WASHINGTON DEPARTMENT OF WILDLIFE

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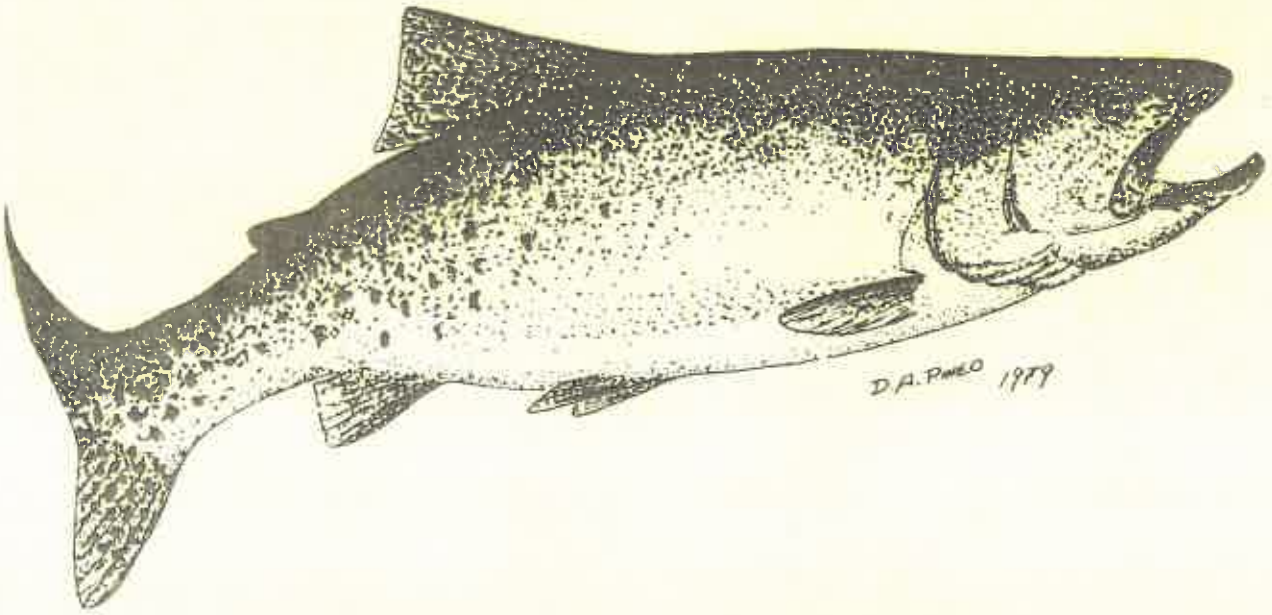

LYONS FERRY EVALUATION STUDY
Part II: 1985-86 Annual Report

Report No. FRI/LSR-87-8
Report Date: December 1987

Mark L. Schuck
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Part II: 1985-86 Annual Report

Assessment of Production from Lyons Ferry/Tucannon Hatchery Complex; and Field Studies Summary.

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TABLE OF CONTENTS

ABSTRACT

Lyons Ferry Hatchery operated in its third full year of production with two stocks of steelhead and one stock of rainbow trout from the 1984 brood year. A total of 1,149,979 steelhead smolts weighing 193,246 pounds were released during the spring of 1985 into the Snake, Grande Ronde, Walla Walla, Touchet and Tucannon Rivers and Asotin and Mill Creeks of Washington and the Wallowa River of Oregon. Smolts averaged 6.0 fish/pound for the entire release and ranged in size from 2.6-8.4 fish/pound. A total of 198,453 rainbow trout weighing 63,895 pounds were planted into 38 different lakes and streams in southeastern Washington during the summer. This production level represented 76% of goal. Trout averaged 3.4 fish/pound.

Six study groups of steelhead totalling 215,918 fish were coded-wire-tagged, fin clipped and branded as part of catch contribution and return rate studies for evaluating stock success. An additional 47,934 fish were brand only marked for release at the hatchery since we did not have sufficient funds to tag the entire release. Tag loss for all groups was between 2.9-11%. Brand loss this year averaged 4.6% for all groups, ranging between 0.4% and 6.7%.

Smolt outmigration went reasonably well this year except for the Curl Lake conditioning pond release. Cold water temperatures and late release appear to have impeded emigration. Estimates of the smolt passage Index (P.I.) at Snake and Columbia River dams indicated similar smolt performance in 1985 to other years. Average daily migration rates varied for different mark groups between 4.0 and 9.0 miles per day. Fish released from the Grande Ronde Conditioning pond migrated faster than fish released from Lyon's Ferry Hatchery or from the Tucannon River.

