	7	23.1
WiT1*		33.7	8.4	7.0	25.6
WiC1	9-May	23	4.6		
WiT2	22-May	32	8.8	6	26.9
wic2	12-May	22	4.8		
WiT3	25-May	31	9.1	9	17.9
wic3	11-May	17	6.2		
=====					
WeT1	20-May	14	16.6	5	32.3
WeC1a	17-May	7	15.0		
WeC1b	20-May	9	11.7		
WeC1c	19-May	6	17.5		
WeC1*		6.7	14.7		
WeT2	25-May	15	15.5	9	17.9
WeC2a	22-May	7	15.0		
WeC2b	24-May	8	13.1		
WeC2c	24-May	7	15.0		
WeC2*		7.3	14.4		
WeT3	29-May	15	15.5	9	17.9
WeC3a	25-May	5	21.0		
WeC3b	26-May	5	21.0		
WeC3c	27-May	5	21.0		
WeC3*		5	21.0		
=====					
LyT1	21-May	15	6.7		
LyC1a	15-May	7	5.9		
LyC1b	17-May	8	5.1		
LyC1c	18-May	8	5.1		
LyC1*		8.0	5.4		
LyT2	26-May	16	6.3		
LyC2a	19-May	6	6.8		
LyC2b	23-May	10	4.1		
LyC2c	21-May	7	5.9		
LyC2*		7.7	5.6		
=====					

\* average of previous groups.

a/From release site to McNary Dam.

b/Between Smolt Monitoring Program indexing sites  
(Rock Island to McNary; Lower Granite to McNary).

a migration speed of 6.5 miles per day. This is appreciably slower than the Wells steelhead test group which migrated from the Pateros release site to McNary at a rate of 15.9 miles per day. The Lyons Ferry steelhead also migrated at a slower rate than did the Winthrop chinook (8.8 miles per day).

#### Recoveries

Three types of mark recovery data were collected at McNary Dam (Table 4). Sample data consisted of the actual observed brand recoveries. At McNary Dam, these data were collected by subsampling from the bypass/collection system for a portion of every hour. The portion of each hour that the collection system was sampled was around **10%**, but varied day to day, depending on the number of fish expected to pass the project. The sample data does **not**, therefore, necessarily reflect the collection on any given day. By expanding the sample data by the portion of time that the system was subsampled, the number of branded fish passing through the collection system on a day was estimated.

The collection data, however, is still not a true representation of fish passage at the project over a time period since the collection system does not sample a constant proportion of the river migration. It is generally assumed that the collection system does sample a constant proportion of the fish passing through the powerhouse (fish guidance efficiency is assumed to be constant).<sup>1</sup>

<sup>1</sup>Recent work conducted at Lower Granite Dam by NMFS (**Kcrma**, personal communication) suggests that fish guiding efficiency may vary through the season. This observation has not been confirmed nor has a mechanism for producing this response been shown. This phenomena has not been observed at McNary Dam. At present, it is assumed that fish guiding efficiency is constant over the season.

The proportion of the total daily migration that is sampled is dependent on collection or sampling efficiency, which in turn is dependent on the operation of the project, and the proportion of the river flow passed through the powerhouse. This provides a mechanism to adjust the daily collection to account for changes in the proportion of the daily migration passing the powerhouse. Thus, the third type of recovery data is termed the passage index, and consists of the estimated daily collection divided by the proportion of river flow passing through the powerhouse on that day. The passage index is an index of the pattern of fish passage over a time period. It is not, however, an estimate of the total population passing the project on either a daily or annual basis.

The passage index was used as the basic statistic to compute survival. The daily collection is adjusted to the passage index, to minimize the effect of differences in mixing of test and control lots on the survival estimate. Discrepancies in mixing of test and control lots are caused by differences in sampling rate.

The patterns of recovery of the test and control groups from the three study groups clearly indicate the differences in the study designs. The three steelhead replicates from Wells Hatchery display a relatively high degree of mixing (Figures 2-4). These marks first began appearing at McNary during the second week of **May**, and peaked within about another ten days. Similarly, the recovery pattern of the Lyons Ferry steelhead reflects the attempt to achieve mixing (Figures 5 & 6). These marks passed McNary at a similar time to the Wells steelhead. Mixing of the Lyons Ferry fish at McNary was noticeably poorer than that of the Wells fish, in

**TABLE 4 :** Brand **recovery** data for 1985 smolt survival monitoring groups.

Hatchery	Code	Sample	Collection	Index	Proportion
Winthrop	<b>WiT1a</b>	544	7,386	7,845	0.2137
	<b>WiT1b</b>	89	1,195	1,253	0.2127
	<b>WiT1c</b>	190	2,586	2,723	0.2167
	<b>WiT1*</b>	823	11,167	11,821	0.2143
	<b>WiC1</b>	343	4,623	4,924	0.3879
Winthrop	<b>WiT2</b>	457	6,131	6,438	0.1830
	wic2	387	5,235	5,601	0.4498
Winthrop	<b>WiT3</b>	458	6,194	6,478	0.1853
	wic3	402	5,372	5,797	0.4713
Wells	<b>WeT1</b>	612	8,542	8,860	0.2907
	<b>WeC1a</b>	152	2,091	2,201	0.5447
	<b>WeC1b</b>	106	1,425	1,492	0.3677
	<b>WeC1c</b>	124	1,736	1,765	0.4368
	<b>WeC1*</b>	382	5,252	5,458	0.4496
Wells	WeT2	686	9,179	9,571	0.3153
	<b>WeC2a</b>	114	1,589	1,635	0.4049
	<b>WeC2b</b>	101	1,435	1,492	0.3710
	<b>WeC2c</b>	135	1,891	1,973	0.4875
	<b>WeC2*</b>	350	4,915	5,100	0.4212
Wells	WeT3	505	6,692	7,025	0.2313
	<b>WeC3a</b>	116	1,586	1,707	0.4282
	<b>WeC3b</b>	51	640	692	0.1672
	<b>WeC3c</b>	92	1,146	1,209	0.2819
	<b>WeC3*</b>	259	3,372	3,608	0.2907
Lyons F.	<b>LyT1</b>	490	6,528	6,915	0.3460
	<b>LyC1a</b>	92	1,155	1,263	0.3099
	<b>LyC1b</b>	83	1,130	1,178	0.3137
	<b>LyC1c</b>	86	1,104	1,158	0.2784
	<b>LyC1*</b>	261	3,389	3,599	0.3002
Lyons F.	<b>LyT2</b>	483	6,516	6,719	0.3375
	<b>LyC2a</b>	75	1,065	1,101	0.2719
	<b>LyC2b</b>	59	784	809	0.2012
	<b>LyC2c</b>	81	1,142	1,166	0.2764
	<b>LyC2*</b>	215	2,991	3,076	0.2503

\*Sum of previous sub-groups

FIGURE 2  
CUMULATIVE MARK RECOVERIES AT MCNARY DAM  
WELLS STEELHEAD, REPLICATE 1  
1985 SURVIVAL STUDY

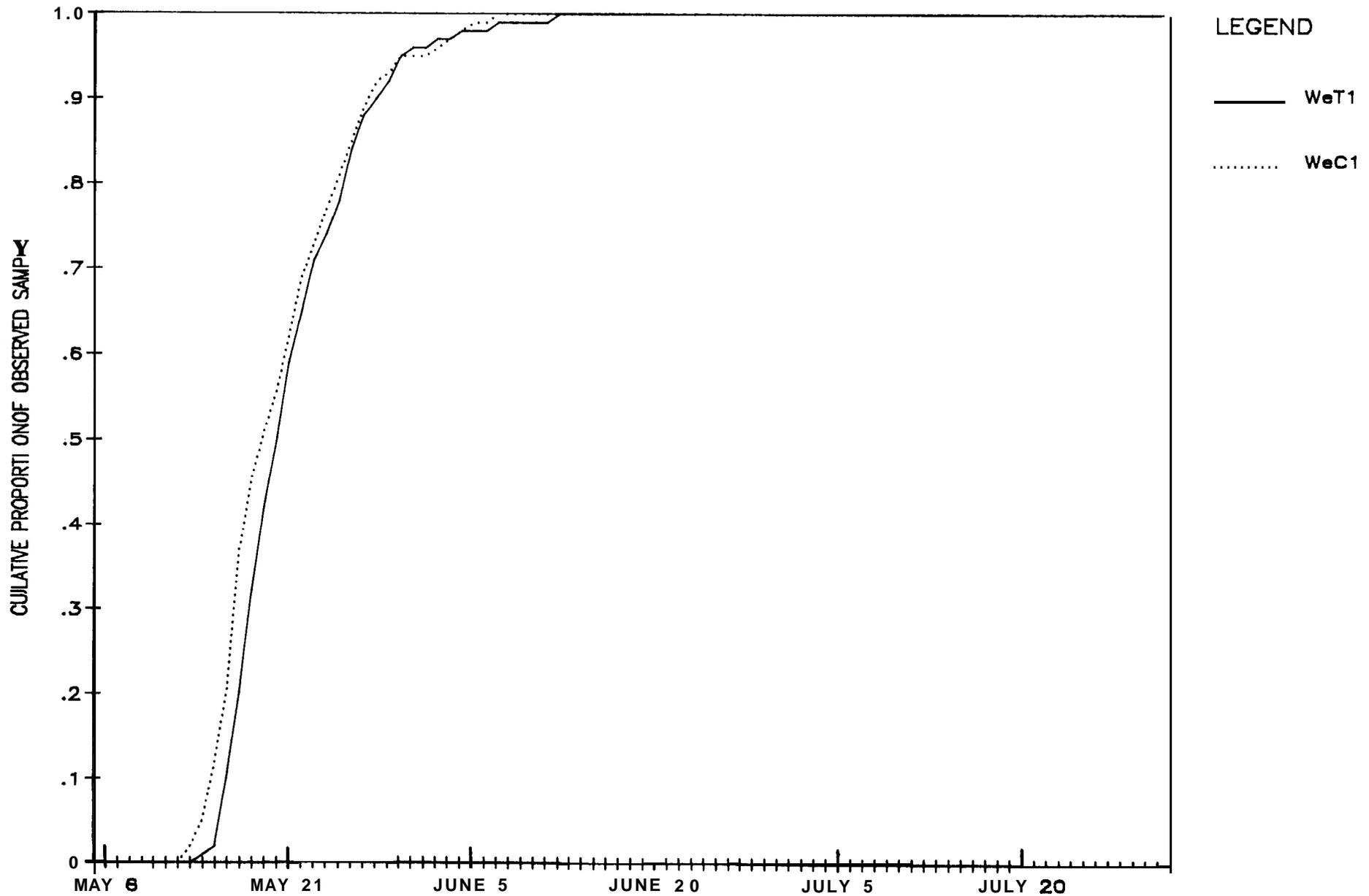
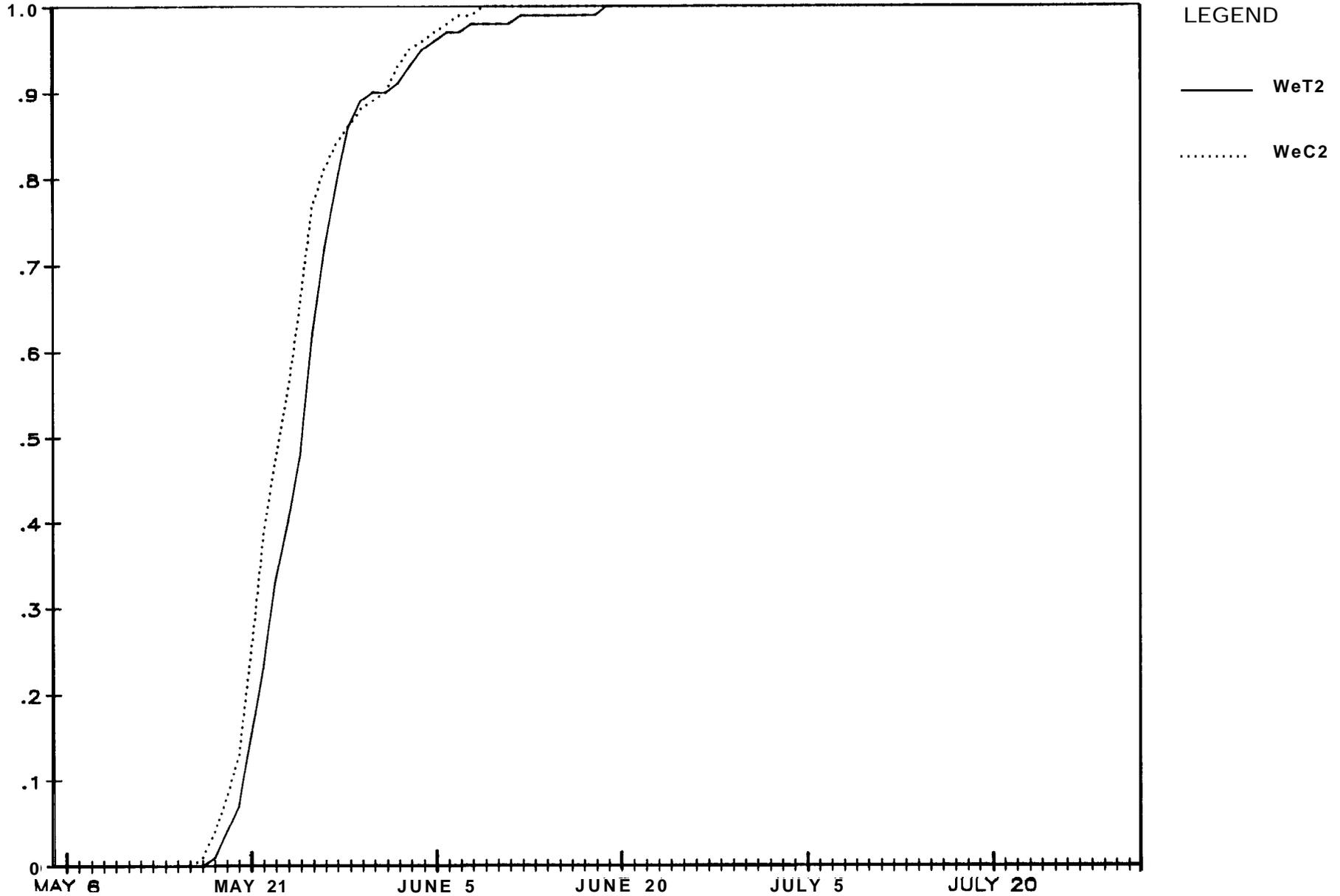