Escapement of adults from tagged groups to above Bonneville Dam was between 0.508 and 0.931% of release for a single return year. Escapement of individual groups into the project area (above Lower Granite Dam) since 1983 has been between 0.37% and 1.00% of release for an entire three year return cycle. Wallowa stock fish are returning in the ratio of 57% 1-ocean to 43% 2-ocean adults. Average fork length for 1-ocean and 2-ocean age Wallowa stock fish was 58.6cm and 72.0cm respectively. The Zone 6 treaty Indian gillnet fishery and the Snake River sport fishery are the major harvestors of Lyon's Ferry released steelhead.

Populations of juvenile salmonid fish in the compensation plan streams showed some changes over data collected during an 1981 field season. General increases in populations occurred throughout the sampling area. These increases may or may not be due to increased spawning escapement of steelhead planted from the hatchery. Residual steelhead smolts were found in tributaries of stocked streams as far upstream as 12 miles from release. These fish may be competing with native resident trouts for space and forage.

Redd counts were attempted on the Tucannon and Touchet Rivers and Asotin Creek during the spring of 1985. High murky water prevented collection of reliable quantitative data on spawning escapement.

An intensive creel survey was conducted during the trout season on the Forks and parts of main Asotin Creek, the Tucannon River and the Tucannon Impoundments to determine percent utilization and user days provided by catchable trout plants from the Hatchery. Tagged fish were released to assess migration patterns of catchable trout after planting. Results showed that a substantial effort and harvest occurred on opening weekend of the season. Tagging showed that there did not appear to be a significant amount of emigration of the catchable trout from the system as most tags were recovered within 5 miles from point of release. We estimated exploitation rates on catchable trout at 78% for the river and between 60% and 100% of stocked trout numbers for the impoundments. There was an estimated 84,844 hours expended fishing in stocked waters that we censused. Cost/benefit ratio for this program compared to value to the local economy was between 1/6 and 1/13. Residual steelhead smolts contributed up to 42% of river harvest in the late summer.

ACKNOWLEDGEMENTS

We would like to thank Suzanne Anderson, Gary Lambacher and Leslie Lutz for their work on the project during this contract period. Their field data collection was the basis for much of the body of the report. Leslie Lutz is also responsible for collecting the Tucannon Impoundments limnological data, which is included as an appendix, on her own time.

We would like to thank John Hisata, Bob Bugert and Dan Herrig for reviewing the draft manuscript and providing some excellent comments. We would also like to express our appreciation to Dan for his patience throughout this writing process. Jerry Harmon of the NMFS and his crew at Lower Granite Dam removed all our coded wire tags and provided timely and accurate data. Their professionalism and insight into Snake River fisheries have been a great help.

I would personally like to express my appreciation to the Managers and crews at Lyon's Ferry and Tucannon Hatcheries. Their dedication to the program and to the fish that are produced is beyond question.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Evaluation Project Summary

This is the third report by the Washington Department of Game concerning a new steelhead production facility on the Snake River. Lyons Ferry Hatchery, located at RM 58, began operation in 1982. Washington Department of Game (WDG) operates half of the joint salmon-steelhead-rainbow trout facility, which is the only new production hatchery constructed in Washington under the Lower Snake River Compensation Plan (LSRCP; U.S.Army, 1975). Two remote conditioning ponds have been constructed and the Tucannon Trout Hatchery is being renovated and enlarged as part of this program. One additional conditioning pond remains to be constructed on the Touchet River.

The contract period for this report is 1-April-1985 through 31-March-1986. There were, however, activities performed outside of these dates that are essential parts of the data that need to be reported. There were also data collected in previous years that are pertinent to the 1985 year. These data have been included in this report for sake of clarity.

Refinements to the evaluation project are continuing. The 1984 proposal as submitted to the U.S. Fish and Wildlife Service (FWS) (Appendix A) served as a guideline for our field activities. The list of objectives and tasks within the proposal served as a reference point for us to determine our progress in the evaluation project for the year. The 1985 proposal was updated based on experience from the 1982-84 field seasons. This refinement occurs yearly to assure progress or to respond to new problems that have arisen with the facilities.

The year 1985 was again important for collecting background data concerning the streams and lakes receiving compensation fish as well as for adjusting to continued changes in the facilities themselves. We continued collecting tags from our first tag releases to determine adult steelhead contribution to Compensation Plan and other harvest areas. The data are very encouraging now that we have complete recoveries from two release years. We can reasonably describe the nature of returns from one of the steelhead stocks we are using, ie; time of return, size at age of return, smolt to adult survival to the project area and contribution to the various Columbia Basin fisheries.