FIGURE 3

CUMULATIVE MARK RECOVERIES AT MCNARY DAM  
WELLS STEELHEAD, REPLICATE 2  
1985 SURVIVAL STUDY



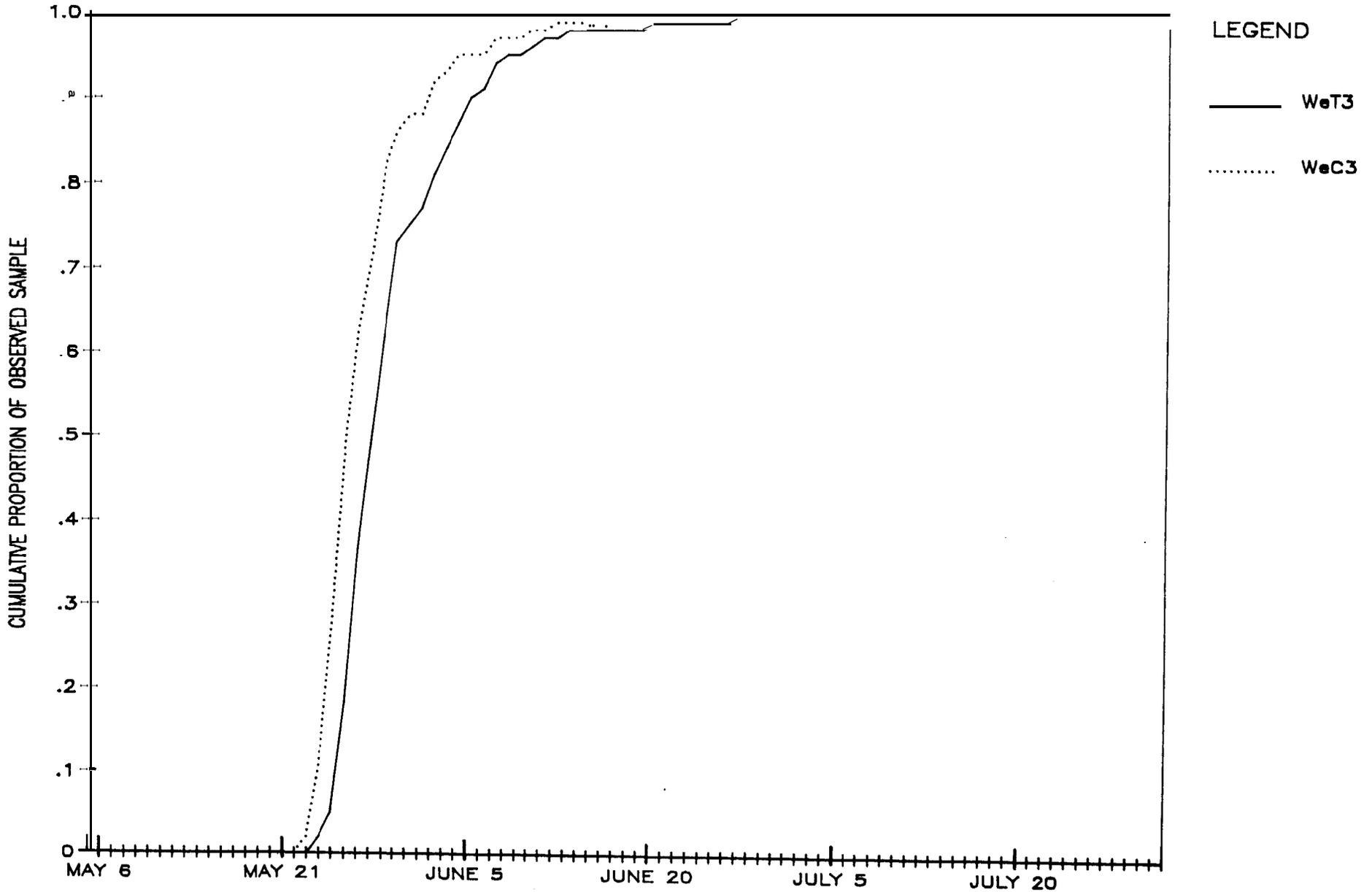
LEGEND

—— WeT2

..... WeC2

FIGURE 4

CUMULATIVE MARK RECOVERIES AT MCNARY DAM  
WELLS STEELHEAD, REPLICATE 3  
1985 SURVIVAL STUDY



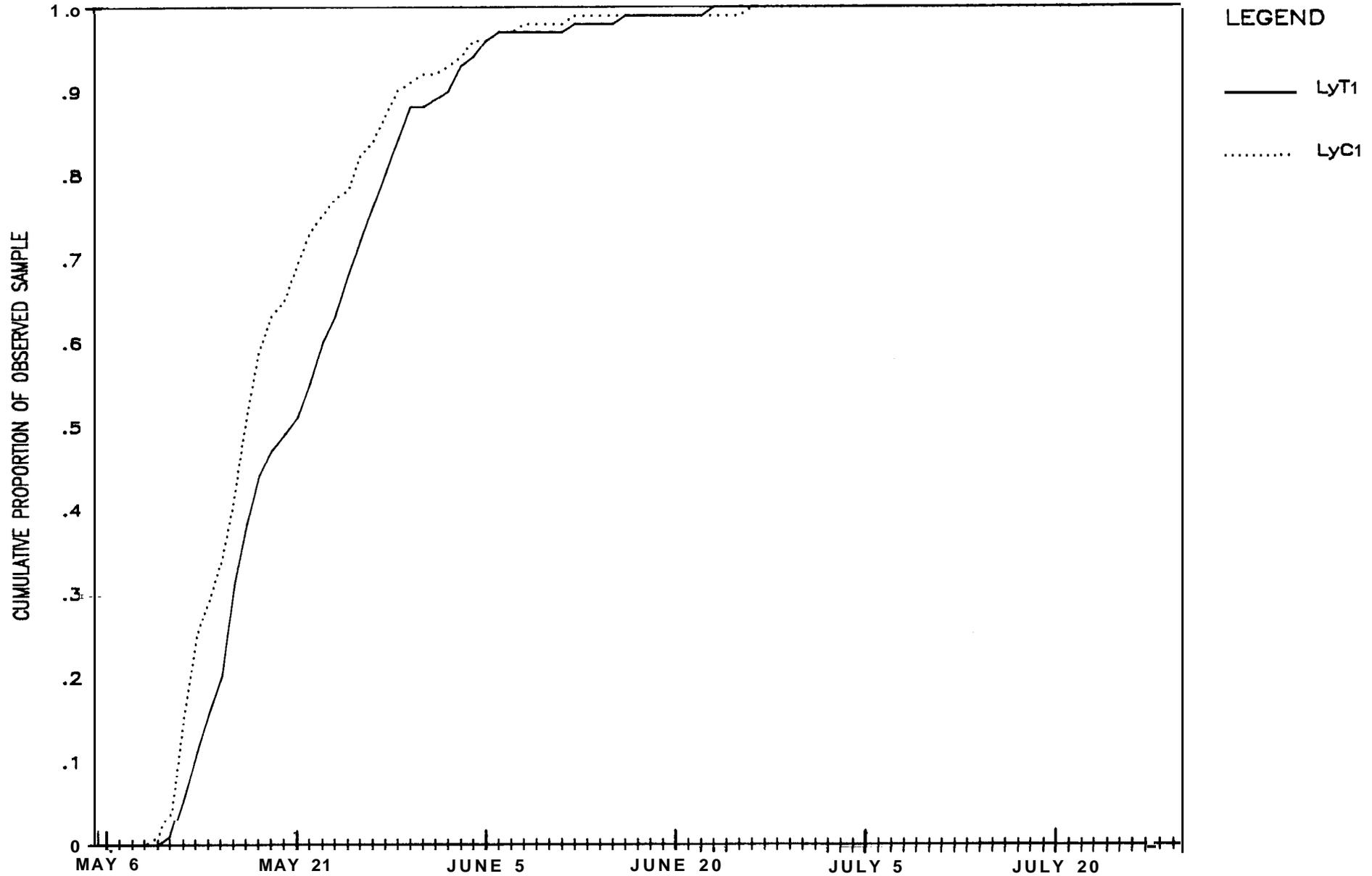
LEGEND

—— WeT3

..... WeC3

FIGURE 5

CUMULATIVE MARK RECOVERIES AT MCNARY DAM  
LYONS FERRY STEELHEAD, REPLICATE 1  
1985 SURVIVAL STUDY



LEGEND

— LyT1

..... LyC1

FIGURE 6

CUMULATIVE MARK RECOVERIES AT MCNARY DAM  
LYONS FERRY STEELHEAD, REPLICATE 2  
1985 SURVIVAL STUDY

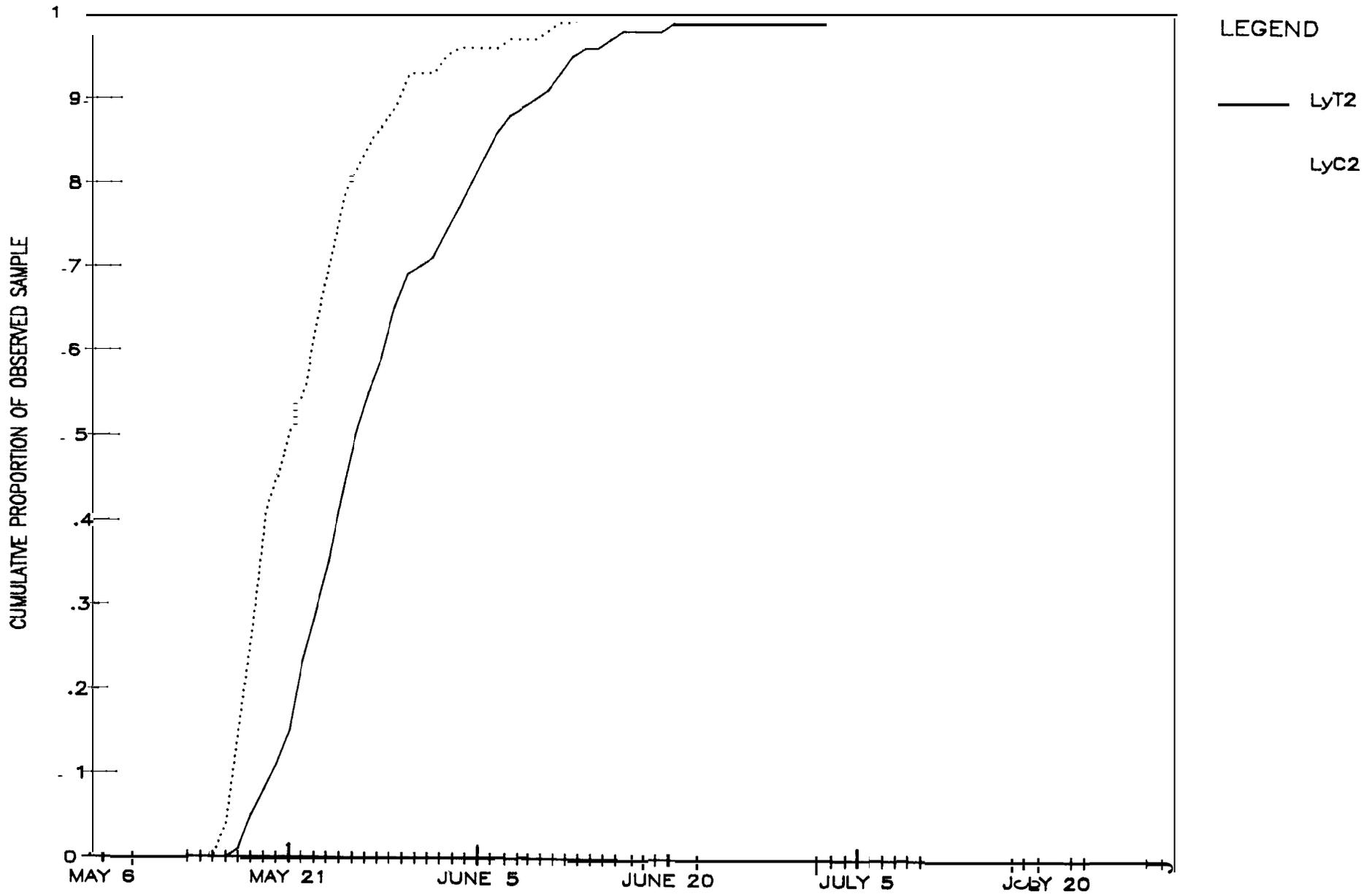


FIGURE 7

CUMULATIVE MARK RECOVERIES AT McNARY DAM  
WINTHROP SPRING CHINOOK, REPLICATE 1  
1985 SURVIVAL STUDY

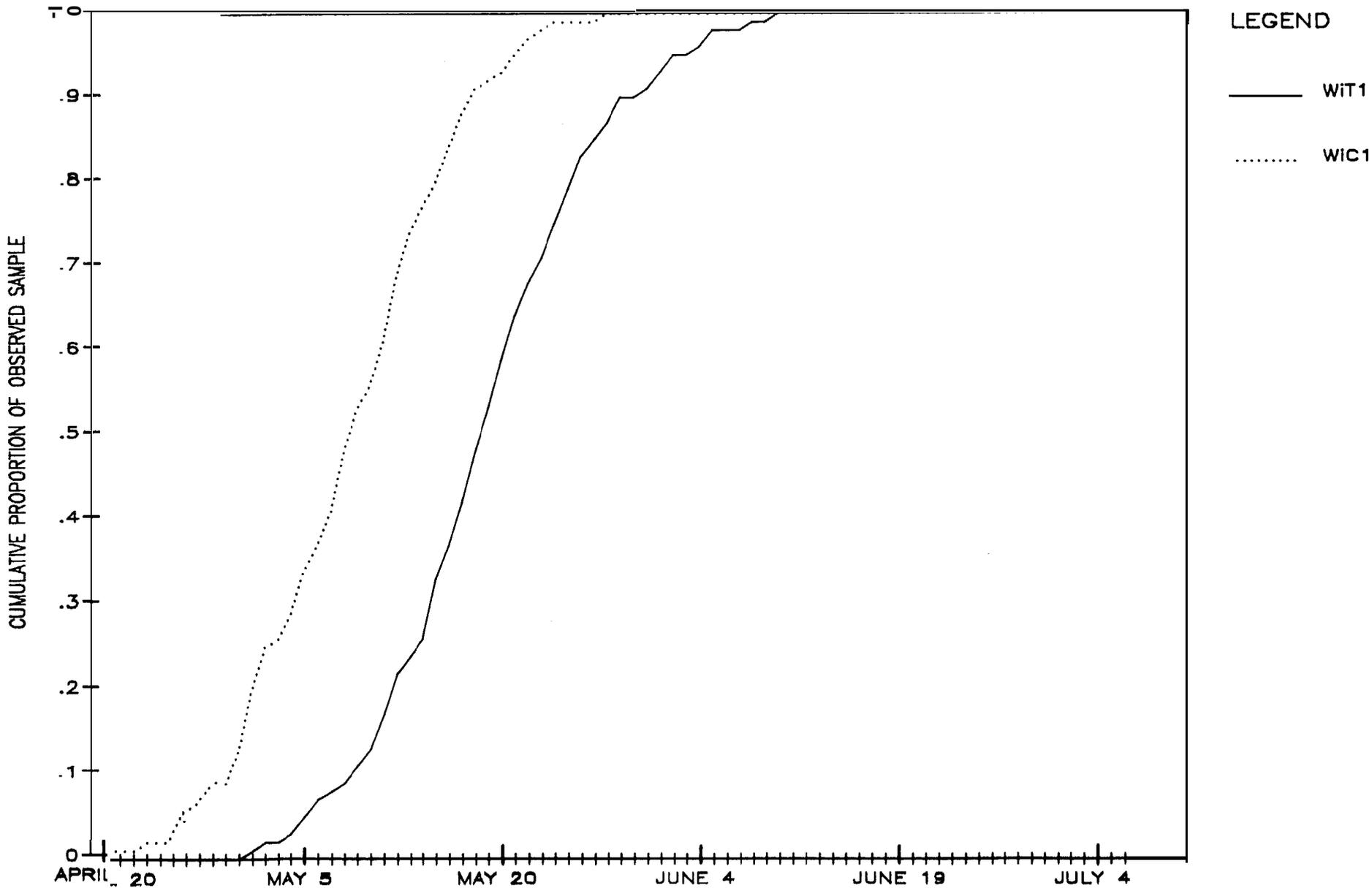


FIGURE 8

CUMULATIVE MARK RECOVERIES AT MCNARY DAM  
WINTHROP SPRING CHINOOK, REPLICATE 2  
1985 SURVIVAL STUDY

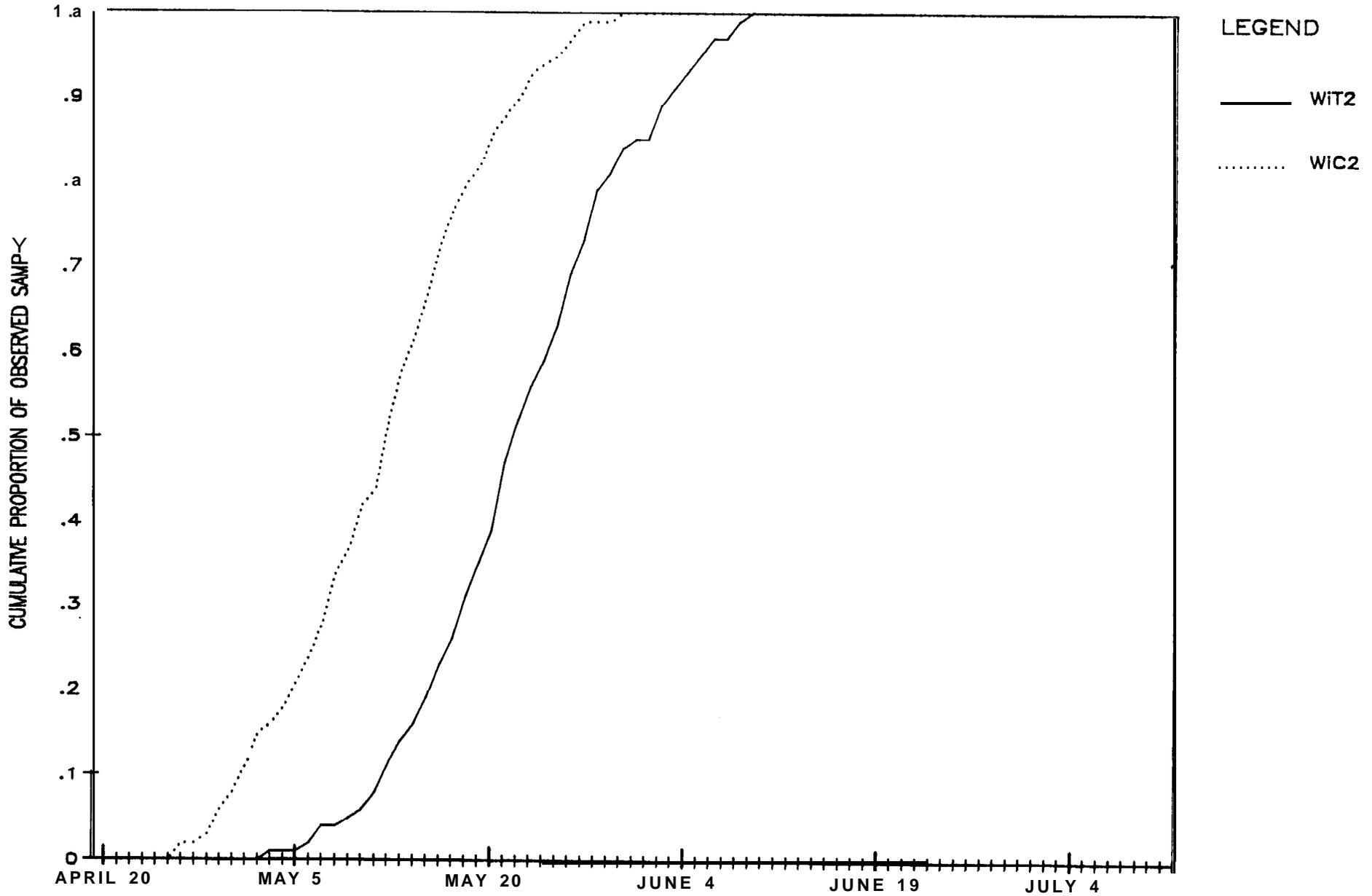
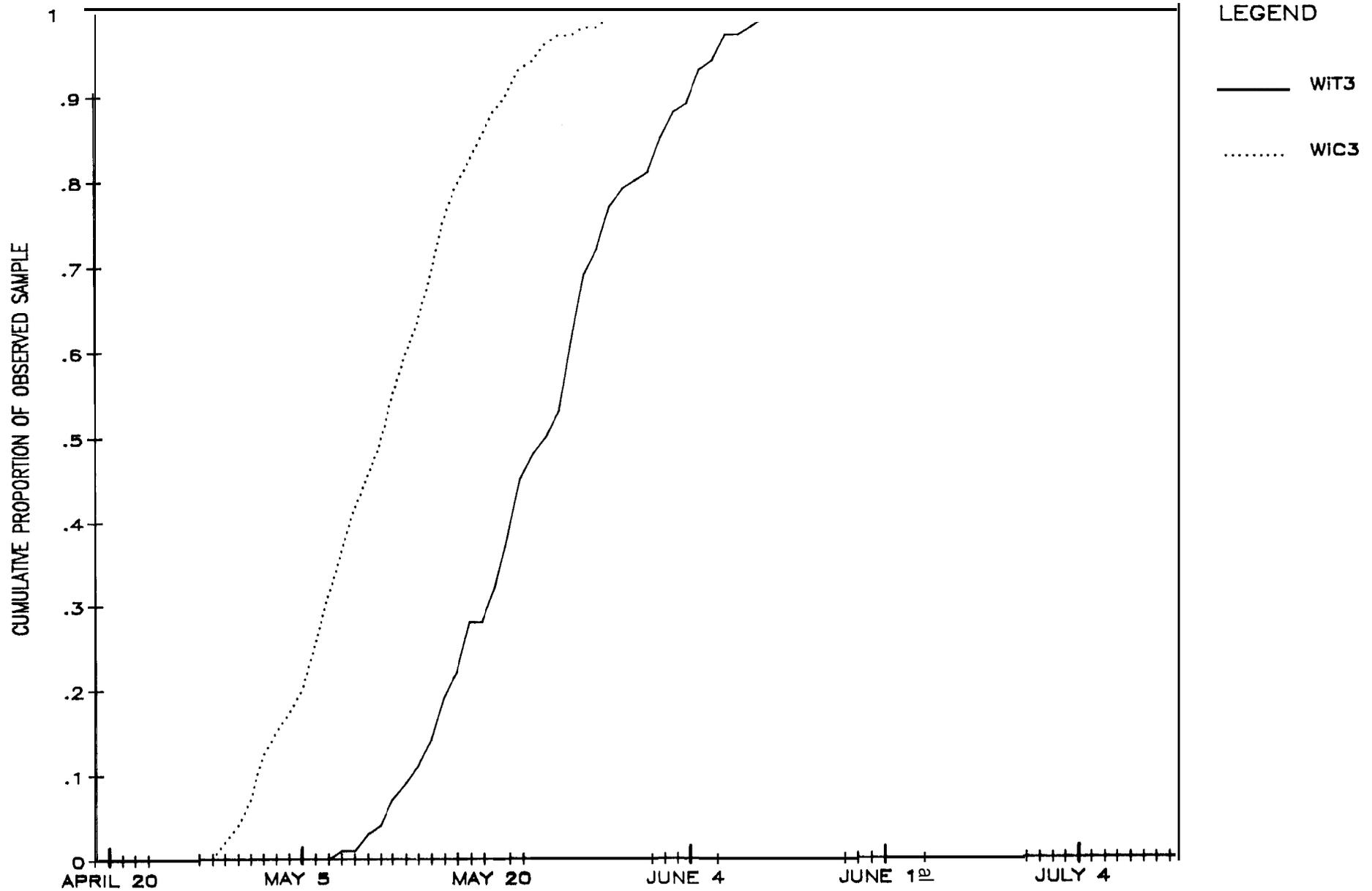


FIGURE 9

CUMULATIVE MARK RECOVERIES AT McNARY DAM  
WINTHROP SPRING CHINOOK, REPLICATE 3  
1985 SURVIVAL STUDY



LEGEND

— WIT3

..... WIC3

part because of a weaker pattern of control recoveries later in the period relative to the test fish.

In contrast to the steelhead recovery patterns is the pattern for spring chinook from Winthrop (Figures 7-9). For these fish, no attempt was made to achieve mixing at McNary. Recovery of test and control groups at McNary was widely separated in time. Peak dates of migration for test and control groups were separated by approximately eight days for all three groups.

#### Survival

Estimated survival and the associated binomial error for individual replicates is shown in Table 5. Because the recovery data has not been evaluated in regard to the design assumptions (this will occur in the discussion section), a standard error of the mean survival estimate is not calculated at this point.

Survival of Winthrop spring chinook averaged 45% for the three replicates, and ranged from 39% to 55%. Binomial 95% confidence limits averaged  $\pm 13\%$  of the mean.

Survival of Wells steelhead averaged 73% for the complete data set, and ranged from 65% to 80% for individual replicates. Binomial 95% confidence limits averaged  $\pm 14.5\%$  of the mean.

For the two Lyons Ferry steelhead replicates, average survival of the test groups was calculated to be 124%. This result is caused by the fact that control groups were recovered at McNary at a lower rate than the test groups. Because this occurrence is obviously improbable, and indicated data problems, calculation of binomial error terms was deemed pointless.

TABLE 5: Calculated survival of test groups from the 1985 Smolt Monitoring Program.

<u>Group</u>	<u>Survival</u>	<u>Std.Dev.</u>	<u>95% C.I.</u>	<u>C.I. %</u>
<u>Winthrop Spring Chinook</u>				
<b>WiT1</b>	. 5526	<b>.0351</b>	+/- .0688	<b>+/-12.5%</b>
<b>WiT2</b>	. 4069	<b>.0285</b>	+/- . 0559	<b>+/-13.7%</b>
<b>WiT3</b>	. 3933	<b>.0271</b>	+/- .0530	<b>+/-13.5%</b>
<hr/>				
Average	. 4509			
 <u>Wells Steelhead</u>				
<b>WeT1</b>	. 6466	<b>.0410</b>	<b>+/- .0804</b>	<b>+/-12.4%</b>
WeT2	. 7485	<b>.0506</b>	+/- . 0993	+/-13.3%
WeT3	. 7957	<b>.0601</b>	+/- . 1179	<b>+/-17.9%</b>
<hr/>				
Average	. 7303			
 <u>Lyons Ferry Steelhead</u>				
<b>LyT1</b>	1.152			
<b>LyT2</b>	1.349			
<hr/>				
Average	1.243			

### Physical Conditions

The survival monitoring conducted in 1985 was not designed to determine quantitative relationships between physical conditions and survival indices within a year. **However,** the environmental conditions prevailing during the time period test groups were passing through the monitored river reaches are summarized for comparison with future indices.

Flow conditions in the mid-Columbia were generally favorable, and maintained within water budget weekly average constraints of 130 kcfs to 140 kcfs. During the period of migration, the mid-Columbia hydroelectric projects were spilling water for fish passage in compliance with a FERC ordered fish passage plan. Runoff in the mid-Columbia above Grand Coulee was 80% of the January - July 20-year average.

Flow conditions in the Snake River were less favorable. Prevailing flow conditions were below the water budget minimum of 85 kcfs for 22 days at Lower Granite during the water budget period from April 15 to June 15. Runoff in the Snake River was 83% of the January - July, 20-year average.

In order to look more specifically at physical conditions which might have affected the migration and survival of the eight mark groups, average migration rate of the mark groups was calculated in Tables 6 - 8, based on travel times in Table 3. This allows the estimation of approximate arrival times at each hydroelectric project for the test groups. Passage of the test groups at each project can then be associated with a flow and spill regime.

Passage conditions were examined for each test group passing

TABLE 6: Estimated average speed of marked Winthrop spring chinook in the mid-Columbia and estimated periods of passage and associated conditions at mid-Columbia hydroelectric projects, 1985.

		-----50% PASSAGE-----				
	PROJECT	ARRIVAL DATE	AVE. * FLOW (KCFS)	AVE. ** SPILL		AVE SPEED (MI/DAY)
<b>WiT1a</b>	WELLS	<b>4/28</b>	116.87 **	8.54 **		4.6
	R.REACH	<b>5/07</b>	144.83	11.45		4.6
	R.ISLAND	<b>5/13</b>	147.05	<b>12.90</b>		4.6
	WANAPUM	<b>5/14</b>	146.68	21.59		25.6
	PRIEST R	<b>5/15</b>	143.98	16.77		25.6
<b>WiT2</b>	WELLS	<b>5/02</b>	126.84 **	8.68 **		4.6
	R.REACH	<b>5/11</b>	154.19	11.46		4.6
	R.ISLAND	<b>5/16</b>	131.45	7.38		4.6
	WANAPUM	<b>5/17</b>	131.55	21.48		26.9
	PRIEST R.	<b>5/18</b>	131.32	16.82		26.9
<b>WiT3</b>	WELLS	<b>5/04</b>	134.83 **	8.70 **		5.5
	R.REACH	<b>5/12</b>	153.28	10.77		5.5
	R.ISLAND	<b>5/16</b>	131.45	7.38		5.5
	WANAPUM	<b>5/18</b>	129.97	21.42		17.9
	PRIEST R.	<b>5/19</b>	128.75	16.96		17.9

\* Average at 50% passage date +/- 3 days

\*\* Average at 50% passage date + 3 days

**TABLE 7:** Estimated average speed of marked Wells steelhead in the mid-Columbia and estimated periods of passage and associated conditions at mid-Columbia hydroelectric projects, 1985.

		-----50% PASSAGE-----				
	PROJECT	ARRIVAL DATE	AVE. * FLOW (KCFS)	AVE. ** SPILL		AVE SPEED (MI/DAY)
<b>WeT1</b>	WELLS	<b>5/07</b>	149.31 **	8.72 **		7.8
	R.REACH	<b>5/12</b>	153.28	10.77		7.8
	R.ISLAND	<b>5/15</b>	138.10	8.98		7.8
	WANAPUM	<b>5/16</b>	135.42	21.45		32.3
	PRIEST R.	<b>5/16</b>	137.04	16.81		32.3
WeT2	WELLS	<b>5/11</b>	150.21 **	8.63 **		11.8
	R.REACH	<b>5/14</b>	144.88	9.30		11.8
	R.ISLAND	<b>5/16</b>	131.45	7.38		11.8
	WANAPUM	<b>5/18</b>	129.97	21.42		17.9
	PRIEST R.	<b>5/19</b>	128.75	16.96		17.9
WeT3	WELLS	<b>5/15</b>	125.16 **	8.35 **		11.8
	R.REACH	<b>5/18</b>	121.39	3.66		11.8
	R.ISLAND	<b>5/20</b>	121.59	2.14		11.8
	WANAPUM	<b>5/22</b>	126.28	19.96		17.9
	PRIEST R.	<b>5/23</b>	125.95	12.31		17.9

\* Average at 50% passage date +/- 3 days  
 \*\* Average at 50% passage date + 3 days

**TABLE 8:** Estimated average speed of marked Lyons Ferry steelhead in the lower-Snake and estimated periods of passage and associated conditions at lower-Snake hydroelectric projects, 1985.

		-----50% PASSAGE-----			
PROJECT		ARRIVAL DATE	AVE. * FLOW (KCFS)	AVE. %* SPILL	AVE SPEED (MI/DAY)
<b>LyT1</b>	L.MONUMENTAL	<b>5/10</b>	82.67	20.17	6.7
	ICE HARBOR	<b>5/15</b>	72.46	12.55	6.7
<b>LyT2</b>	L.MONUMENTAL	<b>5/14</b>	75.70	20.98	6.3
	ICE HARBOR	<b>5/19</b>	81.80	12.49	6.3

\* Average at 50% passage date +/- 3 days

Wells, Rocky Reach, Rock Island, Wanapum, Priest Rapids, Lower Monumental, and Ice Harbor dams. The passage regime was identified as the average flow and percent spill at each project on the estimated median date of **passage**, plus or minus three days (seven day total period), except Wells Dam which was plus three days. This approach assumes that groups migrated through the monitored river reaches at a constant rate.

For the Winthrop spring chinook groups, average flow during the calculated passage period was 139.9 kcfs for **WiT1**, 135.1 kcfs for **WiT2**, and 135.7 kcfs for **WiT3**. Average project spill associated with these flows was 14.3%. **13.2%**, and 13.0% of the daily flow, respectively.

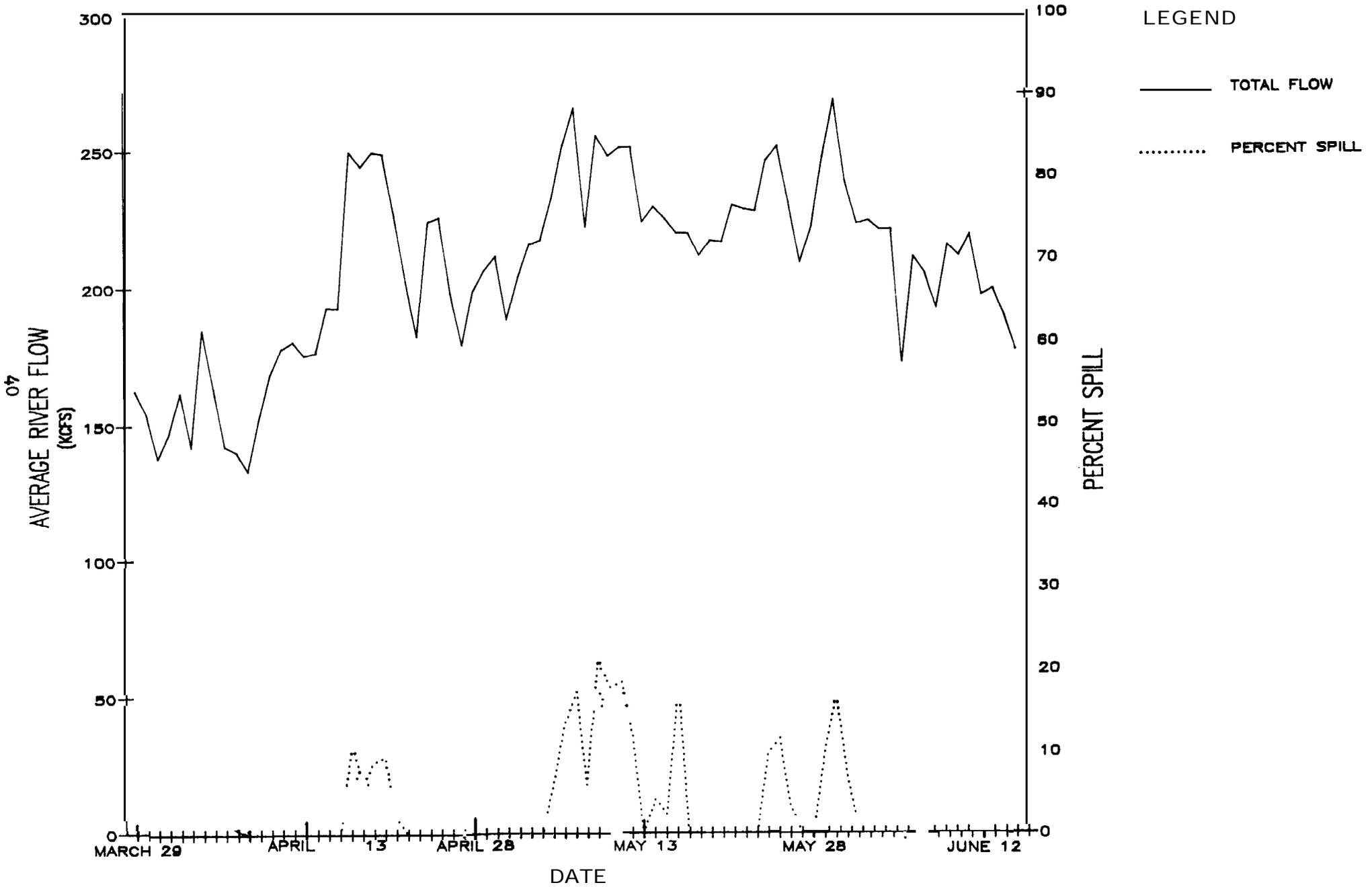
Flows were higher in the mid-Columbia for the migration of the Wells steelhead. Flow averaged 142.6 kcfs for **WeT1**, 137.0 kcfs for **WeT2**, and 124.1 kcfs for **WeT3**. Associated spills were **13.3%**, **12.7%**, and **9.3%**, respectively.

In the Snake River, flows during the migration of the Lyons Ferry test groups averaged 77.6 kcfs for **LyT1**, and 78.8 kcfs for **LyT2**. Spills averaged 16.4% and 16.7% respectively.

Flow at **McNary** over the recovery period March 29 to June 15 averaged 207 kcfs. Spill occurred sporadically (Figure 10) during periods of relatively high flow. Peak spill level was 21% of the daily flow.

FIGURE 10

AVERAGE RIVER FLOW: McNARY DAM  
TOTAL RIVER FLOW AND PERCENT SPILL



## VI. DISCUSSION

In addition to providing estimates of smolt survival, the 1985 survival monitoring activities of the Smolt Monitoring Program provided the opportunity to test different study designs and expand the program to areas outside the mid-Columbia. Results have expanded the survival data base in the mid-Columbia, and indicated that alternative release strategies in smolt survival studies are desirable. However, survival monitoring in the lower Snake River resulted in data incompatible with the study design. Reasons for these data problems are not apparent.

The study design used in this program has one overall assumption: test and control groups are assumed to be equal in all respects except for the study treatment, namely passage through the river between test and control release points. This implies that (1) sample rates of the test and control groups at **McNary** are equal, and (2) pre-release treatment of the two groups is identical. Although, as was discussed earlier, it is not possible to fully meet the overall assumption, the data must be evaluated in relation to the assumption to explore for bias which might invalidate the results.

Criteria were established for examination of the data in relation to the assumptions (Table 9). These criteria are similar to those used in the 1984 study (**McConnaha** and **Basham**, 1985). A major objective of these criteria is to identify factors which could differentially affect the recovery rates of the test and control groups other than the test variable. Because the control groups are the standard against which the recovery of the test fish

is judged, the examination is especially directed at identifying unusual behavior or recovery of the control groups.

In criterion (b) of Table 9, length is used as one indication of randomness in the selection of test and control fish. Travel time and recovery rate of the controls are aimed at identifying behavioral features of the controls which could bias the results.

TABLE 9: Subjective criteria for evaluation of smolt survival data  
Assumption

(a) Equality of sample rate between test and control groups.  
Test  
**i.** Adequacy of mixing of the two groups if inherent in the study design.  
**ii.** Adequate measures to correct for sample rate differences if mixing is not inherent in the study design.

Assumption  
(b) Equality of pre-release treatment of test and control groups.  
Test  
**i.** Random selection and marking of test and control groups.  
(1) Significant length differences between groups.  
**ii.** No indication of behavioral differences in test and controls resulting from differences in pre-release stress level or physiological condition. These indicators include:  
(1) Decline in the recovery rate of controls over time.  
(2) Decline in travel rate of controls over time.

The criteria in Table 9 are not absolutes, but are general guidelines against which to judge the data. For instance, there could be sound biological or physical reasons why the recovery rate or travel time of controls should decline over time. However, such a pattern can also be an indication that residualism or other physiological changes have occurred which could bias the results. Because the overall assumption is basically of a biological and procedural nature, the evaluation will be subjective and open to

interpretation.

Using these criteria, each study group was evaluated and the following conclusion was reached: (1) the Winthrop spring chinook data adequately meet the criteria and are accepted, (2) the Wells steelhead data can meet the criteria on **Table 9**, but may contain further features which bias the data; the Wells data are accepted with reservations, (3) the Lyons Ferry steelhead data meet the criteria on procedural grounds, but clearly fail in some unidentified aspect outside the criteria in Table 9; the Lyons Ferry data are rejected.

The data from all three hatcheries should meet criteria (a) regarding equality of sample rate. Mixing was achieved in the Wells data, and less so in the Lyons Ferry data. Mixing was not an objective of the Winthrop study design. Any differences in sample rate have been compensated for in all three studies by correcting the daily collection data for changes in daily powerhouse operation. Even if fish guiding efficiency (FGE) changes as a result of smoltification, as has been suggested, this effect should be minimal in this data, because every replicate group is a distinct cohort marked and released at similar physiological states.

Criteria (b) applies differently to the data sets from the three hatcheries. At Winthrop, the control fish were all longer than the test fish (Table 2). These differences averaged 8.3 mm (6.5%) for the first replicate, 1.6 mm (1.2%) for the second, and 5.7 mm (4.4%) for the third replicate. These differences were statistically significant ( $\alpha = .05$ ) for the first and third replicates.

Recovery rates of the controls from Winthrop did not decline

over time, but actually increased from 39% to 47% from the first to the third replicate. Similarly, migration rate of the controls did not decline over time (Table 3). Migration speed of the test groups within the Rock Island to **McNary** indexing area was 26, 27, and 18 miles per day, respectively, for the three replicates.

Because neither migration rate nor recovery rate of the controls indicate the presence of factors which could bias the survival estimate, the length difference is discounted as a significant factor, and the Winthrop data are accepted.

The Wells steelhead data present a more confusing picture in regard to criterion (b). Length of test and control groups was very similar in all replicates and were not statistically different (Table 2). Travel time of the controls did not decline over time (Table 3). The first two replicates were very similar in regard to migration rate, while the third control migrated to McNary appreciably faster than the first two.

The recovery rate of the nine Wells control mark groups did not show a clear trend over time. Except for the last two sub-groups of the last replicate (**WeC3b** and c), the recovery rate was approximately equal between all groups (Table 4). The low recovery rate of these last two groups is cause for concern, and contributed to the higher survival estimate for the third replicate. It was also previously noted that these last two groups had higher rates of fin rot than previous groups. The third test group (WeT3) also was recovered at an appreciably lower rate than the other test groups.

Because of the problems apparent in the data from groups **WeC3b**

and c, and the association with the fact that they were in poor condition at release, these groups were dropped from the final analysis. The data were recalculated using only **WeC3a** as the control for WeT3. This procedure allowed us to calculate a standard error for the Wells estimate to facilitate year-to-year comparison. This changed the estimated survival of this group from 79.6% to **54.0%**. This result is also more in keeping with the trend in proportion recovered of the three test groups. Dropping the recoveries from **WeC3b** and c also resulted in a wider confidence limit on the estimate.

Another factor which could have affected the results from the Wells study was the burning of the fish during the branding operation. This would not affect the estimated in-river survival if it acted uniformly on both test and control groups prior to their being sampled at McNary. However, it was noted that the controls, probably because they were held longer in the hatchery after marking, had a higher incidence of burning than did the test fish. If this caused a higher mortality of the controls in the river reach between Priest Rapids and McNary than occurred in the test fish, the estimated survivals would be too high. Because this seems like a plausible, although not testable, hypothesis, the recalculated Wells data is accepted with the reservation that it could result in overestimation of the survival.

The Lyons Ferry steelhead data, interestingly, would be accepted based on the criteria in Table 9, although the fact that the controls were recovered at lesser rates than the test fish obviously indicates that problems exist in the data. The fact that

\* the data are accepted by the criteria in Table 9 indicates that the problems occurred outside the study design. Despite exhaustive recapitulation of events and discussion with involved personnel, no unusual procedural occurrence can be found which would account for the results. It appears to be caused by some factor outside the procedures or study design.

One explanation that has been suggested is that the control fish encountered unusual concentrations of predators near the release point. Past studies have shown that concentrations of predators can be present in the tailrace of hydroelectric projects. (Sims et.al, 1976-1978). Because the controls would be concentrated together and disoriented immediately after release, they could have been more susceptible to predators, relative to the actively migrating test fish. This hypothesis could be tested in the future by varying the release location of successive control groups within the general area below Ice Harbor Dam.

Final estimates and the standard errors of survival for the Winthrop spring chinook and Wells steelhead were calculated using the evaluated data (Table 10). The standard error of the average survival estimates is naturally much higher than the binomial error of the individual estimates. The calculated standard error of the 1985 data is similar to the magnitude of error estimated for the 1984 data (McConnaha and Basham, 1985).

The estimated spring chinook survival of 45% is remarkably close to previous estimates made over a similar area. McKenzie et al. (1984) reported spring chinook survival from Pateros to below Priest Rapids (Figure 1) to be 44% in 1982, and 45% in 1983

TABLE 10: Final survival estimates and standard error for the 1985 survival monitoring study.

<u>Hatchery</u>	<u>Species</u>	<u>Survival</u>	n	<u>Std.Error</u>	<u>95% C.I.</u>
Winthrop	Spring Chinook	.4509	3	0.0510	+/-0.2194
Wells	Steelhead	.6451*	3	0.0601	<b>+/-0.2588</b>

\* This estimate does not include data from groups **WeC3b** and c.

(McKenzie et al. 1984). It should be noted that the survival reported here does contain an element accounting for survival within the Methow River from the hatchery to Pateros (40 miles). The survival from Pateros to Priest Rapids was, therefore, higher than the overall estimate reported here.

Steelhead survival in the mid-Columbia in 1985 appeared to be higher than was observed in 1984. Steelhead survival was estimated to be 65% in 1985 and 52% in 1984. These differences are, however, within the error of the 1985 estimate. This comparison is made difficult by the fact that only one replicate was utilized to determine the 1984 study estimate.

An important feature of the 1985 program was the use of a study design in which the test and control groups were released at the same time, rather than delaying the control releases to achieve mixing at the recovery site. Equality of sample rate was assumed to occur by correcting the sample data for daily changes in sample rate and powerhouse operations. Although no test could be conducted in 1985 to test this study design against the "normal" design, the 1985 study results indicated that such a procedure offered many advantages to a monitoring program over the usual study design. The data itself are difficult to evaluate in this sense, without objective criteria. Nonetheless, nothing in the Winthrop data would indicate study design problems. In fact, just the opposite is true. More problems were encountered in evaluating the Wells data, which included holding control groups, than were encountered in the Winthrop data.

Many of the problems with the Wells data can be attributed to

delaying the release of the controls after **release of the test** fish. As was the case with the 1984 study, data were rejected from the 1985 Wells study because of unusual occurrences in the later released control groups. It has been mentioned that the 1985 Wells survival may have been overestimated because of a higher incidence of burning and ulceration of the control fish, relative to the test fish. This may have been the result of holding the controls longer than the test groups, which could have allowed the burns to develop further.

The contention in using the simultaneous release strategy is that the error induced by holding the controls after the test fish were released, is greater than the error in the assumption that daily sample rate changes can be compensated for, by dividing the collection data by powerhouse flow proportion. While the latter portion of this contention cannot be tested without further understanding of FGE, the statement holds logically, and is not contradicted by any data. Results from this program over the last two years have indicated that holding the controls after release of the test fish may cause errors which can significantly bias the results. For this reason, **it** is recommended that future studies use the simultaneous release strategy.

## VII. CONCLUSIONS

1. Survival of Winthrop spring chinook through the mid-Columbia reach in 1985 was 45%. This estimate is bounded by a 95% confidence limit of  $\pm 22\%$ .
2. Steelhead survival in the mid-Columbia as indexed by Wells hatchery fish was 65% with a 95% confidence limit of  $\pm 26\%$ . This estimate does not include data from the last two sub-groups of the third control group (**WeC3b** and c). These two sub-groups were rejected because of abnormally low recovery proportions associated with the observation were in noticeably poorer condition at release relative to the other fish released from Wells. Further, there are data which suggest that the reported survival estimate could be biased toward the high side because of a higher incidence of burning from the branding operation in the control groups relative to the test groups.
3. Monitoring of the survival of Lyons Ferry steelhead was not successful. Control fish released below Ice Harbor had a lower rate of recovery at McNary than did the test fish released below Little Goose. No procedural or study design feature is available to explain this result.
4. On the basis of the data collected for two years on steelhead survival at Wells hatchery, it is recommended that future monitoring of survival utilize a strategy of simultaneous release of test and control fish. It is concluded that the additional stress on the control group caused by holding them in the hatchery longer than the test groups can seriously bias the resulting survival estimate.