1.2 Compensation Program Description

The Lower Snake River Compensation Plan was initiated in 1976 by the 94th Congress. This legislation authorized construction of hatchery facilities in Idaho, Oregon, and Washington. Fish

production from these facilities would compensate or replace natural production of salmon, steelhead, and resident fish lost because of construction of hydroelectric dams on the lower Snake River in the 1960's and 1970's by the U.S. Army Corps of Engineers(COE).

Compensation program levels or goals for each State were negotiated and established by joint agreement between the state and the COE. The steelhead trout/resident fish portion of the program as administered by the WDG for the State of Washington was based on two essential criteria; 1) anadromous steelhead losses attributable to hydroelectric dam construction on the Snake River amounted to 4,656 adult fish destined for Washington, and, 2) resident fisheries for rainbow trout, smallmouth bass, sturgeon, channel catfish and crappie would be diminished by 67,500 angler days of recreation annually. These criteria were the basis for designing hatchery facilities capable of producing sufficient steelhead smolts at 8 fish/lb to return 4,656 adults back to the project area, and additionally, 93,000 pounds of legal size (3 fish/lb) rainbow trout to offset the losses to resident fisheries.

Lyons Ferry hatchery was constructed to produce 116,400 pounds of steelhead and 45,000 pounds of legal rainbow, and the Tucannon hatchery was repaired and updated to produce 41,000 pounds of legal rainbow and to aid in the propagation of spring chinook salmon for the Washington Department of Fisheries (WDF). The remaining 7,000 pounds of catchable rainbow were foregone in-lieu of improving instream habitat in various streams in southeastern Washington.

Washington Department of Game personnel developed program goals that will guide our efforts at achieving the compensation plan goals of replacing lost populations and angler opportunity. These are general guidelines that are compatible with WDG long term management goals for both anadromous and resident trout. A more detailed summation of our approach to achieve the goal was provided in the 1984 annual report (Schuck & Mendel, 1986) and has not changed significantly. Brief comments are provided to explain the goals (Appendix A) and facilities (Appendix B).

2.0 METHODS

2.1 Hatchery Operation Monitoring

There were no changes in our methods of sampling growth rates during the production year or in sampling the smolts prior to release in the spring. A detailed description of the sampling is available in our 1983 Annual Report (Schuck, 1985).

2.2 Smolt Out-Migration

A majority of our fish this year were hauled by truck to one of the conditioning ponds first, reared from 4-7 weeks, then allowed to out-migrate into stream systems. This was our first year for using the remote ponds. These fish were sampled for length, weight, condition factor (K), descaling and precocious males at the time they exited the conditioning ponds.

Those fish released directly into river systems from the transport trucks were sampled at the hatchery prior to release as in previous years. A large number of fish were provided to ODFW again this year in support of their broodstock development program. They were sampled by ODFW personnel after transport to measure trucking mortality or descaling that might affect the success of the release. Their sampling efforts are available in an ODFW evaluation annual report (Carmichael et al, 1986).

All fish were loaded into trucks using a Neilson brand fish pump. Total numbers of fish planted to a stream were determined by one of two methods: 1) When groups of fish had been tagged and enumerated, this number minus any mortality since tagging was multiplied by average weights from samples to determine total pounds of fish planted; 2) Un-tagged fish were volumetrically weighed by water displacement when trucked out of the hatchery. The average number of fish/pound from samples was then used to determine total numbers planted.

We attempted to assess residualism in the release streams by two separate methods. The proposal (task 2.6) stated that we would electrofish 100m sections of streams in the vicinity of release sites and express residualism as a percent of incidence in a one pass removal of fish in the reach. Task 2.5 stated we would survey fishermen during the opening of the stream trout season and express results as percentage of catch over the first few weeks of the season. This would not give an actual estimate of entire residualism for a release year, but would give a means to monitor relative indices of residualism yearly under different release strategies. This will also help assess if conditioning ponds were effective in improving outmigration.