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- Sims, Carl W., R.C. Johnsen, and W.W. Bentley, 1976. Progress Report Effects of Power Peaking Operations on Juvenile Salmon and Steelhead Trout Migrations, 1977. Report of Research to U.S. Army Corps of Engineers Contract DACW57-76-F-0303 and NOAA, NMFS, NWAFC, Seattle, WA.

## **APPENDIX A**

## **APPENDIX A: MARK RECAPTURE DATA**

This appendix includes the freeze brand recapture data used for analysis of spring chinook and steelhead survival in the mid-Columbia and lower Snake Rivers for 1985. Presented below is an explanation of the data listing format.

Brand recapture data listings summarize catch statistics for freeze branded fish in conjunction with flow and sample parameters obtained at the smolt monitoring sites. Data presented in the listings are defined as follows:

Smolt Monitoring Site is identified on each page in the table heading.

Species is identified on each page in the table heading. Each report is divided into sections based on species. Brand recaptures are reported in order by the following species categories: yearling chinook (chinook 1), steelhead, sub-yearling chinook (chinook 0), coho, and sockeye, respectively. **Within** each species category brand recaptures are reported in order by brand symbol, brand location, and brand rotation, respectively.

Brand Release Information is indicated on each page in the table heading. This information includes the following:

1. Freeze Brand Code: This includes brand location, brand symbol, and brand rotation.
2. Race: The race of the branded fish.
3. Species: The species of the branded fish.
4. Lot ID: An identification number assigned to each brand release. This number can be used to find additional information from hatchery and brand release listings in Volume I of this report.

5. # Released: The number of branded fish released.
6. Release Site: The site where the branded fish were released.
7. Release Dates: The time period over which the brands were released.
8. Agency: The agency responsible for the release.
9. Hatchery: The hatchery from where the fish were released. Non-hatchery indicates migrating fish were captured, freeze branded, and released.

Date: The year is indicated in the heading line of each page; the month and day, representing the ending date of the sample period, is indicated for each sample. Detailed information on the start and end date and time for each sample can be obtained from the Water Budget Center (now known as the Fish Passage Center).

Sample Parameters are used to indicate relative sampling effort and changes in sampling conditions. These parameters are used to aid interpretation and analysis of the fish counts. The sample parameters primarily are for qualitative purposes and can not be used to quantify **sample** effort. Descriptive information about the samples is provided in comments recorded with the sample parameters. These comments are not included in this **report but** are available upon request from the Fish Passage Center.

Sample Quality Code (SC) is used to identify samples deviating from "normal " sample conditions and to identify the cause for missing samples. Sample quality codes are defined below. Fish counts from samples with sample quality codes greater than **1** are indicated with an asterisk. The basis for assignment of quality codes **is** discussed for each site later in this **report**.

### Definition of Sample Quality Codes

- 1 = Normal complete sample.
- 2 = Sample taken prior to separator cleanout (used for McNary Dam only).
- 3 = Questionable sample due to abnormal flows.
- 4 = No sample or incomplete sample due to weather conditions.
- 5 = No sample or incomplete sample due to equipment failure/maintenance/ repair.
- 6 = Sample following 1 or more days without samples. Used for Priest Rapids Dam only.
- 7 = No sample, incomplete or biased sample. Cause explained in comments recorded with data.
- 8 = No fish counts were entered for this sample period. Fish accumulated and were sampled at a later date.
- 9 = This code was not used in 1985.
- 10 = Separator cleanout counts.
- ≥12 = Sample of fish accumulated 2 or more days. The sample code minus 10 is the number of days that fish accumulated before being sampled.

Number of Days (#D) This code is used to indicate samples of fish collected over more than 1 day. Flow parameters corresponding with these accumulated samples are averaged over the entire sample period.

Number of Gatewells (GW) indicates the number of gatewells sampled. This parameter is printed only for gatewell sampling systems.

Number of Hours (HR.S) indicates the number of hours represented by the sample.

River Flow is the average river flow (in kcfs) during the sample period.

Passage Index Flow is the percentage of the river flow (available for fish passage) flowing through the sampling system.

Definition of flow percentage varies for each site and is explained in the report footnotes. The flow is averaged over the sample period (defined by the start and end date and time). The

**source** of flow data (either compiled by the remote site operators and entered with the catch data or obtained from COE data) is indicated in the report footnotes.

Number Sampled is the number of branded fish observed. Missing counts are indicated by "---". Total sample counts are indicated at the end of each report section.

Number Collected is the number of fish collected during the sample period. If the collection is not subsampled, the number sampled and the number collected are equal. For monitoring sites that subsample the fish collection, the number of branded fish collected is estimated **based** on a sample rate. At McNary and Lower Granite the sample rate is based on the proportion of time **the** bypass collection system was sampled. Missing counts are indicated by "---". Total collection counts are indicated at the end of each report section.

Passage Index is calculated as follows:

$$\text{Passage Index} = (\# \text{ collected} * 100) / (\% \text{ passage index flow})$$

Cumulative percent passage index is printed to the right of each passage index estimate. These percentages are based **on** the total counts printed at the end of each report section.

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\*\* Brand Recapture Summary \* \*

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 \*\*\*\*\*

MCNARY

\*\*\*

CHINOOK 1'S

\*\*\*

LA-7C-1 SP CHINOOK LOT ID # 85002-02

35,186 RELEASED AT: WINTHROP NFH  
 AGENCY; USFWS

FROM: 4/20/85 T O 4/20/85  
 HATCHERY; WINTHROP NFH

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-1D-CW-UR-S						
5/01	1 24.0	214.77	100.00 %	1	14	14	0.2%
5/02	1 24.0	183.10	100.00 %	1	14	14	0.4%
5/03	1 24.0	213.20	100.00 %	3	43	43	1.1%
5/04	1 24.0	214.28	100.00 %	0	0	0	1.1%
5/05	1 24.0	218.32	100.00 %	1	14	14	1.3%
5/06	1 24.0	243.11	90.11 %	3	43	48	2.1%
5/07	1 24.0	271.65	79.76 %	7	82	103	3.7%
5/08	1 24.0	234.50	93.53 %	3	32	34	4.2%
5/09	1 24.0	233.77	85.71 %	3	43	50	5.0%
5/10	1 24.0	249.76	80.54 %	5	53	66	6.0%
5/11	1 24.0	257.35	79.20 %	7	82	104	7.6%
5/12	1 24.0	249.25	84.34 %	16	168	199	10.7%
5/13	1 24.0	238.86	93.39 %	11	162	173	13.4%
5/14	1 24.0	220.75	100.00 %	9	129	129	15.4%
5/15	1 24.0	234.10	93.53 %	12	171	183	18.2%
5/16	1 24.0	225.04	81.94 %	17	200	244	22.0%
5/17	1 24.0	212.92	100.00 %	14	200	200	25.1%
5/18	1 24.0	217.94	100.00 %	22	314	314	30.0%
5/19	1 24.0	213.18	100.00 %	20	286	286	34.5%
5/20	1 24.0	208.28	100.00 %	17	243	243	38.2%
5/21	1 24.0	228.17	100.00 %	34	486	486	45.8%
5/22	1 24.0	228.01	100.00 %	23	329	329	50.9%
5/23	1 24.0	227.75	100.00 %	17	243	243	54.7%
5/24	1 24.0	225.09	100.00 %	13	186	186	57.5%
5/25	1 24.0	261.27	84.28 %	18	257	305	62.3%
5/26	1 24.0	243.13	91.20 %	26	306	336	67.5%
5/27	1 24.0	208.07	100.00 %	15	188	188	70.4%
5/28	1 24.0	222.11	100.00 %	26	371	371	76.2%
5/29	1 24.0	233.81	94.42 %	11	157	166	78.8%
5/30	1 24.0	257.16	86.20 %	12	150	174	81.5%
5/31	2 22.0	260.70	84.66 %	4 *	145 *	171 *	84.1%
5/31	10 0.0	220.78	99.45 %	18 *	18 *	18 *	84.4%
6/01	1 26.0	224.90	98.51 %	2	100	102	86.0%
6/02	1 24.0	223.18	100.00 %	15	200	200	89.1%

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MCNARY \* \* \* CHINOOK 1'S \* \* \*

LA-7C-3 SP CHINOOK LOT ID # 85002-03 36,704 RELEASED AT: WINTHROP NFH FROM: 4/16/85 TO 4/16/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) .. PARAMETERS .. SC--#D--GW--HR.S	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT	(4) CUMULATIVE	
4/30	1	24.0	206.63	100.00 x	2	29	29	0.4X
5/01	1	24.0	214.77	100.00 x	1	14	14	0.5X
5/02	1	24.0	183.10	100.00 x	5	71	71	1.5%
5/03	1	24.0	213.20	100.00 x	3	43	43	2.0X
5/04	1	24.0	214.28	100.00 x	0	0	0	2.0%
5/05	1	24.0	218.32	100.00 x	2	29	29	2.4%
5/06	1	24.0	243.11	90.11 x	8	114	127	4.0%
5/07	1	24.0	271.65	79.76 X	12	141	177	6.2X
5/08	1	24.0	234.50	93.53 x	8	84	90	7.4%
5/09	1	24.0	233.77	85.71 x	7	100	117	8.9X
5/10	1	24.0	249.76	80.54 X	8	84	104	10.2%
5/11	1	24.0	257.35	79.20 x	9	106	134	11.9%
5/12	1	24.0	249.25	84.34 x	27	284	337	16.2X
5/13	1	24.0	238.86	93.39 x	23	338	362	20.8X
5/14	1	24.0	220.75	100.00 X	11	157	157	22.8X
5/15	1	24.0	234.10	93.53 x	17	243	260	26.1X
5/16	1	24.0	225.04	81.94 x	38	447	546	33.1X
5/17	1	24.0	212.92	100.00 x	21	300	300	36.9X
5/18	1	24.0	217.94	100.00 x	23	329	329	41.1%
5/19	1	24.0	213.18	100.00 x	35	500	500	47.5X
5/20	1	24.0	208.28	100.00 x	28	400	400	52.6%
5/21	1	24.0	228.17	100.00 x	32	457	457	58.4%
5/22	1	24.0	228.01	100.00 x	30	429	429	63.9X
5/23	1	24.0	227.75	100.00 x	m	286	286	67.5%
5/24	1	24.0	225.09	100.00 x	17	243	243	70.6%
5/25	1	24.0	261.27	84.28 x	23	329	390	75.6X
5/26	1	24.0	243.13	91.20 x	25	294	322	79.7X
5/27	1	24.0	208.07	100.00 x	15	188	188	62.1%
5/28	1	24.0	222.11	100.00 X	10	143	143	83.9X
5/29	1	24.0	233.81	94.42 X	10	143	151	85.9%
5/30	1	24.0	257.16	86.20 x	17	213	247	89.0%
5/31	2	22.0	260.70	84.66 x	2 *	73 *	86 *	90.1X
5/31	10	0.0	220.78	99.45 x	5 *	5 *	5 *	90.2%
6/01	1	26.0	224.90	98.51 x	3	150	152	92.1X

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MCNARY \* \* \* CHINOOK 1'S \* \* \*

LA-7C-3SP CHINOOK LOT ID # 85002-03 36,704 RELEASED AT: WINTHROP NFH FROM: 4/16/85 TO 4/16/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) .. PARAMETERS . *	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC--#D--GW--HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE

\*\*\*\*\* CONTINUED \*\*\*\*\*

6/02	1	24.0	223.18	100.00 x	12	160	160	94.1%
6/03	1	24.0	213.99	100.00 x	6	86	86	95.2%
6/04	1	24.0	236.00	100.00 x	2	29	29	95.6%
6/05	1	24.0	182.95	100.00 x	5	71	71	96.5%
6/06	1	24.0	196.81	100.00 x	4	57	57	97.2%
6/07	1	24.0	211.60	100.00 x	1	14	14	97.4%
6/08	1	24.0	193.64	100.00 x	2	29	29	97.8%
6/09	1	24.0	203.05	100.00 x	5	71	71	98.7%
6/10	1	24.0	210.63	100.00 x	3	43	43	99.2%
6/11	1	24.0	218.02	100.00 x	2	29	29	99.6%
6/12	1	24.0	195.52	100.00 x	1	14	14	99.8%
6/13	2	21.0	217.08	100.00 x	0 *	0 *	0 *	99.8%
6/13	10	0.0	180.89	100.00 x	3 *	3 *	3 *	99.8%
6/14	1	27.0	184.50	100.00 x	0	0	0	99.8%
6/15	1	24.0	176.92	100.00 x	0	0	0	99.8%
6/16	1	24.0	179.20	100.00 x	1	14	14	100.0%
<b>TOTAL</b>					<b>544</b>	<b>7,386</b>	<b>7,845</b>	

(1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled  
(2) River Flow: Data acquired from Corps data site - MCN  
(3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*  
(4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)  
(\* Sample deviates from "normal" conditions (i.e. SC code > 1)

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MCNARY \* \* \* CHINOOK 1'S \* \* \*

LA-7F-1 SP CHINOOK LOT ID # 85002-05 12,568 RELEASED AT: WINTHROP NFH FROM: 4/16/85 TO 4/16/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) .. PARAMETERS .. SC--#D--GW--LB.S	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE	
5/02	1	24.0	183.10	100.00 %	2	29	29	1.1X
5/03	1	24.0	213.20	100.00 %	3	43	43	2.6X
5/04	1	24.0	214.28	100.00 %	0	0	0	2.6X
5/05	1	24.0	218.32	100.00 %	1	14	14	3.2X
5/06	1	24.0	243.11	90.11 %	5	71	79	6.1X
5/07	1	24.0	271.65	79.76 %	1	12	15	6.6X
5/08	1	24.0	234.50	93.53 %	2	21	22	7.4X
5/09	1	24.0	233.77	85.71 %	4	57	67	9.9X
5/10	1	24.0	249.76	80.54 %	1	11	14	10.4X
5/11	1	24.0	257.35	79.20 %	3	35	44	12.0X
5/12	1	24.0	249.25	84.34 %	9	95	113	16.2X
5/13	1	24.0	238.86	93.39 %	8	118	126	20.8X
5/14	1	24.0	220.75	100.00 %	2	29	29	21.9X
5/15	1	24.0	234.10	93.53 %	3	43	46	23.5X
5/16	1	24.0	225.04	81.94 %	9	106	129	28.3X
5/17	1	24.0	212.92	100.00 %	12	171	171	34.6X
5/18	1	24.0	217.94	100.00 %	14	200	200	41.9X
5/19	1	24.0	213.18	100.00 %	10	143	143	47.2X
5/20	1	24.0	208.28	100.00 %	12	171	171	53.4X
5/21	1	24.0	228.17	100.00 %	10	143	143	58.7X
5/22	1	24.0	228.01	100.00 %	12	171	171	65.0X
5/23	1	24.0	227.75	100.00 %	4	57	57	67.1X
5/24	1	24.0	225.09	100.00 %	6	86	86	70.2X
5/25	1	24.0	261.27	84.28 %	4	57	68	72.7X
5/26	1	24.0	243.13	91.20 %	8	94	103	76.5X
5/27	1	24.0	208.07	100.00 %	6	75	75	79.3X
5/28	1	24.0	222.11	100.00 %	7	100	100	82.9X
5/29	1	24.0	233.81	94.42 %	3	43	46	84.6X
5/30	1	24.0	257.16	86.20 %	1	13	15	85.2X
5/31	2	22.0	260.70	84.66 %	4 *	145 *	171 *	91.4X
5/31	10	0.0	220.78	99.45 %	7 *	7 *	7 *	91.7X
6/01	1	26.0	224.90	98.51 %	0	0	0	91.7X
6/02	1	24.0	223.18	100.00 %	4	53	53	93.6X
6/03	1	24.0	213.99	100.00 %	3	43	43	95.2X

\*\*\*\*\* CONTINUED \*\*\*\*\*



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FISH PASSAGE DATA SYSTEM

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MCNARY

\* \* \*

CHINOOK 1'S

\* \* \*

LA-7K-1 SP CHINOOK LOT ID # 85002-01 34,959 RELEASED AT: WINTHROP NFH FROM: 4/24/85 TO 4/24/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1)				(2)		(3)		(4)		
	.. PARAMETERS ..	SC	#D	GW	LB.S	RIVER FLOW	INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
5/07	1				24.0	271.65	79.76 X	1	12	15	0.2X
5/08	1				24.0	234.50	93.53 X	2	21	22	0.6X
5/09	1				24.0	233.77	85.71 X	1	14	16	0.8X
5/10	1				24.0	249.76	80.54 X	9	95	118	2.6X
5/11	1				24.0	257.35	79.20 X	6	71	90	4.0X
5/12	1				24.0	249.25	84.34 X	12	126	149	6.3X
5/13	1				24.0	238.86	93.39 X	9	132	141	8.5X
5/14	1				24.0	220.75	100.00 X	8	114	114	10.3X
5/15	1				24.0	234.10	93.53 X	14	200	214	13.6X
5/16	1				24.0	225.04	81.94 X	19	224	273	17.8X
5/17	1				24.0	212.92	100.00 X	15	214	214	21.1X
5/18	1				24.0	217.94	100.00 X	24	343	343	26.4X
5/19	1				24.0	213.18	100.00 X	1	14	14	26.6X
5/20	1				24.0	208.28	100.00 X	16	229	229	30.1X
5/21	1				24.0	228.17	100.00 X	28	400	400	36.3X
5/22	1				24.0	228.01	100.00 X	29	414	414	42.7X
5/23	1				24.0	227.75	100.00 X	16	229	229	46.2X
5/24	1				24.0	225.09	100.00 X	9	129	129	48.2X
5/25	1				24.0	261.27	84.28 X	13	186	221	51.6X
5/26	1				24.0	243.13	91.20 X	31	365	400	57.8X
5/27	1				24.0	208.07	100.00 X	36	450	450	64.8X
5/28	1				24.0	222.11	100.00 X	15	214	214	68.1X
5/29	1				24.0	233.81	94.42 X	20	286	303	72.7X
5/30	1				24.0	257.16	86.20 X	9	113	131	74.8X
5/31	2				22.0	260.70	84.66 X	5 *	182 *	215 *	78.1X
5/31	10				0.0	220.78	99.45 X	20 *	20 *	20 *	78.4X
6/01	1				26.0	224.90	98.51 X	4	200	203	81.5X
6/02	1				24.0	223.18	100.00 X	16	213	213	84.8X
6/03	1				24.0	213.99	100.00 X	12	171	171	87.4X
6/04	1				24.0	236.00	100.00 X	8	114	114	89.2X
6/05	1				24.0	182.95	100.00 X	14	200	200	92.3X
6/06	1				24.0	196.81	100.00 X	7	100	100	93.8X
6/07	1				24.0	211.60	100.00 X	13	186	186	96.7X

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MCNARY \* \* \* CHINOOK 1'S \* \* \*

LA-7T-1 SP CHINOOK LOT ID # 85002-04 5,890 RELEASED FIT: WINTHROP NFH FROM: 4/16/85 T O 4/16/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-#D-GW-HRS						

\* \* \* \* \* C O N T I N U E D \* \* \* \* \*

6/01	1	26.0	224.90	98.51 %	0	0	0	84.2%
6/02	1	24.0	223.18	100.00 %	2	27	27	86.4%
6/03	1	24.0	213.99	100.00 %	6	86	86	93.2%
6/04	1	24.0	236.00	100.00 %	0	0	0	93.2%
6/05	1	24.0	182.95	100.00 %	1	14	14	94.3%
6/06	1	24.0	196.81	100.00 %	2	29	29	96.6%
6/07	1	24.0	211.60	100.00 %	1	14	14	97.8%
6/08	1	24.0	193.64	100.00 %	1	14	14	98.9%
6/W	1	24.0	203.05	100.00 %	1	14	14	100.0%

TOTAL ----- 82 ----- 1,195 ----- 1,253 -----

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\* Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE

FISH PASSAGE DATA SYSTEM

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MCNARY

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CHINOOK 1'S

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LA-7T-3 SP CHINOOK LOT ID # 85036-01 12,695 RELEASED AT: BELOW PRST RAPI FROM: 4/16/85 TO 4/16/85  
 AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) .. PARAMETERS .. SC--#D--GW--HR.S	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE	
4/21	1	24.0	240.61	92.94 %	2	14	15	0.3%
4/22	1	24.0	224.15	98.61 %	2	27	27	0.9%
4/23	2	24.0	187.47	100.00 %	1 *	14 *	14 *	1.1%
4/23	10	0.0	210.65	100.00 %	5 *	5 *	5 *	1.2%
4/24	1	24.0	197.70	100.00 %	1	33	33	1.9%
4/25	1	24.0	226.20	100.00 %	0	0	0	1.9%
4/26	1	24.0	208.06	100.00 %	2	67	67	3.3%
4/27	1	24.0	186.73	100.00 %	8	123	123	5.8%
4/28	1	24.0	182.12	100.00 %	5	71	71	7.2%
4/29	1	24.0	208.57	100.00 %	7	100	100	9.2%
4/30	1	24.0	206.63	100.00 %	4	57	57	10.4%
5/01	1	24.0	214.77	100.00 %	13	186	186	14.2%
5/02	1	24.0	183.10	100.00 %	23	329	329	20.9%
5/03	1	24.0	213.20	100.00 %	16	229	229	25.5%
5/04	1	24.0	214.28	100.00 %	4	57	57	26.7%
5/05	1	24.0	218.32	100.00 %	10	143	143	29.6%
5/06	1	24.0	243.11	90.11 %	16	229	254	34.7%
5/07	1	24.0	271.65	79.76 %	12	141	177	38.3%
5/08	1	24.0	234.50	93.53 %	13	137	146	41.3%
5/09	1	24.0	233.77	85.71 %	24	343	400	49.4%
5/10	1	24.0	249.76	80.54 %	16	168	209	53.7%
5/11	1	24.0	257.35	79.20 %	10	118	149	56.7%
5/12	1	24.0	249.25	84.34 %	18	189	224	61.2%
5/13	1	24.0	238.86	93.39 %	25	368	394	69.2%
5/14	1	24.0	220.75	100.00 %	18	257	257	74.5%
5/15	1	24.0	234.10	93.53 %	11	157	168	77.9%
5/16	1	24.0	225.04	81.94 %	9	106	129	80.5%
5/17	1	24.0	212.92	100.00 %	13	186	186	84.3%
5/18	1	24.0	217.94	100.00 %	12	171	171	87.7%
5/19	1	24.0	213.18	100.00 %	11	157	157	90.9%
5/20	1	24.0	208.28	100.00 %	5	71	71	92.4%
5/21	1	24.0	228.17	100.00 %	4	57	57	93.5%
5/22	1	24.0	228.01	100.00 %	5	71	71	95.0%
5/23	1	24.0	227.75	100.00 %	7	100	100	97.0%

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FISH PASSAGE DATA SYSTEM  
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MCNARY \* \* \* CHINOOK 1'S \* \* \*

LA-7T-3 SP CHINOOK LOT ID # 85036-01 12,695 RELEASED AT: BELOW PRST WI FROM: 4/16/85 TO 4/16/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) PARAMETERS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-#D-GW-HRS						

\* \* \* \* \* CONTINUED \* \* \* \* \*

5/24	1	24.0	225.09	100.00 %	4	57	57	98.2%
5/25	1	24.0	261.27	04.28 %	1	14	17	98.5%
5/26	1	24.0	243.13	91.20 %	1	12	13	98.8%
5/27	1	24.0	208.07	100.00 %	0	0	0	98.8%
5/28	1	24.0	222.11	100.00 %	2	29	29	99.4%
5/29	1	24.0	233.81	94.42 %	2	29	31	100.0%
5/30	1	24.0	257.16	86.20 %	0	0	0	100.0%
5/31	2	22.0	260.70	84.66 %	0 *	0 *	0 *	100.0%
5/31	10	0.0	220.78	99.45 %	1 *	1 *	1 *	100.0%

TOTAL ----- 343 ----- 4,623 ----- 4,924 -----

- 1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs= Number of hours samp Led
- 2) River Flow: Data acquired from Corps data site - MCN
- 3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- 4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- \*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
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MCNARY \* \* \* CHINOOK 1'S \* \* \*

RA-7T-1 SP CHINOOK LOT ID # 85036-03 12,259 RELEASED AT: BELOW PRST RAPI FROM: 4/24/85 T O 4/24/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1)				(2)		(3)	NUMBER SAMPLED	NUMBER COLLECTED	(4)	
	PARAMETERS				RIVER	INDEX	PASSAGE INDEX			CUMULATIVE	
1985	SC	TD	GW	HR.S	FLOW	FLOW			DAILY COUNT		
4/28	1			24.0	182.12	100.00	%	1	14	14	0.2%
4/29	1			24.0	208.57	100.00	%	6	86	86	1.7%
4/30	1			24.0	206.63	100.00	%	10	143	143	4.2%
5/01	1			24.0	214.77	100.00	%	10	143	143	6.7%
5/02	1			24.0	183.10	100.00	%	20	286	286	11.6%
5/03	1			24.0	213.20	100.00	%	15	214	214	15.3%
5/04	1			24.0	214.28	100.00	x	6	86	86	16.8%
5/05	1			24.0	218.32	100.00	%	14	200	200	20.2%
5/06	1			24.0	243.11	90.11	x	19	271	301	25.4%
5/07	1			24.0	271.65	79.76	%	23	271	340	31.3%
5/08	1			24.0	234.50	93.53	%	21	221	236	35.3%
5/09	1			24.0	233.77	85.71	%	20	286	334	41.1%
5/10	1			24.0	249.76	80.45	%	17	179	222	44.9%
5/11	1			24.0	257.35	79.20	%	14	165	208	48.5%
5/12	1			24.0	249.25	84.34	%	23	242	287	53.5%
5/13	1			24.0	238.86	93.39	%	17	250	268	58.1%
5/14	1			24.0	220.75	100.00	%	17	243	243	62.3%
5/15	1			24.0	234.10	93.53	%	21	300	321	67.8%
5/16	1			24.0	225.04	81.94	%	28	329	402	74.8%
5/17	1			24.0	212.92	100.00	%	17	243	243	79.0%
5/18	1			24.0	217.94	100.00	%	11	157	157	81.7%
5/19	1			24.0	213.18	100.00	%	13	186	186	84.9%
5/20	1			24.0	208.28	100.00	%	10	143	143	87.3%
5/21	1			24.0	228.17	100.00	%	9	129	129	89.6%
5/22	1			24.0	228.01	100.00	%	13	186	186	92.8%
5/23	1			24.0	227.75	100.00	%	4	57	57	93.8%
5/24	1			24.0	225.09	100.40	%	6	86	86	95.2%
5/25	1			24.0	261.27	84.28	%	3	43	51	96.1%
5/26	1			24.0	243.13	91.20	%	2	24	26	96.6%
5/27	1			24.0	208.07	100.00	%	2	25	25	97.0%
5/28	1			24.0	222.11	100.00	x	1	14	14	97.2%
5/29	1			24.0	233.81	94.42	%	4	57	60	98.3%
5/30	1			24.0	257.16	86.20	%	0	0	0	98.3%
5/31	2			22.0	260.70	84.66	%	1 *	36 *	43 *	99.0%

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MCNARY \* \* \* CHINOOK 1'S \* \* \*

3A-7T-1 SP CHINOOK LOT ID # 85036-03 12,299 RELEASED AT: BELOW PRST RAPI FROM: 4/24/85 TO 4/24/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

MTE	.. PARAMETERS ..	(1)	(2)	(3)	NUMBER	NUMBER	... PASSAGE INDEX ...
1985	SC <del>GD</del> GW HRS	FLOW	INDEX	FLOW	SAMPLED	COLLECTED	DAILY COUNT CUMULATIVE

\* \* \* \* \* CONTINUED \* \* \* \* \*

5/31	10	0.0	220.78	99.45 %	0 *	0 *	0 * 99.0%
6/01	1	26.0	224.90	98.51 %	0	0	0 99.0%
6/02	1	24.0	223.18	100.00 %	0	0	0 99.0%
6/03	1	24.0	213.99	100.00 %	2	29	29 99.5%
6/04	1	24.0	236.00	100.00 %	0	0	0 99.5%
6/05	1	24.0	182.95	100.00 %	0	0	0 99.5%
6/06	1	24.0	196.81	100.00 %	0	0	0 99.5%
6/07	1	24.0	211.60	100.00 %	1	14	14 99.8%
6/08	1	24.0	193.64	100.00 %	1	14	14 100.0%

OIAL ----- 402 ----- 5,372 ----- 5,797 -----

- 1) Sample parameters: SC = Sample quality code GD = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled
- 2) River Flow: Data acquired from Corps data site - MCN
- 3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- 4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)  
\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* CHINOOK 1'S \* \* \*

RA-7T-3 SP CHINOOK LOT ID # 85036-02 12,451 RELEASED AT: BELOW PRSTRAPI FROM: 4/20/85 TO 4/20/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER		e* PASSAGE INDEX ...		
				---SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE	
1985- 4/26	1	24.0	208.06	100.00 %	6	200	200	3.6%
4/27	1	24.0	186.73	100.00 %	1	15	15	3.8%
4/28	1	24.0	182.12	100.00 %	6	86	86	5.4%
4/29	1	24.0	208.57	100.00 %	10	143	143	7.9%
4/30	1	24.0	206.63	100.00 %	8	114	114	10.0%
5/01	1	24.0	214.77	100.00 %	10	143	143	12.5%
5/02	1	24.0	183.10	100.00 %	18	257	257	17.1%
5/03	1	24.0	213.20	100.00 %	1	14	14	17.4%
5/04	1	24.0	214.28	100.00 %	10	143	143	19.9%
5/05	1	24.0	218.32	100.00 %	10	143	143	22.5%
5/06	1	24.0	243.11	90.11 %	13	186	206	26.1%
5/07	1	24.0	271.65	79.76 %	15	176	221	30.1%
wo8	1	24.0	234.50	93.53 %	24	253	271	34.9%
wo9	1	24.0	233.77	85.71 %	12	171	200	38.5%
5/10	1	24.0	249.76	80.54 %	19	200	248	42.9%
5/11	1	24.0	257.35	79.20 %	7	82	104	44.8%
5/12	1	24.0	249.25	84.34 %	30	316	375	51.5%
5/13	1	24.0	238.86	93.39 %	25	368	394	58.5%
5/14	1	24.0	220.75	100.00 %	15	214	214	62.3%
5/15	1	24.0	234.10	93.53 %	19	271	290	67.5%
5/16	1	24.0	225.04	81.94 %	22	259	316	73.1%
5/17	1	24.0	212.92	100.00 %	17	243	243	77.5%
5/18	1	24.0	217.94	100.00 %	10	143	143	80.0%
5/19	1	24.0	213.18	100.00 %	11	157	157	82.8%
5/20	1	24.0	208.28	100.00 %	13	186	186	86.2%
5/21	1	24.0	228.17	100.00 %	10	143	143	88.7%
5/22	1	24.0	228.01	100.00 %	6	86	86	90.3%
W23	1	24.0	227.75	100.00 %	11	157	157	93.1%
5/24	1	24.0	225.09	100.00 %	6	86	86	94.6%
5/25	1	24.0	261.27	84.28 %	4	57	68	95.1%
5/26	1	24.0	243.13	91.20 %	8	94	103	97.6%
5/27	1	24.0	208.07	100.00 %	6	75	75	99.0%
5/28	1	24.0	222.11	100.00 %	1	14	14	99.2%
5/29	1	24.0	233.81	94.42 %	1	14	15	99.5%

\*\*\*\*\* CONTINUED \*\*\*\*\*

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM

\* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* CHINDOOK 1'S \* \* \*

A-7T-3 SP CHINOOK LOT ID # 85036-02 12,451 RELEASED AT: BELOW PRST RAPI FROM: 4/20/85 TO 4/20/85  
AGENCY: USFWS HATCHERY: WINTHROP NFH

ATE	.. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	(4) INDEX CUMULATIVE
985	SC-ID-GW-HRS						

\*\*\*\*\* CONTINUED \*\*\*\*\*

5/30	1	24.0	257.76	86.20 %	1	13	15	99.8%
5/31	2	22.0	260.76	84.66 %	0 *	0 *	0 *	99.8%
5/31	10	0.0	220.78	99.45 x	0 *	0 *	0 *	99.8%
5/01	1	26.0	224.90	98.51 %	0	0	0	99.8%
5/02	1	24.0	223.18	100.00 x	1	13	13	100.0%
<b>TOTAL</b>					<b>387</b>	<b>5,235</b>	<b>5,601</b>	

- 1) Sample parameters: SC = Sample quality code ID = Number of accumulated days for sample  
GW = Number of gatewells saw led Hrs = Number of hours sampled
- 2) River Flow: Data acquired from Corps data site - MCN
- 3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- 4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- 5) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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\*\*\*\*\*

MCNARY

\* \* \*

STEELHEAD

\* \* \*

u-M-1 su STEELHEAD LOT ID # 85163-01

4,041

RELEASED AT: BELOW PRST RAPI

FROM: 5/10/85 TO 5/10/85

AGENCY: WDG

HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX CUMULATIVE
1985	SC-#D-GW-HS.S	FLOW	FLOW				
5/13	1 24.0	238486	93.39 x	6	88	94	4.
5/14	1 24.0	220.75	100.00 x	12	171	171	12.
5/15	1 24.0	234.10	93.53 x	21	300	321	26.
5/16	1 24.0	225.04	81.94 x	19	224	273	39.
5/17	1 24.0	212.92	100.00 x	15	214	214	484
5/18	1 24.0	217.94	100.00 x	6	86	86	52.
5/19	1 24.0	213.18	100.00 x	8	114	114	57.
5/20	1 24.0	208.28	100.00 x	4	57	57	60
5/21	1 24.0	228.17	100.00 x	5	71	71	63
5/22	1 24.0	228.01	100.00 x	9	129	129	69
5/23	1 24.0	227.75	100.00 x	8	114	114	74
5/24	1 24.0	225.09	100.00 x	6	86	86	78
5/25	1 24.0	261.27	84.28 x	5	71	84	82
5/26	1 24.0	243.13	91.20 x	7	82	90	86
5/27	1 24.0	208.07	100.00 x	4	50	50	88
5/28	1 24.0	222.11	100.00 x	4	57	57	91
5/29	1 24.0	233.81	94.42 x	2	29	31	92
5/30	1 24.0	257.16	86.20 x	2	25	29	94
5/31	2 22.0	260.70	84.66 x	1 *	36 *	43 *	96
5/31	10 0.0	220.78	99.45 x	2 *	2 *	2 *	96
6/01	1 26.0	224.90	98.51 x	0	0	0	96
6/02	1 24.0	223.18	100.00 x	0	0	0	96
6/03	1 24.0	213.99	100.00 x	1	14	14	96
6/04	1 24.0	236.00	100.00 x	1	14	14	96
6/05	1 24.0	182.95	100.00 x	1	14	14	96
6/06	1 24.0	196.81	100.00 x	2	29	29	96
6/07	1 24.0	211.60	100.00 x	1	14	14	10

\*\*\*\*\* CONTINUED \*\*\*\*\*



NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE WTA SYSTEM  
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MCNARY

\* \* \*

STEELHEAD

\* \* \*

LA-7K-3 GU STEELHEAD LOT ID # 85163-02

4,058 RELEASED AT: BELOW PRST RAPI  
AGENCY: WDG

FROM: 5/11/85 T O 5/11/85  
HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS .. 1985 SC--#D--GW--HRS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE	
5/14	1	24.0	220.75	100.00 %	1	14	14	0.9%
5/15	1	24.0	234.10	93.53 %	7	100	107	8.1%
5/16	1	24.0	225.04	81.94 %	14	165	201	21.6%
5/17	1	24.0	212.92	100.00 %	15	214	214	35.9%
5/18	1	24.0	217.94	100.00 %	9	129	129	44.6%
5/19	1	24.0	213.18	100.00 %	3	43	43	47.5%
5/20	1	24.0	208.28	100.00 x	4	57	57	51.3%
5/21	1	24.0	228.17	100.00 %	4	57	57	55.1%
5/22	1	24.0	228.01	100.00 %	10	143	143	64.7%
5/23	1	24.0	227.75	100.00 %	4	57	57	68.5%
5/24	1	24.0	225.09	100.00 %	6	86	06	74.3%
5/25	1	24.0	261.27	84.28 %	3	43	51	77.7%
5/26	1	24.0	243.13	91.20 %	6	71	78	82.9%
5/27	1	24.0	208.07	100.00 x	4	50	50	86.3%
5/28	1	24.0	222.11	100.00 %	2	29	29	88.2%
5/29	1	24.0	233.81	94.42 %	4	57	60	92.2x
5/30	1	24.0	257.16	86.20 %	3	38	44	95.2%
5/31	2	22.0	260.70	84.66 %	0 *	0n	0 *	95.2%
5/31	10	0.0	220.78	99.45 %	2 *	2 *	2 *	95.3%
6/01	1	26.0	224.90	98.51 x	0	0	0	95.3%
6/02	1	24.0	223.18	100.00 %	1	13	13	96.2%
6/03	1	24.0	213. W	100.00 %	3	43	43	99.1%
6/04	1	24.0	236.00	100.00 x	1	14	14	100.0%
<b>TOTAL</b>					106	1,425	1,422	

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs= Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1 )

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
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MCNARY

\* \* \*

STEELHEAD

\* \* \*

LD-7K-1 SU STEELHEAD LOT ID # 85163-W

4,038

RELEASED AT: BELOW PRST WI  
AGENCY: WDG

FROM: 5/15/85 TO 5/15/85  
HATCHERY: WELLS-WDG

DATE	SAMPLE (1)		(2)	(3)	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE	
	SC	GD	GW	HR					INDEX FLOW
5/17	1		24.0	212.92	100.00 %	3	43	43	2.6X
5/18	1		24.0	217.94	100.00 %	11	157	157	12.2%
5/19	1		24.0	213.18	100.00 %	12	171	171	22.7X
5/20	1		24.0	208.28	100.00 %	11	157	157	32.3%
5/21	1		24.0	228.17	100.00 %	12	171	171	42.8X
5/22	1		24.0	228.01	100.00 %	16	229	229	56.8X
5/23	1		24.0	227.75	100.00 %	4	57	57	60.2%
5/24	1		24.0	225.09	100.00 %	2	29	29	62.0X
5/25	1		24.0	261.27	84.28 %	9	129	153	71.4X
5/26	1		24.0	243.13	91.20 %	13	153	168	81.7X
5/27	1		24.0	208.07	100.00 %	8	100	100	87.8%
5/28	1		24.0	222.11	100.00 %	3	43	43	90.4X
5/29	1		24.0	233.81	94.42 %	0	0	0	90.4X
5/30	1		24.0	257.16	86.20 %	0	0	0	90.4%
5/31	2		22.0	260.70	84.66 %	1 *	36 *	43 *	93.0%
5/31	10		0.0	220.78	99.45 %	1 *	1 *	1 *	93.1X
6/01	1		26.0	224190	98.51 %	0	0	0	93.1X
6/02	1		24.0	223.18	100.00 %	2	27	27	94.7%
6/03	1		24.0	213.W	100.00 %	3	43	43	97.4%
6/04	1		24.0	236.00	100.00 %	1	14	14	98.2X
6/05	1		24.0	182.95	100.00 %	0	0	0	98.2%
6/06	1		24.0	196.81	100.00 %	2	29	29	100.0%
<b>TOTAL</b>						<b>114</b>	<b>1,589</b>	<b>1,635</b>	

- (1) Sample parameters: SC = Sample quality code      GD = Number of accumulated days for sample  
 GW = Number of gatewells sampled      Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*): Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
 FISH PASSAGE DATA SYSTEM  
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MCNARY

\* \* \*

STEELHEAD

\* \* \*

LD-7K-3 SU STEELHEAD LOT ID # 85163-05      4,022      RELEASED AT: BELOW FRST RAPI      FROM: 5/16/85 T O 5/16/85  
 AGENCY: WDG      HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC--#D--GW--HRS						
5/19	1      24.0	213.18	100.00 %	2	29	29	1.9%
5/20	1      24.0	208.28	100.00 %	7	100	100	8.6%
5/21	1      24.0	228.17	100.00 x	12	171	171	20.1%
5/22	1      24.0	228.01	100.00 %	15	214	214	34.5X
5/23	1      24.0	227.75	100.00 %	6	86	86	40.2X
5/24	1      24.0	225.09	100.00 %	11	157	157	50.7X
5/25	1      24.0	261.27	84.28 x	10	143	170	62.1%
5/26	1      24.0	243.13	91.20 %	9	106	116	69.9X
5/27	1      24.0	208.07	100.00 %	1	13	13	70.8%
5/28	1      24.0	222.11	100.00 %	1	14	14	71.7%
5/29	1      24.0	233.81	94.42 %	2	29	31	73.8%
5/30	1      24.0	257.16	86420 %	5	63	73	78.7%
5/31	2      22.0	260.70	84.66 %	1 *	36 *	43 *	81.6%
5/31	10      0.0	220.78	99.45 %	2 *	2 *	2 *	81.7%
6/01	1      26.0	224.90	98.51 %	1	50	51	85.1%
6/02	1      24.0	223.18	100.00 %	8	107	107	92.3%
6/03	1      24.0	213.99	100.00 x	2	29	29	94.2%
6/04	1      24.0	236.00	100.00 %	1	14	14	95.2X
6/05	1      24.0	182.95	100.00 %	0	0	0	95.2%
6/06	1      24.0	196.81	100.00 x	0	0	0	95.2X
6/07	1      24.0	211.60	100.00 %	2	29	29	97.1%
6/08	1      24.0	193.64	100.00 x	2	29	29	99.1X
6/09	1      24.0	203.05	100.00 %	1	14	14	100.0%
TOTAL				01	1,435	1,492	

(1) Sample parameters:      SC = Sample quality code      #D = Number of accumulated days for sample  
    GW = Number of gatewells sampled      Hrs = Number of hours sampled  
 (2) River Flow:      Data acquired from Corps data site - MCN  
 (3) Index Flow:      \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*  
 (4) Passage Index:      Calculated as the (number collected) / (100 \* percent index flow)  
 (\*)      Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* STEELHEAD \* \* \*

A-M-1 SU STEELHEAD LOT ID # 85163-03 4,041 RELEASED AT: BELOW PRST RAPI FROM: 5/13/85 TO 5/13/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS .. SC--ID--GW--HR.S	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	(4) ... PASSAGE INDEX ...		
						DAILY COUNT	CUMULATIVE	
5/16	1	24.0	225.04	81.94 %	1	12	15	0.8%
5/17	1	24.0	212.92	100.00 %	29	414	414	24.3%
5/18	1	24.0	217.94	100.00 %	19	271	271	39.7%
5/19	1	24.0	213.18	100.00 %	9	129	129	47.0%
5/20	1	24.0	208.28	100.00 %	8	114	114	53.4%
5/21	1	24.0	228.17	100.00 %	14	200	200	64.8%
5/22	1	24.0	228.01	100.00 %	7	100	100	70.4%
5/23	1	24.0	227.75	100.00 %	5	71	71	74.4%
5/24	1	24.0	225.09	100.00 %	3	43	43	76.9%
5/25	1	24.0	261.27	84428 x	8	114	135	84.5%
5/26	1	24.0	243.13	91.20 %	2	24	26	8610%
5/27	1	24.0	208.07	100.00 %	6	75	75	90.3%
5/28	1	24.0	222.11	100.00 %	3	43	43	92.7%
5/29	1	24.0	233.81	94.42 %	1	14	15	93.5%
5/30	1	24.0	257.16	86.20 %	1	13	15	94.4%
5/31	2	22.0	260.70	84.66 %	0 *	0 *	0 *	94.4%
5/31	10	0.0	220.78	99.45 %	1 *	1 *	1 *	94.4%
5/01	1	26.0	224.90	98.51 x	0	0	0	94.4%
5/02	1	24.0	223.18	100.00 %	1	13	13	95.2%
5/03	1	24.0	213.99	100.00 %	1	14	14	96.0%
5/04	1	24.0	236.00	100.00 %	2	29	29	97.6%
5/05	1	24.0	182.95	100.00 %	1	14	14	98.4%
5/06	1	24.0	196.81	100.00 %	0	0	0	98.4%
5/07	1	24.0	211.60	100.00 %	1	14	14	99.2%
5/08	1	24.0	193.64	100.00 %	1	14	14	100.0%

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NATIONAL MARINE FISHERIES SERVICE  
 FISH PASSAGE DATA SYSTEM  
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MCNARY \* \* \* STEELHEAD \* \* \*

RA-7K-1 SU STEELHEAD 101 ID # 85163-03 4,041 RELEASED AT: ~~III-III~~ PRST RAPI FROM: 5/13/85 1 0 5/13/85  
 AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER	(3) INDEX	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	(4) INDEX ... CUMULATIVE
1985	SC-#D-GW-HRS	FLOW	FLOW				

\*\*\*\*\* CONTINUED \*\*\*\*\*

TOTAL ----- 124 ----- 1,736 ----- 1,765 -----

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
 GW = Number of gatewells sampled Hrs= Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* STEELHEAD \* \* \*

RD-7K-1 SU STEELHEAD LOT ID # 85163-06 4,047 RELEASED AT: BELOW PRST RAPI FROM: 5/17/85 TO 5/17/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-ID-GW-UB.S	-----	-----	-----	-----	-----	-----
5/21	1 24.0	228.17	100.00 X	13	186	186	9.4%
5/22	1 24.0	228.01	100.00 X	19	271	271	23.2%
5/23	1 24.0	227.75	100.00 X	19	271	271	36.9%
5/24	1 24.0	225.09	100.00 x	15	214	214	47.8%
5/25	1 24.0	261.27	84.428 X	14	200	237	59.8%
5/26	1 24.0	243.13	91.20 X	18	212	232	71.6%
5/27	1 24.0	208.07	100.00 X	7	88	88	76.0%
5/28	1 24.0	222.11	100.00 X	4	57	57	78.9%
5/29	1 24.0	233.81	94.42 X	5	71	75	82.7%
5/30	1 24.0	257.16	86.20 X	3	38	44	84.9%
5/31	2 22.0	260.70	84.66 X	2 *	73 *	86 *	89.3%
5/31	10 0.0	220.78	99.45 X	4 *	4 *	4 *	89.5%
6/01	1 26.0	224.90	98.51 X	1	50	51	92.1%
6/02	1 24.0	223.18	100.00 X	1	13	13	92.7%
6/03	1 24.0	213.99	100.00 X	2	29	29	94.2%
6/04	1 24.0	236.00	100.00 X	1	14	14	94.9%
6/05	1 24.0	182.95	100.00 X	3	43	43	97.1%
6/06	1 24.0	196.81	100.00 X	2	29	29	98.6%
6/07	1 24.0	211.60	100.00 X	0	0	0	98.6%
6/08	1 24.0	193.64	100.00 X	1	14	14	99.3%
6/09	1 24.0	203.05	100.00 X	0	0	0	99.3%
6/10	1 24.0	210.63	100.00 X	0	0	0	99.3%
6/11	1 24.0	218.02	100.00 X	1	14	14	100.0%

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NATIONAL MARINE FISHERIES SERVICE  
 FISH PASSAGE DATA SYSTEM  
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MCNARY \* \* \* STEELHEAD \* \* \*

RD-7K-1 SU STEELHEAD LOT ID # 85163-06 4,047 RELEASED AT: BELOW PRST RAPI FROM: 5/17/85 T O 5/17/85  
 AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER	(3) INDEX	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT	(4) INDEX ... CUMULATIVE
1985	SC-#D-GW-HRS	FLOW	FLOW				

\*\*\*\*\* CONTINUED \*\*\*\*\*

TOTAL ----- 135 1,891 1,972

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
 GW = Number of gateways sampled Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)



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\* authorization and/or clearance \*  
\*\*\*\*\*

MCNARY \* \* \* STEELHEAD \* \* \*

RA-7N-1 SU STEELHEAD LOT ID # 85166-01 19,963 RELEASED AT: BELOW LIGOOSE FROM: 5/06/85 TO 5/06/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-D-GW-HRS						

\*\*\*\*\* CONTINUED \*\*\*\*\*

6/13	2	21 to	217.08	100.00 %	2 *	67 *	67 *	97.7%
6/13	10	0.0	180.89	100.00 %	4 *	4 *	4 *	97.8%
6/14	1	27.0	184.50	100.00 %	1	33	33	98.3%
6/15	1	24.0	176.92	100.00 %	0	0	0	98.3%
6/16	1	24.0	179.20	100.00 %	2	29	29	98.7%
6/17	1	24.0	183.76	100.00 %	1	14	14	98.9%
6/18	1	24.0	170.52	100.00 %	0	0	0	98.9%
6/19	1	24.0	204.46	100.00 %	0	0	0	98.9%
6/20	1	24.0	201.23	100.00 %	1	14	14	99.1%
6/21	1	24.0	189.82	100.00 %	1	14	14	99.3%
6/22	1	24.0	184.08	100.00 %	0	0	0	99.3%
6/23	1	24.0	138.31	100.00 %	1	14	14	99.5%
6/24	1	24.0	157.00	100.00 %	0	0	0	99.5%
6/25	1	24.0	155.94	100.00 %	0	0	0	99.5%
6/26	1	24.0	154.78	100.00 %	0	0	0	99.5%
6/27	1	24.0	154.16	100.00 %	0	0	0	99.5%
6/28	1	24.0	152.23	100.00 %	0	0	0	99.5%
6/29	1	24.0	132.98	100.00 %	1	14	14	99.7%
6/30	1	24.0	131.17	100.00 %	0	0	0	99.7%
7/01	1	24.0	144.13	100.00 %	0	0	0	99.7%
7/02	1	24.0	139.01	100.00 %	0	0	0	99.7%
7/03	1	24.0	164.86	100.00 %	0	0	0	99.7%
7/04	1	24.0	147.66	100.00 %	0	0	0	99.7%
7/05	1	24.0	120.52	100.00 %	0	0	0	99.7%
7/06	1	24.0	118.49	100.00 %	0	0	0	99.7%
7/07	1	24.0	103.75	100.00 %	0	0	0	99.7%
7/08	1	24.0	138.07	100.00 %	0	0	0	99.7%
7/09	1	24.0	108.65	100.00 %	0	0	0	99.7%
7/10	1	24.0	116.53	100.00 %	0	0	0	99.7%
7/11	1	24.0	109.58	100.00 %	0	0	0	99.7%
7/12	1	24.0	105.28	100.00 %	0	0	0	99.7%
7/13	1	24.0	105.79	100.00 %	1	21	21	100.0%

\*\*\*\*\* CONTINUED \*\*\*\*\*

NATIONAL MARINE FISHERIES SERVICE  
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MCNARY \* \* \* STEELHEAD \* \* \*

RA-7N-1 SJ STEELHEAD LOT ID † 85166-01 19,983 f&EASED AT: BELOW LI GOOSE FROM: 5/06/85 TO 5/06/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER	(3) INDEX	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT	(4) CUMULATIVE
1985	SC-GW-HRS	FLOW	FLOW				

\* \* \* \* \* C O N T I N U E D \* \* \* \* \*

TOTAL ----- 490 ----- 6,528 ----- 6,912 -----

- (1) Sample parameters: SC = Sample quality code CD = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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\*\*\*\*\*

MCNARY

\* \* \*

STEELHEAD

\* \* \*

RA-7N-3 SU STEELHEAD LOT ID # 85166-02

19,906 RELEASED AT: BELOW LI GOOSE

FROM: 5/10/85 TO 5/10/85

AGENCY: WDG

HATCHERY: LYONS FERRY

DATE	SAMPLE (1)				(2)		(3)		(4)	
	SC	TD	GW	HR.S	RIVER FLOW	INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	DAILY COUNT	PASSAGE INDEX CUMULATIVE
1985										
5/17	1	24.0	212.92	100.00 %	4	57	57	0.8%		
5/18	1	24.0	217.94	100.00 %	17	243	243	4.5%		
5/19	1	24.0	213.18	100.00 %	15	214	214	7.6%		
5/20	1	24.0	208.28	100.00 %	14	200	200	1016%		
5/21	1	24.0	228.17	100.00 %	18	257	257	14.4%		
5/22	1	24.0	228.01	100.00 %	34	486	486	21.7%		
5/23	1	24.0	227.75	100.00 %	29	414	414	27.8%		
5/24	1	24.0	225.09	100.00 %	26	371	371	33.4%		
5/25	1	24.0	261.27	84.28 %	33	471	559	41.7%		
5/26	1	24.0	243.13	91.20 %	32	376	412	47.8%		
5/27	1	24.0	208.07	100.00 %	26	325	325	52.6%		
5/28	1	24.0	222.11	100.00 %	15	214	214	55.8%		
5/29	1	24.0	233.81	94.42 %	29	414	438	62.3%		
5/30	1	24.0	257.16	86.20 %	18	225	261	66.2%		
5/31	2	22.0	260.70	84.66 %	3 *	109 *	129 *	68.1%		
5/31	10	0.0	220.78	99.45 %	33 *	33 *	33 *	68.6%		
6/01	1	26.0	224.90	98.51 %	3	150	152	70.9%		
6/02	1	24.0	223.18	100.00 %	14	187	187	73.7%		
6/03	1	24.0	213.99	100.00 %	16	229	229	77.1%		
6/04	1	24.0	236.00	100.00 %	11	157	157	79.4%		
6/05	1	24.0	182.95	100.00 %	12	171	171	82.0%		
6/06	1	24.0	196.81	100.00 %	14	200	200	84.9%		
6/07	1	24.0	211.60	100.00 %	10	143	143	87.1%		
6/08	1	24.0	193.64	100.00 %	6	86	86	88.3%		
6/09	1	24.0	203.05	100.00 %	5	71	71	89.4%		
6/10	1	24.0	210.63	100.00 %	3	43	43	90.0%		
6/11	1	24.0	218.02	100.00 %	9	129	129	92.0%		
6/12	1	24.0	195.52	100.00 %	10	143	143	94.1%		
6/13	2	21.0	217.08	100.00 %	4 *	133 *	133 *	96.1%		
6/13	10	0.0	180.89	100.00 %	3 *	3 *	3 *	96.1%		
6/14	1	27.0	184.50	100.00 %	1	33	33	96.6%		
6/15	1	24.0	176.92	100.00 %	3	43	43	97.2%		
6/16	1	24.0	179.20	100.00 %	2	29	29	97.7%		
6/17	1	24.0	183.76	100.00 %	2	29	29	98.1%		

\*\*\*\*\* CONTINUED \*\*\*\*\*

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MCNARY \* \* \* STEELHEAD \* \* \*

RA-7N-3 SU STEELHEAD LOT I D # 85166-02 19,906 RELEASED AT: BELOW LI GOOSE FROM: 5/10/85 T O 5/10/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) PARAMETERS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX . * CUMULATIVE
1985	SC-#D-GW-HB.S						

\*\*\*\*\* CONTINUED \*\*\*\*\*

6/18	1	24.0	170.52	100.00 %	1	14	14	98.3%
6/19	1	24.0	204.46	100.00 %	0	0	0	98.3%
6/20	1	24.0	201.23	100.00 %	2	29	29	98.7%
6/21	1	24.0	189.82	100.00 %	1	14	14	98.9%
6/22	1	24.0	184.08	100.00 %	2	29	29	99.4%
6/23	1	24.0	138.31	100.00 %	0	0	0	99.4%
6/24	1	24.0	157.00	100.00 %	0	0	0	99.4%
6/25	1	24.0	155.94	100.00 %	0	0	0	99.4%
6/26	1	24.0	154.78	100.00 %	0	0	0	99.4%
6/27	1	24.0	154.16	100.00 %	0	0	0	99.4%
6/28	1	24.0	152.23	100.00 %	0	0	0	99.4%
6/29	1	24.0	132.98	100.00 %	0	0	0	99.4%
6/30	1	24.0	131.17	100.00 %	0	0	0	99.4%
7/01	1	24.0	144.13	100.00 %	0	0	0	99.4%
7/02	1	24.0	139.01	100.00 %	0	0	0	99.4%
7/03	1	24.0	164.86	100.00 %	1	14	14	99.6%
7/04	1	24.0	147.66	100.00 %	0	0	0	99.6%
7/05	1	24.0	120.52	100.00 %	0	0	0	99.6%
7/06	1	24.0	118.49	100.00 %	0	0	0	99.6%
7/07	1	24.0	103.75	100.00 %	0	0	0	99.6%
7/08	1	24.0	138.07	100.00 %	0	0	0	99.6%
7/09	1	24.0	108.65	100.00 %	0	0	0	99.6%
7/10	1	24.0	116.53	100.00 %	0	0	0	99.6%
7/11	1	24.0	109.58	100.00 %	0	0	0	99.6%
7/12	1	24.0	105.28	100.00 %	0	0	0	99.6%
7/13	1	24.0	105.79	100.00 %	0	0	0	99.6%
7/14	1	24.0	100.93	100.00 %	0	0	0	99.6%
7/15	1	24.0	84.63	100.00 %	0	0	0	99.6%
7/16	1	24.0	85.46	100.00 %	0	0	0	99.6%
7/17	1	24.0	105.94	100.00 %	0	0	0	99.6%
7/18	1	24.0	121.82	100.00 %	0	0	0	99.6%
7/19	1	24.0	117.51	100.00 %	0	0	0	99.6%
7/20	1	24.0	104.98	100.00 %	0	0	0	99.6%
7/21	1	24.0	101.26	100.00 %	1	14	14	99.8%
7/22	1	24.0	87.47	100.00 %	0	0	0	99.8%

\*\*\*\*\* CONTINUED \*\*\*\*\*

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MCNARY \* \* \* STEELHEAD \* \* \*

RA-7N-3 SU STEELHEAD LOT ID # 85166-02 19,906 RELEASED AT: BELOW LI GOOSE FROM: 5/10/85 TO 5/10/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	.. SAMPLE (1) .. SC-#D-GW-HRS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
* * * * * C O N T I N U E D * * * * *							
7/23	1 24.0	90.48	100.00 %	0	0	0	99.8%
7/24	1 24.0	94.51	100.00 %	0	0	0	99.8%
7/25	1 24.0	108.61	100.00 %	0	0	0	99.8%
7/26	1 24.0	92.51	100.00 %	1	14	14	100.0%
<b>TOTAL</b>				<b>483</b>	<b>6,516</b>	<b>A L</b>	<b>- - -</b>

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled  
(2) River Flow: Rate acquired from Corps data site - MCN  
(3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*  
(4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)  
(\*) Sample deviates from "normal" conditions (i.e. SC code > 1)



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MCNARY \* \* \* STEELHEAD \* \* \*

LA-7S-1 SJ STEELHEAD LOT ID # 85167-01 4,076 RELEASED AT: BELOW ICE HARBR FROM: 5/08/85 T O 5/08/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC--#D--GW--HRS	FLOW	FLOW				
***** CONTINUED *****							
6/12	1 24.0	195.52	100.00 %	0	0	0	98.8%
6/13	2 21.0	217.08	100.00 %	0 *	0 *	0 *	98.8%
6/13	10 0.0	180.89	100.00 %	1 *	1 *	1 *	98.9%
6/14	1 27.0	184.50	100.00 %	0	0	0	98.9%
6/15	1 24.0	176.92	100.00 %	0	0	0	98.9%
6/16	1 24.0	179.20	100.00 %	1	14	14	100.0%
<b>TOTAL</b>				<b>92</b>	<b>1,155</b>	<b>1,263</b>	

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs= Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1 )

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\*\*\*\*\*

MCNARY \* \* \* STEELHEAD \* \* \*

LA-7S-3 SU STEELHEAD LOT ID # 85167-02 3,755 RELEASED AT: BELOW ICE HARBR FROM: 5/09/85 T O 5/09/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS .. SC--SD--GW--HR.S	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX DAILY COUNT	(4) CUMULATIVE	
5/12	1	24.0	249.25	84.34 %	10	105	124	10.5%
5/13	1	24.0	238.86	93.39 %	9	132	141	22.5%
5/14	1	24.0	220.75	100.00 %	0	0	0	22.5%
5/15	1	24.0	234.10	93.53 %	4	57	61	27.7%
5/16	1	24.0	225.04	81.94 %	4	47	57	32.5%
5/17	1	24.0	212.92	100.00 %	10	143	143	44.7%
5/18	1	24.0	217.94	100.00 %	9	129	129	55.6%
5/19	1	24.0	213.18	100.00 %	4	57	57	60.4%
5/20	1	24.0	208.28	100.00 %	4	57	57	65.3%
5/21	1	24.0	228.17	100.00 %	2	29	29	67.7%
5/22	1	24.0	228.01	100.00 %	4	57	57	72.6%
5/23	1	24.0	227.75	100.00 %	2	29	29	75.0%
5/24	1	24.0	225.09	100.00 %	1	14	14	76.2%
5/25	1	24.0	261.27	84.28 %	0	0	0	76.2%
5/26	1	24.0	243.13	91.20 %	2	24	26	78.4%
5/27	1	24.0	208.07	100.00 %	2	25	25	90.4%
5/28	1	24.0	222.11	100.00 %	2	29	29	83.0%
5/29	1	24.0	233.81	94.42 %	5	71	75	89.4%
5/30	1	24.0	257.16	86.20 %	0	0	0	89.4%
5/31	2	22.0	260.70	84.66 %	0 *	0 *	0 *	89.4%
5/31	10	0.0	220.78	99.45 %	0 *	0 *	0 *	89.4%
6/01	1	26.0	224.90	98.51 %	0	0	0	89.4%
6/02	1	24.0	223.18	100.00 %	2	27	27	91.7%
6/03	1	24.0	213.99	100.00 %	1	14	14	92.9%
6/04	1	24.0	236.00	100.00 %	1	14	14	94.1%
6/05	1	24.0	182.95	100.00 %	0	0	0	94.1%
6/06	1	24.0	196.81	100.00 %	1	14	14	95.2%
6/07	1	24.0	211.60	100.00 %	1	14	14	96.4%
6/08	1	24.0	193.64	100.00 %	1	14	14	97.6%
6/09	1	24.0	203.05	100.00 %	0	0	0	97.6%
6/10	1	24.0	210.63	100.00 %	0	0	0	97.6%
6/11	1	24.0	218.02	100.00 %	0	0	0	97.6%
6/12	1	24.0	195.52	100.00 %	1	14	14	98.8%