We assessed smolt survival throughout their migration by sampling at the hatchery or release site and from samples collected

and expanded at the Snake and Columbia River dams by National Marine Fisheries Service (NMFS) and Water Budget Center (WBC) personnel. The fish passage index (P.I.) estimates at the dams are based on the assumption that tagged (cwt) and/or branded juveniles collected and sampled are representative of the entire release. Also, the P.I. for the tagged and /or branded groups are not an estimate of total survival for fish passing that point. The P.I. is a figure developed by NMFS and WBC personnel to provide a "relative" indicator of passage success within and between years. Total survival would be higher than the P.I. for any particular year but it is more difficult to obtain and less accurate since it is highly dependent on daily spill and guidance efficiency at the dams. Data are available from samples taken at Lower Granite, Little Goose, McNary and John Day Dams.

2.3 Fish Marking Program

Three types of marking were acomplished this year for separate purposes. 1) We adipose clipped all the production fish for the 1986 release this year. These fish were marked to designate them as hatchery produced and available for harvest in selective fisheries upon return as adults. 2) Coded-wire tagged fish were released for specific contribution and return rate studies pertinent to Lyons Ferry production, conditioning pond release operation and to help assess progress toward achieving mitigation goals. Group sizes were set in blocks of 20,000 fish or multiples thereof to fully utilize raceway space while the fish are held after marking. Twenty thousand fish are considered a minimum group size because of low expected return rates and the difficulties of sampling sport fisheries for mark recoveries. Tagged fish for the 1985 release year were left ventral fin clipped (LV) to indicate the presence of a cwt and most were also AD clipped. Fish with cwt's released directly from Lyons Ferry Hatchery received only an LV clip. 3) All cwt fish received a nitrogen freeze brand to allow easy identification of returning adults without sacrificing the fish. Additional groups of fish released for juvenile emigration timing studies by the Fish Passage Center received only a brand.

Tagging and branding were conducted during February, 1985 for the 1985 release. Adipose clipping was accomplished during August of 1985 for the 1986 release fish.

The WDG hired experienced personnel to operate equipment borrowed from NMFS for the marking program in 1985. Fish have to be moved from large rearing ponds to raceways so that they may be accessed easily. Retaining screens are removed from the rearing ponds and the fish forced out of the lake with seines into the collection facility below. They are then pumped into trucks, total numbers are determined from weight counts, and then deposited in raceways.

Fish are tagged, branded and returned to raceways where they are held for at least 14 days. Tag loss is then determined by passing anesthetized fish through a Smith-Root tube type tag

detector. Tag codes and brands are reported to the Pacific Marine Fishery Commission for publication in their annual report.

2.4 Returns of Adult Steelhead To Project Area

The National Marine Fishery Service monitors adult passage at Bonneville, McNary and Lower Granite Dams (Slatick, 1985; Gilbreath, 1985; Jerry Harmon, NMFS, personal comm., 1985). Data on 1982-84 brand and cwt releases into various streams were provided to NMFS. Adults coming into their traps were mark sampled and the information along with sample rates, when available, was provided to us. Metal jaw tags were placed on some returning adult steelhead at both Bonneville and Lower Granite Dams. These jaw tags helped to track movement of the fish following their handling at the dams and determine the percentage taken in sport fisheries or returning to the hatchery.

Harvest of adults destined for Compensation Plan areas occurs in sport, commercial and treaty Indian fisheries throughout the Columbia River Basin. Estimates of harvest and tags recovered (interception rates) are available from WDG, Oregon Department of Fish and Wildlife (ODFW), Idaho Department of Fish and Game (IDFG), WDF and the Indian tribes. Where these data are available, they are used to determine the total contribution of LSRCP fish within the basin.

We estimate steelhead sport harvest in the Snake River through an intensive creel survey. The results from that survey have been published separately as part of the 1985 annual report (Mendel et al. 1987).

We counted adult steelhead jumping the old dam structure at Headgates Park during daylight hours. Counts were made for 20 minute intervals on randomly selected mornings or afternoons. Means of these counts were multiplied by a correction factor of 1.5 to estimate the number of steelhead crossing the dam during the entire 60 minutes of each hour (including the 20 minutes each hour that counts were not made). Statistical formulas used for estimating the total number of steelhead that crossed the dam and confidence limits are the same as those used for estimating angler effort in our creel analyses (See Appencix C, Mendel et al. 1987). The WDF fish weir was also used to trap migrating adult steelhead near the Tucannon Hatchery.

2.5 Juvenile Steelhead Populations in Project Rivers

Population and density estimates were generally performed as described in Hallock and Mendel (1985) and Schuck & Mendel (1984 Annual Report: Part II, 1986). This year however, we sampled streams or stream sections where we were lacking juvenile trout density information. The Tucannon River below the Wooten HMA was sampled cooperatively with WDF Lyon's Ferry Evaluation personnel.

We stratified the Tucannon River below the Wooten HMA based on general stream characteristics (maximum summer water temp., gradients, etc.) into three sections: 1) mouth to Pataha Creek (Road mile 0-11.1); 2) Pataha Creek to Marengo (Road mile 11.1-25.3), and; 3) Marengo to the North boundary of the HMA (Road mile 35.0). We sampled two sites in the lower section and three sites in each of the other sections. We also obtained WDF electrofishing data (Bugert, Pers. Comm.) for the upper Tucannon River and it's tributaries.

The distance and direction from an access point to a sampling site were selected at random for all streams. Site CH-3 on Charlie Creek was selected to encompass an area that had been electrofished in 1981 (Mendel and Taylor, 1981). Site designations are the first two letters of river or stream names (eg. TU = Tucannon River). Data were recorded on a specially designed form (Appendix C). We altered our method of calculating mean site depth by taking depths at 1/4, 1/2 and 3/4 of the stream's width and dividing by four at each width transect (Platts et al. 1983). Substrate types, embeddedness levels, and embedding material were recorded at each depth measurement location (see data form, Appendix C). Population estimates based on the removal or depletion method were obtained by using a BASIC computer program know as "MICROFISH" version 2.1 (Van Deventer and Platts, 1986).

2.6 Redd Counts

We walked individual sections of the Tucannon and Touchet Rivers, and Asotin Creek beginning in late March to determine the extent of spawning. High murky runoff during the spring occasionally precluded walking in the stream, and smolt trapping activities consumed considerable time also. We did not extensively walk areas of streams to attempt total enumeration this year. Notations were made about the location of some confirmed redds.

2.7 Legal Trout Program

Intensive creel surveys were accomplished on Asotin Creek, the Tucannon River, and Tucannon impoundments to assess the affect of legal rainbow plants on sport fisheries and estimate the amount of angler days recreation that they provide. Differences in surveys methods were required and are explained separately here.

2.7.1 Tucannon River

We used a progressive roving creel survey for angler counts on the Tucannon River within the Wooten Habitat Management Area (HMA - Camp 1 to Panjab Creek - approx. 11.6 miles by road). We separated the fishing season into 3 sampling periods; June (May 25 through June 30, which includes the opening day of the season), July and August. The remainder of the fishing season had to be ignored because of low angler effort and other creel survey commitments. Other strata used for data collection and analysis included daytype

(weekends and major holidays, and weekdays), and time-of-day (AM or PM) for each daytype. Angler counts required 2-4 hours to check all easily visible or accessable portions of the river. Count data was recorded on a specially designed data form (Appendix D).

We attempted to sample 1 morning and 1 afternoon weekday each week as well as 30 - 33 % of the weekend AM's and PM's per month. Survey dates, AM or PM sampling periods, start times and directions of travel were randomly selected. Start times were randomly selected from 0600, 0700, 0800 or 0900 hrs. for AM and 1400, 1500, 1600 or 1700 hrs. for PM.

It was not practical to sample areas with poor access or visibility during our daily angler counts. Consequently, we had additional personnel walk these normally unsurveyed areas during times that scheduled angler counts were being conducted. This supplemental sampling was repeated 2 or 3 times for each stratum during June and July. Mean correction factors were calculated to account for the number of anglers that were missed during each of the scheduled angler counts within each stratum.

Originally we had planned to conduct interviews of anglers and creel checks separately from our angler counts. However, we quickly found that low angler effort and the amount of time required to cover the entire survey area made that sampling scheme impractical. Thus, anglers were interviewed as they were encountered during the angler counts. We supplemented these data with other interviews before or after angler counts, whenever possible.

We also sampled the mid Tucannon River area from the Wooten HMA to Marengo, nearly 10 road miles downstream. We randomly selected our starting points and direction, as well as whether sampling would occur here before, or after, scheduled angler counts within the HMA. Most of this portion of the Tucannon River is not visible from the road. Therefore we counted vehicles parked along the roadway and multiplied by the mean number of anglers per vehicle, for each stratum, obtained from our angler interviews along the mid Tucannon River.

Data analyses generally follow the methods described in Appendix C in Mendel et al. (1987). However, we multiplied the mean number of anglers per stratum by the mean of correction factors for each stratum, as a constant, to account for anglers in poor visibility areas missed during scheduled angler counts. These strata correction factors were applied to all three months of the season (June, July, August) although none of the correction factor data were collected in August. No correction factors were applied to the angler counts for the mid Tucannon River.