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MCNARY \* \* \* STEELHEAD \* \* \*

LA-75-3 SU STEELHEAD LOT ID # 85167-02 3,755 RELEASED AT: BELOW ICE HARBR FROM: 5/09/85 T O 5/09/85  
 AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-#D-GW-HRS	FLOW	FLOW				

\* \* \* \* \* C O N T I N U E D \* \* \* \* \*

6/13	2	21.0	217.08	100.00 %	0 *	0 *	0 *	98.8X
6/13	10	0.0	180.89	100.00 %	0 *	0 *	0 *	98.8X
6/14	1	27.0	184.50	100.00 %	0	0	0	98.8%
6/15	1	24.0	176.92	100.00 %	0	0	0	98.8X
6/16	1	24.0	179.20	100.00 %	0	0	0	98.8X
6/17	1	24.0	183.76	100.00 %	0	0	0	98.8X
6/18	1	24.0	170.52	100.00 %	0	0	0	98.8%
6/19	1	24.0	204.46	100.00 %	0	0	0	98.8%
6/20	1	24.0	201.23	100.00 %	0	0	0	98.8X
6/21	1	24.0	189.82	100.00 %	0	0	0	98.8X
6/22	1	24.0	184.08	100.00 %	0	0	0	98.8X
6/23	1	24.0	138131	100.00 %	0	0	0	98.8%
6/24	1	24.0	157.00	100.00 %	0	0	0	98.8X
6/25	1	24.0	155.94	100.00 %	0	0	0	98.8X
6/26	1	24.0	154.78	100.00 %	0	0	0	98.8%
6/27	1	24.0	154.16	100.00 %	0	0	0	98.8%
6/28	1	24.0	152.23	100.00 %	0	0	0	98.8%
6/29	1	24.0	132.98	100.00 %	0	0	0	98.8X
6/30	1	24.0	131.17	100.00 %	0	0	0	98.8%
7/01	1	24.0	144.13	100.00 %	0	0	0	98.8%
7/02	1	24.0	139.01	100.00 %	0	0	0	98.8X
7/03	1	24.0	164.86	100.00 %	1	14	14	100.0X
<b>TOTAL</b>					83	1,130	1,178	

- (1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
 GW = Number of gatewells sampled Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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\*\*\*\*\*

MCNARY \* \* \* STEELHEAD \* \* \*

LD-7S-1 SU STEELHEAD LOT ID # 85167-04 4,050 RELEASED AT: BELOW ICE HARBR FROM: 5/13/85 TO 5/13/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-SD-GW-HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE
5/16	1 24.0	225.04	81.94 %	8	94	115	10.4%
5/17	1 24.0	212.92	100.00 %	6	86	86	18.3%
5/18	1 24.0	217.94	100.00 %	15	214	214	37.7%
5/19	1 24.0	213.18	100.00 %	13	186	186	54.6%
5/20	1 24.0	208.28	100.00 %	3	43	43	58.5%
5/21	1 24.0	228.17	100.00 %	4	57	57	63.7%
5/22	1 24.0	228.01	100.00 %	0	0	0	63.7%
5/23	1 24.0	227.75	100.00 %	7	100	100	72.8%
5/24	1 24.0	225.09	100.00 %	5	71	71	79.2%
5/25	1 24.0	261.27	84.28 %	5	71	84	86.8%
5/26	1 24.0	243.13	91.20 %	1	12	13	88.0%
5/27	1 24.0	208.07	100.00 %	2	25	25	90.3%
5/28	1 24.0	222.11	100.00 %	0	0	0	90.3%
5/29	1 24.0	233.81	94.42 %	0	0	0	90.3%
5/30	1 24.0	257.16	86.20 %	0	0	0	90.3%
5/31	2 22.0	260.70	84.66 %	0 *	0 *	0 *	90.3%
5/31	10 0.0	220.78	99.45 %	0 *	0 *	0 *	90.3%
6/01	1 26.0	224.90	98.51 %	1	50	51	94.9%
6/02	1 24.0	223.18	100.00 %	1	13	13	96.1%
6/03	1 24.0	213.99	100.00 %	1	14	14	97.4%
6/04	1 24.0	236.00	100.00 %	0	0	0	97.4%
6/05	1 24.0	182.95	100.00 %	0	0	0	97.4%
6/06	1 24.0	196.81	100.00 %	0	0	0	97.4%
6/07	1 24.0	211.60	100.00 %	0	0	0	97.4%
6/08	1 24.0	193.64	100.00 %	0	0	0	97.4%
6/09	1 24.0	203.05	100.00 %	0	0	0	97.4%
6/10	1 24.0	210.63	100.00 %	1	14	14	98.6%
6/11	1 24.0	218.02	100.00 %	0	0	0	98.6%
6/12	1 24.0	195.52	100.00 %	0	0	0	98.6%
6/13	2 21.0	217.08	100.00 %	0 *	0 *	0 *	98.6%
6/13	10 0.0	180.89	100.00 %	1 *	1 *	1 *	98.7%
6/14	1 27.0	184.50	100.00 %	0	0	0	98.7%
6/15	1 24.0	176.92	100.00 %	0	0	0	98.7%

\*\*\*\*\* CONTINUED \*\*\*\*\*

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MCNARY \* \* \* STEELHEAD \* \* \*

LD-7S-1 SU STEELHEAD LOT ID # 85167-04 4,050 RELEASED AT: BELOW ICE HARBR FROM: 5/13/85 TO 5/13/85  
 AGENCY: WDG HATCHERY: LYONS FERRY

DATE	.. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ...	(4) DAILY COUNT CUMULATIVE
1985	SC-ID-GW-HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE

\*\*\*\*\* CONTINUED \*\*\*\*\*

6/16	1	24.0	179.20	100.00 %	0	0	0	98.7%
6/17	1	24.0	183.76	100.00 %	0	0	0	98.7%
6/18	1	24.0	170.52	100.00 %	0	0	0	98.7%
6/19	1	24.0	204.46	100.00 %	0	0	0	98.7%
6/20	1	24.0	201.23	100.00 %	1	14	14	100.0%
<b>TOTAL</b>					<b>75</b>	<b>1,045</b>	<b>1,101</b>	

- (1) Sample parameters: SC = Sample quality code ID = Number of accumulated days for sample  
 GW = Number of gatewells sampled Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

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MCNARY

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STEELHEAD

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LD-7S-3 SU STEELHEAD LOT I D 85167-05

4,020 RELEASED AT: BELOW ICE HARBR

FROM: 5/13/85 TO 5/13/85

AGENCY: WDG

HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC--#D--GW--HR.S						
5/17	1 24.0	212.92	100.00 %	7	100	100	12.4%
5/18	1 24.0	217.94	100.00 %	3	43	43	17.7%
5/19	1 24.0	213.18	100.00 %	6	86	86	28.3%
5/20	1 24.0	208.28	100.00 %	3	43	43	33.6%
5/21	1 24.0	228.17	100.00 %	4	57	57	40.7%
5/22	1 24.0	228101	100.00 %	0	0	0	40.7%
5/23	1 24.0	227.75	100.00 %	2	29	29	44.3%
5/24	1 24.0	225.09	100.00 %	8	114	114	58.3%
5/25	1 24.0	261.27	84.28 %	5	71	84	68.7%
5/26	1 24.0	243.13	91.20 %	3	35	38	73.4%
5/27	1 24.0	208.07	100.00 %	2	25	25	76.5%
5/28	1 24.0	222.11	100.00 %	1	14	14	78.2%
5/29	1 24.0	233.81	94.42 %	4	57	60	85.7%
5/30	1 24.0	257.16	86.20 %	3	38	44	91.1%
5/31	2 22.0	260.70	84.66 %	0 *	0 *	0 *	91.1%
5/31	10 0.0	220.78	99.45 %	2 *	2 *	2 *	91.3%
6/01	1 26.0	224.90	98.51 %	0	0	0	91.3%
6/02	1 24.0	223.18	100.00 %	2	27	27	94.7%
6/03	1 24.0	213.99	100.00 %	0	0	0	94.7%
6/04	1 24.0	236100	100.00 %	0	0	0	94.7%
6/05	1 24.0	182.95	100.00 %	0	0	0	94.7%
6/06	1 24.0	196.81	100.00 %	0	0	0	94.7%
6/07	1 24.0	211.60	100.00 %	1	14	14	96.4%
6/08	1 24.0	193.64	100.00 %	0	0	0	96.4%
6/09	1 24.0	203.05	100.00 %	0	0	0	96.4%
6/10	1 24.0	210.63	100.00 %	1	14	14	98.1%
6/11	1 24.0	218.02	100.00 %	0	0	0	98.1%
6/12	1 24.0	195.52	100.00 %	1	14	14	99.9%
6/13	2 21.0	217.08	100.00 %	0 *	0 *	0 *	99.9%
6/13	10 0.0	180.89	100.00 %	1 *	1 *	1 *	100.0%

\*\*\*\*\* CONTINUED \*\*\*\*\*

NATIONAL MARINE FISHERIES SERVICE  
**FISH PASSAGE DATA SYSTEM**  
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MCNARY \* \* \* STEELHEAD \* \* \*

LD-76-3 SU STEELHEAD LOT ID # 85167-05 4,020 RELEASED AT: BELOW ICE HARBR FROM: 5/13/85 T O 5/13/85  
 AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	(4) INDEX ... CUMULATIVE
1985	SC-ID-GW-HRS						

\*\*\*\*\* CONTINUED \*\*\*\*\*

TOTAL ----- 59 ----- 784 ----- 809 -----

- (1) Sample parameters: SC = Sample quality code ID = Number of accumulated days for sample  
 GW = Number of gatewells saw led Hrs= Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1 )



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MCNARY \*it\* STEELHEAD \* \* \*

RA-76-1 SU STEELHEAD LOT ID # 85167-03 4,159 RELEASED AT: BELOW ICE HARBR FROM: 5/10/85 TO 5/10/85  
AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX . DAILY COUNT	(4) CUMULATIVE
1985	SC-ID-GW-HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE
***** CONTINUED *****							
6/14	1	27.0	184.50	100.00 %	0	0	98.8%
6/15	1	24.0	176.92	100.00 %	0	0	98.6%
6/16	1	24.0	179.20	100.00 %	0	0	98.8%
6/17	1	24.0	183.76	100.00 %	0	0	98.8%
6/18	1	24.0	170.52	100.00 %	0	0	98.8%
6/19	1	24.0	204.46	100.00 %	0	0	98.8%
6/20	1	24.0	201.23	100.00 %	0	0	98.8%
6/21	1	24.0	189.82	100.00 %	0	0	98.8%
6/22	1	24.0	184.08	100.00 %	0	0	98.8%
6/23	1	24.0	138.31	100.00 %	0	0	98.8%
6/24	1	24.0	157.00	100.00 %	0	0	98.8%
6/25	1	24.0	155.94	100.00 %	0	0	98.8%
6/26	1	24.0	154.78	100.00 %	1	14	100.0%
<b>TOTAL</b>				86	1,104	1,157	

- (1) Sample parameters: SC = Sample quality code ID = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM

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MCNARY

\* \* \*

STEELHEAD

\* \* \*

RD-7S-1 SU STEELHEAD LOT ID # 85167-06

4,219 RELEASED AT: BELOW ICE HARBR

FROM: 5/14/85 T O 5/14/85

AGENCY: WIG

HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER	(3) INDEX	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC--#D--GW--HR.S	FLOW	FLOW				
5/17	1 24.0	212.92	100.00 %	10	143	143	12.3%
5/18	1 24.0	217.94	100.00 %	8	114	114	22.0%
5/19	1 24.0	213.18	100.00 %	11	157	157	35.5%
5/20	1 24.0	208.28	100.00 %	4	57	57	40.4%
5/21	1 24.0	228.17	100.00 %	4	57	57	45.3%
5/22	1 24.0	228.01	100.00 %	9	129	129	56.3%
5/23	1 24.0	227.75	100.00 %	9	129	129	67.4%
5/24	1 24.0	225.09	100.00 %	3	43	43	71.1%
5/25	1 24.0	261.27	84.28 %	3	43	51	75.5%
5/26	1 24.0	243.13	91.20 %	4	47	52	79.9%
5/27	1 24.0	208.07	100.00 %	1	13	13	81.0%
5/28	1 24.0	222.11	100.00 %	3	43	43	84.7%
5/29	1 24.0	233.81	94.42 %	1	14	15	86.40%
5/30	1 24.0	257.16	86.20 %	5	63	73	92.3%
5/31	2 22.0	260.70	84.66 %	0 *	0 *	0 *	92.3%
5/31	10 0.0	220.78	99.45 %	1 *	1 *	1 *	92.4%
6/01	1 26.0	224.90	98.51 %	0	0	0	92.4%
6/02	1 24.0	223.18	100.00 %	0	0	0	92.4%
6/03	1 24.0	213.99	100.00 %	1	14	14	93.6%
6/04	1 24.0	236.00	100.00 %	0	0	0	93.6%
6/05	1 24.0	182.95	100.00 %	0	0	0	93.6%
6/06	1 24.0	196.81	100.00 %	0	0	0	93.6%
6/07	1 24.0	211.60	100.00 %	1	14	14	94.8%
6/08	1 24.0	193.64	100.00 %	1	14	14	96.0%
6/09	1 24.0	203.05	100.00 %	0	0	0	96.0%
6/10	1 24.0	210.63	100.00 %	0	0	0	96.0%
6/11	1 24.0	218.02	100.00 %	1	14	14	97.2%
6/12	1 24.0	195.52	100.00 %	0	0	0	97.2%
6/13	2 21.0	217108	100.00 %	1 *	33 *	33 *	100.0%
6/13	10 0.0	180.89	100.00 %	0 *	0 *	0 *	100.0%

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MCNARY \* \* \* STEELHEAD \* \* \*

RD-7S-1 SU STEELHEAD LOT ID # 85167-06 4,219 RELEASED AT: BELOW ICE HARBR FROM: 5/14/85 T O 5/14/85  
 AGENCY: WDG HATCHERY: LYONS FERRY

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT CUMULATIVE
1985	SC-ID-GW-HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT CUMULATIVE

\*\*\*\*\* CONTINUED \*\*\*\*\*

TOTAL ----- 81 1,142 1,166 -----

- (1) Sample parameters: SC = Sample quality code #D = Number of accuatated days for sample  
 GW = Number of gatewells sampled Hrs= Number of hours sampled
- (2) River Flow: Data acquired from Corps data site - MCN
- (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- (4) Passage Index: Calculated as the (number collected) / (100 \* Percent index flow)
- (\*) Sample deviates from "normal" conditions (i.e. SC code > 1 )

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MCNARY

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STEELHEAD

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LD-7T-1 SJ STEELHEAD LOT ID # 85163-08

3,986 RELEASED AT: BELOW PRST RAPI FROM: 5/20/85 TO 5/20/85

AGENCY: WDG

HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC--FD--GW--UB.S						
5/23	1	24.0	227.75	100.00 %	6	86	86 5.0%
5/24	1	24.0	225.09	100.00 %	18	257	257 20.1%
5/25	1	24.0	261.27	84.28 %	27	386	458 47.0%
5/26	1	24.0	243.13	91.20 %	21	247	271 62.8%
5/27	1	24.0	208.07	100.00 %	8	100	100 68.7%
5/28	1	24.0	222.11	100.00 %	7	100	100 74.6%
5/29	1	24.0	233.81	94.42 %	10	143	151 83.4%
5/30	1	24.0	257.16	86.20 %	4	50	58 86.8%
5/31	2	22.0	260.70	84.66 %	1 *	36 *	43 * 89.3%
5/31	10	0.0	220.78	99.45 %	4 *	4 *	4 * 89.6%
6/01	1	26.0	224.90	98.51 %	1	50	51 92.6%
6/02	1	24.0	223.18	100.00 %	1	13	13 93.3%
6/03	1	24.0	213.99	100.00 %	2	29	29 95.0%
6/04	1	24.0	236.00	100.00 %	1	14	14 95.8%
6/05	1	24.0	182.95	100.00 %	0	0	0 95.8%
6/06	1	24.0	196.81	100.00 %	0	0	0 95.8%
6/07	1	24.0	211.60	100.00 %	2	29	29 97.5%
6/08	1	24.0	193.64	100.00 %	0	0	0 97.5%
6/09	1	24.0	203.05	100.00 %	0	0	0 97.5%
6/10	1	24.0	210.63	100.00 %	0	0	0 97.5%
6/11	1	24.0	218.02	100.00 %	1	14	14 98.4%
6/12	1	24.0	195.52	100.00 %	1	14	14 99.2%
6/13	2	21.0	217.08	100.00 %	0 *	0 *	0 * 99.2%
6/13	10	0.0	180.89	100.00 %	0 *	0 *	0 * 99.2%
6/14	1	27.0	184.50	100.00 %	0	0	0 99.2%
6/15	1	24.0	176.92	100.00 %	0	0	0 99.2%
6/16	1	24.0	179.20	100.00 %	0	0	0 99.2%
6/17	1	24.0	183.76	100.00 %	0	0	0 99.2%
6/18	1	24.0	170.52	100.00 %	0	0	0 99.2%
6/19	1	24.0	204.46	100.00 %	0	0	0 99.2%
6/20	1	24.0	201.23	100.00 %	0	0	0 99.2%
6/21	1	24.0	189.82	100.00 %	0	0	0 99.2%
6/22	1	24.0	184108	100.00 %	0	0	0 99.2%

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MCNARY \* \* \* STEELHEAD \* \* \*

RD-7T-3 SU STEELHEAD LOT ID # 85163-09 4,289 RELEASED AT: BELOW PRST RWI FROM: 5/22/85 TO 5/22/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS .. SC--TD--GW--HR.S	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX CUMULATIVE
5/25	1	24.0	261.27	84.20 %	5	71	64 7.0%
5/26	1	24.0	243.13	91.20 %	18	212	232 26.2%
5/27	1	24.0	208.07	100.00 %	19	238	238 45.9%
5/28	1	24.0	222.11	100.00 %	11	157	157 58.9%
5/29	1	24.0	233181	94.42 %	9	129	137 70.2%
5/30	1	24.0	257.16	86.20 %	4	50	58 75.0%
5/31	2	22.0	260.70	84.66 %	2 *	73 *	86 * 82.1%
5/31	10	0.0	220.78	99.45 %	9 *	9 *	9 * 82.9%
6/01	1	26.0	224.90	98.51 %	0	0	0 82.9%
6/02	1	24.0	223.18	100.00 %	6	80	80 89.5%
6/03	1	24.0	213.99	100.00 %	1	14	14 90.6%
6/04	1	24.0	236.00	100.00 %	3	43	43 94.2%
6/05	1	24.0	182.95	100.00 %	0	0	0 94.2%
6/06	1	24.0	196.81	100.00 %	1	14	14 55.4%
6/07	1	24.0	211.60	100.00 %	0	0	0 95.4%
6/08	1	24.0	193.64	100.00 %	0	0	0 95.4%
6/W	1	24.0	203.05	100.00 %	0	0	0 95.4%
6/10	1	24.0	210.63	100.00 %	1	14	14 96.5%
6/11	1	24.0	218.02	100.00 %	0	0	0 96.5%
6/12	1	24.0	195.52	100.00 %	1	14	14 97.7%
6/13	2	21.0	217.08	100.00 %	0 *	0 *	0 * 97.7%
6/13	10	0.0	180.89	100.00 %	0 *	0 *	0 * 97.7%
6/14	1	27.0	184.50	100.00 %	0	0	0 97.7%
6/15	1	24.0	176.92	100.00 %	0	0	0 97.7%
6/16	1	24.0	179.20	100.00 %	0	0	0 97.7%
6/17	1	24.0	183.76	100.00 %	0	0	0 97.7%
6/18	1	24.0	170.52	100.00 %	0	0	0 97.7%
6/19	1	24.0	204.46	100.00 %	1	14	14 98.8%
6/20	1	24.0	201.23	100.00 %	0	0	0 98.8%
6/21	1	24.0	189.82	100.00 %	0	0	0 98.8%
6/22	1	24.0	184.08	100.00 %	0	0	0 98.8%
6/23	1	24.0	138.31	100.00 %	0	0	0 98.6%
6/24	1	24.0	157.00	100.00 %	0	0	0 98.8%

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NATIONAL MARINE FISHERIES SERVICE  
 FISH PASSAGE WTA SYSTEM  
 \* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* STEELHEAD \* \* \*