Angler behavior as well as standard sunrise-sunset times (National Almanac Office, US Naval Observatory, Wash. DC) were used to estimate the daily average number of hours available for fishing during each month.

2.7.2 Asotin Creek

Our creel survey design for Asotin creek tributaries was similar to that used in 1984 (Hallock and Mendel 1985). We used the same data collection forms as in 1984. We sampled AM and PM periods on both Saturday and Sunday of opening weekend but no surveys were conducted on Monday, the third day of opening weekend (Memorial day). Two or 3 angler counts were conducted each AM (0600 - 1330 hrs) or PM (1330 - 2030 hrs), at 2 hour intervals, with random start times and locations. We sampled 8 of 26 weekend AM's or PM's available from June 1 to July 8, 1985. Main Asotin Creek angler counts and interviews were conducted before, after, or between angler counts on the N. and S. Forks of Asotin Creek. No corrections were made for those portions of main Asotin Cr. with poor visibility from the the road. We used vehicles parked along the roadway to indicate the presence of anglers. If we were unable to locate anglers for a particular vehicle we used the average number of anglers per vehicle from our angler interviews for Main Asotin Creek for these angler counts. We collected data from fish in the creel as we were able. Lengths were taken only from wild trout or unusual hatchery trout. We attempted to locate wild female trout in spawning condition in the creel to assess length at first spawning.

As in 1984, we recorded our angler counts to indicate whether anglers were using artificial habitat improvements or not. An angler was considered as fishing on a habitat improvement if within 50 ft. upstream or downstream of that improvement site. Total length of all improvements were summed for a comparison on a per mile basis with unimproved portions of the North and South Forks. We made no effort to separate catch rates by improved or unimproved portions of the streams.

2.7.3 Tagging Study

A sample of 200 hatchery rainbow trout (8-12 in. fork length) were taken from the fish stocking truck two days prior to the opening of the fishing season, anesthesized with MS 222, marked with colored, numbered Floy anchor tags, allowed to recover, and then released at 3 locations on the N. Fork of Asotin Creek. All tag numbers were recorded for each release site. Articles were released in local newspapers and signs were posted in conspicuous locations requesting the return of all tags and specific information about each tag (Appendix E). Mileage markers were posted along the N. Fork Road to act as landmarks to assist anglers in describing tag recovery locations. Locked tag collection boxes were placed along the road near the confluence of the N. and S. Forks of Asotin Creek and at the WDG check station near Asotin. Tags also were collected during a limited creel survey along Main Asotin and the North and South Forks of Asotin Creek.

The Tucannon River tagging study was conducted similar to that of Asotin Creek. We tagged 225 hatchery trout in the loading raceways at the Tucannon Hatchery, allowed them to fully recover,

then trucked them to 2 release locations (Camp 7 and Camp 10). Signs were posted along the river, in camp grounds, and in local stores requesting the return of tags, the capture locations and dates. A tag collection box was placed in the HMA office where anglers are required to check out. Intensive river and lake creel surveys were conducted within the HMA through August 1985 and tag information was collected whenever possible.

2.7.4 Tucannon Impoundments

On opening day, Sunday, April 21, WDG personnel conducted counts and interviews of anglers at 0700, 1000, 1400 and 1700 hours. The rest of the angling season was separated into periods that approximated months. For example, the May period included the days in April after opening day until 25 May when the Tucannon River fishing season began. Each "month" was further stratified into day-type (WE and WD), and time-of-day (AM and PM). Sampling periods (AM or PM) were randomly selected so that both an AM and PM were sampled during each week, and we sampled the equivalent of three full weekend days each month.

Initially, two counts were made each sampling period. Count times, starting point, and direction were selected at random. Counts took 1.5 to 2 hours and could begin at 0600 or 0700 and then be repeated at 0900 or 1000 hours in the AM period, and began at 1200 or 1300 with a repeat at 1500 or 1600 hours in the PM. On 5 May however, we began 3 counts per day because we were able to complete the circuit of lakes more rapidly than we had anticipated because of low angler effort. Counts started at 0600 or 0700, or 1200 or 1300 and then were repeated every 2 hours in the AM and every 2.5 hours in the PM.

We began the season conducting angler interviews for catch per effort (CPE), and catch composition, before or after angler counts. Low angler effort, however, made it more practical to collect the angler interviews during the angler counts. Sampling effort remained the same until the July 4 holiday when only one AM and PM count were made. We modified our sampling to a less intensive level in August in conjuction with our Tucannon River sampling schedule. Only one count was made each half day in August instead of the 2 or 3 counts per sampling period as in previous months.

3.0 RESULTS AND DISCUSSION

3.1 Hatchery Operation Monitoring

3.1.1 Juvenile Growth

Juvenile growth and development for all groups of steelhead and rainbow in 1985 were very similar to those observed in 1984. Total poundage produced in 1985 was less than was produced in 1984 but this represents a decrease in the number of fish reared for ODFW, not in the Washington program. All groups of fish responded well to rearing conditions and converted fish food fed to flesh produced comparably to 1984. Table 3.1.1 summarizes production data for the groups of fish produced at Lyons Ferry in 1985.

Table 3.1.1 Trout Production at Lyon's Ferry Hatchery, 1985.

Specie	Stock	Eggs	Fry	Food fed(lbs)	Fish(lbs) produced	Feed conv.	Number planted	Percent survival
SSH*	Wallowa	830,453	794,443	112,725	87,788	1.28	782,499 [1]	94.22
SSH	Wells	373,648	340,339	85,035	57,030	1.46	338,557 [2]	90.55
RB	Spokane[3]	217,500	199,573	78,050	58,774	1.33	198,453	99.3
	Totals	1,421,601		275,810	203,592			

* SSH = summer steelhead; RB = rainbow trout

1 Includes 21,462 pre-smolts (>10/lb) released into the Grande Ronde River.

2 An additional 50,385 smolts were released for which egg-smolt survival data are incomplete. Total Wells stock release for 1985 was 388,942 fish weighing 78,869 pounds. (see Table 3.1.4)

3 Includes some trout production for Tucannon Hatchery. 178,187 fish weighing 47,725 pounds were transferred to Tucannon Hat. for additional rearing. See Appendix F, for a complete listing of catchable fish plants.

Production of steelhead was nearly constant this year as compared to 1984. Oregon Department of Fish and Wildlife received 379,353 fish equaling about one-half of the production of Wallowa stock fish at Lyon's Ferry Hatchery this year. All of these fish were transferred to the Wallowa Hatchery for release. This broodstock development program has been essential to Oregon for a more rapid development of their steelhead program. This is the last year that we will need to dedicate so much hatchery space for ODFW, because their Irrigon Hatchery facility is now complete.

All of our production for the 1985 release was from fish spawned at other locations. Wells fish were spawned in February/March 1984 and Wallowa fish were spawned in April and May 1984. Both were released during April and May of 1985. Wells fish reared approximately 424 days from egg to smolt while Wallowa fish reared only about 365 days. Both were fed OMP diet and converted

well (Table 3.1.1). Grading was done as necessary to separate sizes of fish and to insure feed size was appropriate for optimum intake. Fish were moved from concrete raceways to the large rearing ponds for final rearing in the late fall. Minimum size for the lakes is approximately 130 fish/lb. because of screen size at the outlet. Most of the Wells stock fish were considerably larger than this (50-70/lb.) while the Wallowa fish were smaller (70-100/lb.). Most groups of fish were ponded between late September and early October, which was much earlier than in 1984. Ponding was delayed in 1984 because of construction repairs on the lakes. Wallowa stock fish were some of the last ponded because small fish had been separated out to allow more rapid growth. Every attempt was made to produce as many smolts as possible from these fish because of their importance to both ODFW and WDG programs.

We did experience an outbreak of viral Infectious Hematopoietic Necrosis (IHN) at the Tucannon Hatchery in the catchable rainbow trout. Two round ponds containing 33,000 fish were diagnosed to have IHN on October 1, 1985. Total mortality that occurred in the ponds prior to their destruction was 12.3 % in the first and 2.6 % in the second. The pathological report which contains further detail is included as Appendix G.

There was also one incidence of viral disease at Lyons Ferry Hatchery this year. One raceway containing 14,290 Spokane stock rainbow weighing 2,463 pounds were diagnosed positive for IHN in December. The fish were killed and the raceway disinfected. All eggs and fry received from other hatcheries in Oregon and Washington were examined by a pathologist and certified disease free at the time of transfer. No further incidence or complications were noted. It is hoped that such efforts will retain the hatchery's "clean" status.

Survival from egg to fry for steelhead was good for the groups in 1985 (Table 3.1.2). Survival from fry to smolt was very good and almost the same for the two stocks (table 3.1.1). Mortality for both groups averaged less than 1 % per month for the entire rearing period.