RD-7T-3 SU STEELHEAD LOT ID # 85163-09 4,289 RELEASED AT: BELOW PRST RAPI FROM: 5/22/85 TO 5/22/85  
 AGENCY: WDG HATCHERY: WELLS-WDG

DATE	.. PARAMETERS ..	RIVER FLOW	INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ...	DAILY COUNT	CUMULATIVE
1985	SC-ID-GW-HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE	

\*\*\*\*\* CONTINUED \*\*\*\*\*

6/25	1	24.0	155.94	100.00 %	0	0	0	98.8%
6/26	1	24.0	154.78	100.00 %	1	14	14	100.0%
<b>TOTAL</b>					22	1,146	1,208	

(1) Sample parameters: SC = Sample quality code ID = Number of accumulated days for sample  
 GW = Number of gatewells sampled Hrs = Number of hours sampled  
 (2) River Flow: Data acquired from Corps data site - MCN  
 (3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*  
 (4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)  
 (\*) Sample deviates from "normal" conditions (i.e. SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* STEELHEAD \* \* \*

LA-7U-1 SU STEELHEAD LOT ID # 85152-03 30,378 RELEASED AT: METHOW R FROM: 5/14/85 TO 5/14/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) PARAMETERS	(2) RIVER	(3) INDEX	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE	
1985	SC--ID--GW--HR.S	----- FLOW	----- FLOW					
5123	1	24.0	227.75	100.00 %	2	29	29	0.4%
5/24	1	24.0	225.09	100.00 %	6	86	86	1.6%
5/25	1	24.0	261.27	84.28 %	13	186	221	4.8%
5/26	1	24.0	243.13	91.20 %	62	729	799	16.2%
5127	1	24.0	208.07	100.00 %	79	988	988	30.3%
5/28	1	24.0	222.11	100.00 %	61	871	871	42.7%
5129	1	24.0	233.81	94.42 %	58	829	878	55.2%
5/30	1	24.0	257.16	86.20 %	49	613	711	65.3%
5/31	2	22.0	260.70	84.66 %	10 *	364 *	430 *	71.4%
5/31	10	0.0	220.78	99.45 %	48 *	48 *	48 *	72.1%
6/01	1	26.0	224.90	98.51 %	9	450	457	78.6%
6102	1	24.0	223.18	100.00 %	20	267	267	82.4%
6103	1	24.0	213.99	100.00 %	12	171	171	84.9%
6104	1	24.0	236.00	100.00 %	16	229	229	88.1%
6105	1	24.0	182.95	100.00 %	11	157	157	90.4%
6/06	1	24.0	196.81	100.00 %	5	71	71	91.4%
6/07	1	24.0	211.60	100.00 %	12	171	171	93.8%
6/08	1	24.0	193.64	100.00 %	5	71	71	94.8%
6/09	1	24.0	203.05	100.00 %	3	43	43	95.5%
6110	1	24.0	210.63	100.00 %	1	14	14	95.7%
6111	1	24.0	218.02	100.00 %	5	71	71	96.7%
6112	1	24.0	195.52	100.00 %	3	43	43	97.3%
6113	2	21.0	217.08	100.00 %	1 *	33 *	33 *	97.7%
6113	10	0.0	180.89	100.00 %	3 *	3 *	3 *	97.8%
6114	1	27.0	184.50	100.00 %	0	0	0	97.0%
6/15	1	24.0	176.92	100.00 %	1	14	14	98.0%
6/16	1	24.0	179.20	100.00 %	0	0	0	98.0%
6117	1	24.0	183.76	100.00 %	3	43	43	98.6%
6118	1	24.0	170.52	100.00 %	0	0	0	98.6%
6119	1	24.0	204.46	100.00 %	0	0	0	98.6%
6/20	1	24.0	201.23	100.00 %	1	14	14	98.8%
6/21	1	24.0	189.82	100.00 %	1	14	14	99.0%
6/22	1	24.0	184.08	100.00 %	0	0	0	99.0%

\*\*\*\*\* CONTINUED \*\*\*\*\*

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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\*\*\*\*\*

MCNARY

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STEELHEAD

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LA-7U-1 SU STEELHEAD LOT ID # 85152-03

30,378 RELEASED AT: METHOW R  
AGENCY: WDG

FROM: 5/14/85 TO 5/14/85  
HATCHERY: WELLS-WDG

DATE	SAMPLE (1) PARAMETERS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT	CUMULATIVE
1985	SC--FD--GW--HR.S	----	-----	-----	-----	-----	-----

\*\*\*\*\* CONTINUED \*\*\*\*\*

6/23	1	24.0	138.31	100.00 x	0	0	0	99.0%
6/24	1	24.0	157.00	100.00 x	0	0	0	99.0%
6/25	1	24.0	155.94	100.00 x	1	14	14	99.2%
6/26	1	24.0	154.78	100.00 x	1	14	14	99.4%
6/27	1	24.0	154.16	100.00 x	1	14	14	99.6%
6/28	1	24.0	152.23	100.00 x	0	0	0	99.6%
6/29	1	24.0	132.98	100.00 x	1	14	14	99.8%
6/30	1	24.0	131.17	100.00 x	0	0	0	99.8%
7/01	1	24.0	144.13	100.00 x	0	0	0	99.8%
7/02	1	24.0	139.01	100.00 x	0	0	0	99.8%
7/03	1	24.0	164.86	100.00 x	0	0	0	99.8%
7/04	1	24.0	147.66	100.00 x	0	0	0	99.8%
7/05	1	24.0	120.52	100.00 x	0	0	0	99.8%
7/06	1	24.0	118.49	100.00 x	0	0	0	99.8%
7/07	1	24.0	103.75	100.00 x	0	0	0	99.8%
7/08	1	24.0	138.07	100.00 x	0	0	0	99.8%
7/09	1	24.0	108.65	100.00 x	0	0	0	99.8%
7/10	1	24.0	116.53	100.00 x	0	0	0	99.8%
7/11	1	24.0	109.58	100.00 x	0	0	0	99.8%
7/12	1	24.0	105.28	100.00 x	0	0	0	99.8%
7/13	1	24.0	105.79	100.00 x	0	0	0	99.8%
7/14	1	24.0	100.93	100.00 x	0	0	0	99.8%
7/15	1	24.0	84.63	100.00 x	0	0	0	99.8%
7/16	1	24.0	85.46	100.00 x	0	0	0	99.8%
7/17	1	24.0	105.94	100.00 x	0	0	0	99.8%
7/18	1	24.0	121.82	100.00 x	0	0	0	99.8%
7/19	1	24.0	117.51	100.00 x	0	0	0	99.8%
7/20	1	24.0	104.98	100.00 x	0	0	0	99.8%
7/21	1	24.0	101.26	100.00 x	0	0	0	99.8%
7/22	1	24.0	87.47	100.00 x	0	0	0	99.8%
7/23	1	24.0	90.48	100.00 x	0	0	0	99.8%
7/24	1	24.0	94.51	100.00 x	0	0	0	99.8%
7/25	1	24.0	108.61	100.00 x	0	0	0	99.8%
7/26	1	24.0	92.51	100.00 x	0	0	0	99.8%

\*\*\*\*\* CONTINUED \*\*\*\*\*

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 FISH PASSAGE DATA SYSTEM  
 \* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* STEELHEAD \* \* \*

LA-7U-1 SU STEELHEAD LOT ID # 85152-03 30,378 RELEASED AT: METHOW R FROM: 5/14/85 TO 5/14/85  
 AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX CUMULATIVE
1985	SC--D--GW--HR,S						

\* \* \* \* \* CONTINUED \* \* \* \* \*

7/27	1	24.0	83.51	100.00 %	0	0	0	99.8X
7/28	1	24.0	67.53	100.00 %	0	0	0	99.8X
7/29	1	24.0	91.69	100.00 %	0	0	0	99.8X
7/30	1	24.0	87.67	100.00 %	0	0	0	99.8X
7/31	1	24.0	86.02	100.00 %	0	0	0	99.8X
8/01	2	21.0	84.83	100.00 %	0 *	0 *	0 *	99.8X
8/01	10	0.0	86.13	100.00 %	0 *	0 *	0 *	99.8X
8/02	1	27.0	88.77	100.00 %	0	0	0	99.8X
8/03	1	24.0	90.79	100.00 %	0	0	0	99.8X
8/04	1	24.0	79.26	100.00 %	0	0	0	99.8X
8/05	1	24.0	86.04	100.00 %	0	0	0	99.8X
8/06	1	24.0	77.25	100.00 %	0	0	0	99.8X
8/07	1	24.0	116.09	100.00 %	0	0	0	99.8X
8/08	1	24.0	90.45	100.00 %	0	0	0	99.8X
8/09	1	24.0	99.22	100.00 %	0	0	0	99.8X
8/10	1	24.0	96.76	100.00 %	0	0	0	99.8X
8/11	1	24.0	80.94	100.00 %	0	0	0	99.8X
8/12	1	24.0	71.08	100.00 %	0	0	0	99.8X
8/13	1	24.0	95.40	100.00 %	0	0	0	99.8X
8/14	1	24.0	102.17	100.00 %	0	0	0	99.8X
8/15	1	24.0	113.53	100.00 %	0	0	0	99.8X
8/16	1	24.0	111.22	100.00 %	0	0	0	99.8X
8/17	1	24.0	93.07	100.00 %	0	0	0	99.8X
8/18	1	24.0	89.30	100.00 %	0	0	0	99.8X
8/19	1	24.0	85.41	100.00 %	0	0	0	99.8X
8/20	1	24.0	97.50	100.00 %	0	0	0	99.8X
8/21	1	24.0	89.27	100.00 %	0	0	0	99.8X
8/22	1	24.0	84.62	100.00 %	0	0	0	99.8X
8/23	1	24.0	91.79	100.00 %	0	0	0	99.8X
8/24	1	24.0	80.45	100.00 %	0	0	0	99.8X
8/25	1	24.0	73.42	100.00 %	0	0	0	99.8X
8/26	1	24.0	85.48	100.00 %	0	0	0	99.8X
8/27	1	24.0	95.48	100.00 %	0	0	0	99.8X
8/28	1	24.0	113.00	100.00 %	0	0	0	99.8X

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MCNARY \* \* \* STEELHEAD \* \* \*

LA-7U-1 SU STEELHEAD LOT ID # 85152-03 30,378 RELEASED AT: METHOW R FROM: 5/14/85 TO 5/14/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER	(3) INDEX	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE DAILY COUNT	INDEX ... CUMULATIVE
1985	SC-ID-GW-HRS	FLOW	FLOW				

\* \* \* \* \* C O N T I N U E D \* \* \* \* \* a \* \* \*

8/29	1	24.0	94.01	100.00 %	0	0	0	99.8%
8/30	1	24.0	73.53	100.00 %	0	0	0	99.8%
a m	1	24.0	88.98	100.00 %	0	0	0	99.8%
9/01	1	24.0	72.47	100.00 %	0	0	0	99.8%
9/02	1	24.0	85.55	100.00 %	0	0	0	99.8%
9/03	1	24.0	95.84	100.00 %	0	0	0	99.8%
9/04	1	24.0	77.75	100.00 %	0	0	0	99.8%
9/05	1	24.0	105.89	100.00 %	0	0	0	99.8%
9/06	1	24.0	99.96	100.00 %	0	0	0	99.8%
9/07	1	24.0	87.06	100.00 %	0	0	0	99.8%
9/08	1	24.0	80.68	100.00 %	0	0	0	99.8%
9/09	1	24.0	82.24	100.00 %	0	0	0	99.8%
9/10	1	24.0	89.57	100.00 %	0	0	0	99.8%
9/11	1	24.0	99.12	100.00 %	0	0	0	99.8%
9/12	1	24.0	94.56	100.00 %	0	0	0	99.8%
9/13	1	24.0	97.93	100.00 %	0	0	0	99.8%
9/14	1	24.0	98.05	100.00 %	0	0	0	99.8%
9/15	1	24.0	82.26	100.00 %	0	0	0	99.8%
9/16	1	24.0	87.37	100.00 %	0	0	0	99.8%
9/17	1	24.0	82.98	100.00 %	0	0	0	99.8%
9/18	1	24.0	111.50	100.00 %	0	0	0	99.8%
9/19	1	24.0	116.09	100.00 %	0	0	0	99.8%
9/20	1	24.0	102.93	100.00 %	1	14	14	100.0%
TOTAL					505	6,692	7,017	

- 1) Sample parameters: SC = Sample quality code ID = Number of accuslatd days for sample  
GW = Number of gatewells sampled Hrs= Number of hours sampled
- 2) River Flow: Data acquired from Corps data site - MCN
- 3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- 4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)
- 5) Sample deviates from "normal" conditions (i.e. SC code > 1)



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MCNARY

\* \* \*

STEELHEAD

\* \* \*

RA-7U-1 SU STEELHEAD LOT ID # 85152-01

30,479

RELEASED AT: METHOW R  
AGENCY: WDG

FROM: 5/06/85 T O 5/06/85  
HATCHERY: WELLS-WDG

DATE	SAMPLE (1) PARAMETERS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	PASSAGE INDEX DAILY COUNT	(4) CUMULATIVE
1985	SC #D GW HRS						

\* \* \* \* \* C O N T I N U E D \* \* \* \* \*

6/15	1	24.0	176.92	100.00 %	0	0	0	99.7%
6/16	1	24.0	179.20	100.00 %	0	0	0	99.7%
6/17	1	24.0	183.76	100.00 %	0	0	0	99.7%
6/18	1	24.0	170.52	100.00 %	0	0	0	99.7%
6/19	1	24.0	204.46	100.00 %	0	0	0	99.7%
6/20	1	24.0	201.23	100.00 %	0	0	0	99.7%
6/21	1	24.0	189.82	100.00 %	0	0	0	99.7%
6/22	1	24.0	184.08	100.00 %	0	0	0	99.7%
6/23	1	24.0	138.31	100.00 %	1	14	14	99.8%
6/24	1	24.0	157.00	100.00 %	0	0	0	99.8%
6/25	1	24.0	155.94	100.00 %	0	0	0	99.8%
6/26	1	24.0	154.78	100.00 %	0	0	0	99.8%
6/27	1	24.0	154.16	100.00 %	0	0	0	99.8%
6/28	1	24.0	152.23	100.00 %	0	0	0	99.8%
6/29	1	24.0	132.98	100.00 %	0	0	0	99.8%
6/30	1	24.0	131.17	100.00 %	0	0	0	99.8%
7/01	1	24.0	144.13	100.00 %	0	0	0	99.8%
7/02	1	24.0	139.01	100.00 %	0	0	0	99.8%
7/03	1	24.0	164.86	100.00 %	0	0	0	99.8%
7/04	1	24.0	147.66	100.00 %	0	0	0	99.8%
7/05	1	24.0	120.52	100.00 %	0	0	0	99.8%
7/06	1	24.0	118.49	100.00 %	0	0	0	99.8%
7/07	1	24.0	103.75	100.00 %	0	0	0	99.8%
7/08	1	24.0	138.07	100.00 %	0	0	0	99.8%
7/09	1	24.0	108.65	100.00 %	1	14	14	100.0%

OTL -----U----- 8,542 8,859

- 1) Sample parameters: SC = Sample quality code #D = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled
- 2) River Flow: Data acquired from Corps data site - MCN
- 3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*
- 4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)  
\*) Sample deviates from "normal" conditions (i.e., SC code > 1)

NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

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MCNARY \* \* \* STEELHEAD \* \* \*

RA-7U-3 SU STEELHEAD LOT ID # 85152-02 30,351 RELEASED AT: METHOW R FROM: 5/10/85 T O 5/10/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS .. SC-ID-GW-HRS	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT	(4) CUMULATIVE	
5/15	1	24.0	234.10	93.53 %	1	14	15	0.2%
5/16	1	24.0	225.04	81.94 %	0	0	0	0.2%
5/17	1	24.0	212.92	100.00 %	0	0	0	0.2%
5/18	1	24.0	217.94	100.00 %	3	43	43	0.6%
5/19	1	24.0	213.18	100.00 %	23	329	329	4.0%
5/20	1	24.0	208.28	100.00 %	21	300	300	7.2%
5/21	1	24.0	228.17	100.00 %	52	743	743	15.0%
5/22	1	24.0	228.01	100.00 %	49	700	700	22.3%
5/23	1	24.0	227.75	100.00 %	63	900	900	31.7%
5/24	1	24.0	225.09	100.00 %	45	643	643	38.4%
5/25	1	24.0	261.27	84.28 %	55	786	933	48.2%
5/26	1	24.0	243.13	91.20 %	92	1,082	1,166	60.6%
5/27	1	24.0	208.07	100.00 %	62	775	775	68.7%
5/28	1	24.0	222.11	100.00 %	45	643	643	75.4%
5/29	1	24.0	233.81	94.42 %	44	629	666	62.3%
5/30	1	24.0	257.16	86.20 %	21	263	305	85.5%
5/31	2	22.0	260.70	84.66 %	8 *	291 *	344 *	89.1%
5/31	10	0.0	220.78	99.45 %	36 *	36 *	36 *	89.5%
6/01	1	26.0	224.90	98.51 %	2	100	102	90.6%
6/02	1	24.0	223.18	100.00 %	5	67	67	91.3%
6/03	1	24.0	213.99	100.00 %	14	200	200	93.4%
6/04	1	24.0	236.00	100.00 %	9	129	129	94.7%
6/05	1	24.0	182.95	100.00 %	9	129	129	96.1%
6/06	1	24.0	196.81	100.00 %	3	43	43	96.5%
6/07	1	24.0	211.60	100.00 %	5	71	71	97.3%
6/08	1	24.0	193.64	100.00 %	2	29	29	97.6%
6/09	1	24.0	203.05	100.00 %	0	0	0	97.6%
6/10	1	24.0	210.63	100.00 %	0	0	0	97.6%
6/11	1	24.0	218.02	100.00 %	5	71	71	98.3%
6/12	1	24.0	195.52	100.00 %	1	14	14	98.4%
6/13	2	21.0	217.08	100.00 %	1 *	33 *	33 *	98.8%
6/13	10	0.0	180.89	100.00 %	2 *	2 *	2 *	98.8%
6/14	1	27.0	184.50	100.00 %	0	0	0	98.8%
6/15	1	24.0	176.92	100.00 %	0	0	0	98.8%
6/16	1	24.0	179.20	100.00 %	1	14	14	99.0%

\*\*\*\*\* C O N T I N U E D \*\*\*\*\*



NATIONAL MARINE FISHERIES SERVICE  
FISH PASSAGE DATA SYSTEM  
\* \* Brand Recapture Summary \* \*

\*\*\*\*\*  
\* This information is preliminary or has been derived from sources other than NMFS • IUI \*  
\* as such should not be used for distribution, quotation or publication without proper \*  
\* authorization and/or clearance \*  
\*\*\*\*\*

MCNARY \* \* \* STEELHEAD \* \* \*

RA-7U-3 SU STEELHEAD LOT ID # 85152-02 30,351 RELEASED AT: METHOW R FROM: 5/10/85 TO 5/10/85  
AGENCY: WDG HATCHERY: WELLS-WDG

DATE	SAMPLE (1) .. PARAMETERS ..	(2) RIVER FLOW	(3) INDEX FLOW	NUMBER SAMPLED	NUMBER COLLECTED	... PASSAGE INDEX ... DAILY COUNT	(4) CUMULATIVE
1985	SC-ID-GW-HRS	FLOW	FLOW	SAMPLED	COLLECTED	DAILY COUNT	CUMULATIVE

\*\*\*\*\* CONTINUED \*\*\*\*\*

7/21	1	24.0	101.26	100.00 %	0	0	0	99.9%
7/22	1	24.0	87.47	100.00 %	0	0	0	99.9%
7/23	1	24.0	90.48	100.00 %	0	0	0	99.9%
7/24	1	24.0	94.51	100.00 %	0	0	0	99.9%
7/25	1	24.0	108.61	100.00 %	0	0	0	99.9%
7/26	1	24.0	92.51	100.00 %	0	0	0	99.9%
7/27	1	24.0	83.51	100.00 %	0	0	0	99.9%
7/28	1	24.0	67.53	100.00 %	0	0	0	99.9%
7/29	1	24.0	91.69	100.00 %	1	14	14	100.0%

TOTAL ----- 686 ----- 9,179 ----- 9,565 -----

(1) Sample parameters: SC = Sample quality code ID = Number of accumulated days for sample  
GW = Number of gatewells sampled Hrs = Number of hours sampled  
(2) River Flow: Data acquired from Corps data site - MCN  
(3) Index Flow: \* \* \* POWERHOUSE1 / (POWERHOUSE1 + SPILL) \* \* \*  
(4) Passage Index: Calculated as the (number collected) / (100 \* percent index flow)  
(\* ) Sample deviates from "normal" conditions (i.e. SC code > 1 )