Table 3.1.2 Juvenile mortality, Lyons Ferry Hatchery 1983-85

Stock	Brood year	Eggs In	Fry Out	% mortality
Wallowa	1983	911,504	853,889	6.3
	1984	830,453	794,443	4.4
	1985	377,770	348,360	7.8
Wells	1983	474,390	454,913	4.1
	1984	373,648	340,339	8.9
	1985	471,200	431,627	8.4

3.1.2 Fish at Release

The long period of spawning covered by the two different stocks made rearing to a target smolt size very difficult. There was size variation between stocks and among groups at the time of release (Table 3.1.3), but this was usually associated with lake versus raceway reared fish. Fish size at release ranged from 2.6 - 10.1 fish/lb. The average size for the entire release of smolts for 1985 was 6.0 fish/lb (Std.Dev.=1.2). Total production was 1,171,441 fish totaling 195,371 pounds; 21,462 fish were released that were less than 10 fish/lb and are not considered smolts. A total of 379,353 fish weighing 48,975 pounds were reared for Oregon. Table 3.1.4 summarizes the smolt releases into Southeastern Washington rivers for 1985 (River mile available from WDW annual report). Each truck load of fish or distinct tag or brand group is listed separately to better depict stocking dates and duration.

Table 3.1.3 Smolt characteristics at Lyons Ferry Hatchery 1985.

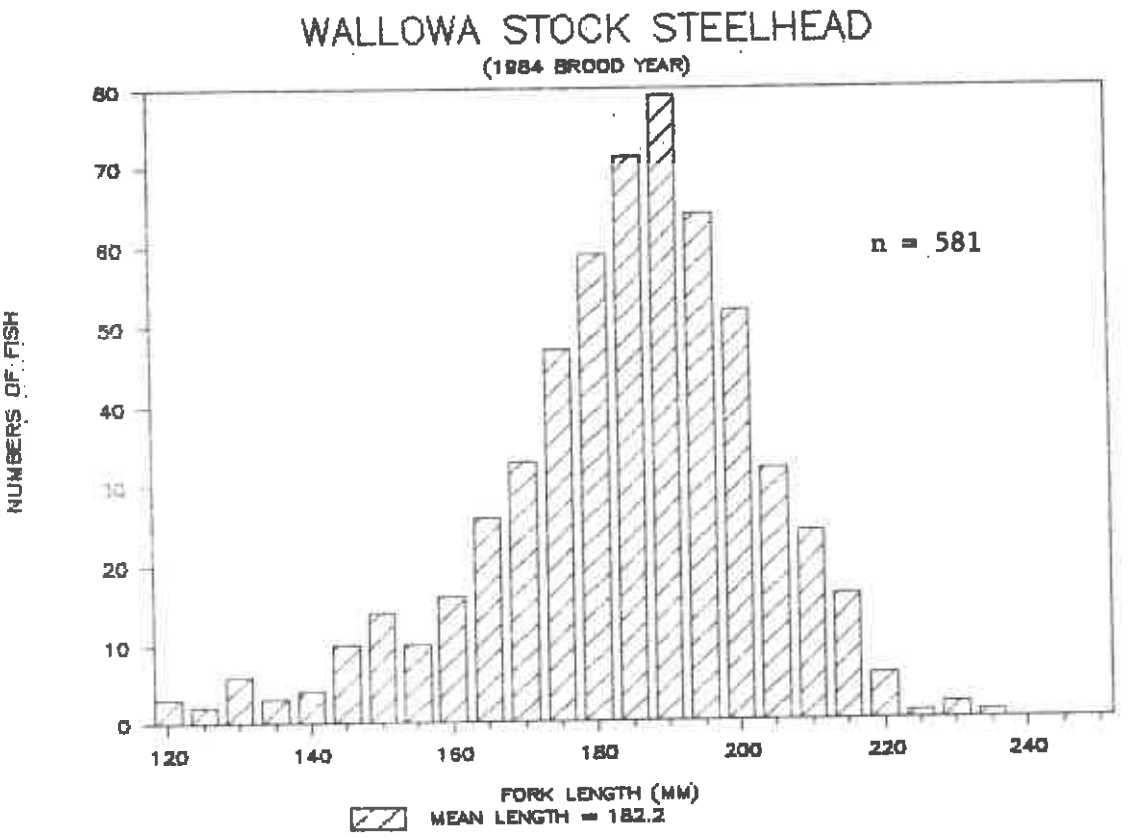
Lake/ Raceway	Stock	Number fish sampled	Sample days	Mean length (mm)	Mean weight (gm)	Mean weight (#/lb.)	K factor	% Precocious males
Lake 1	WA	106	1	182.4	60.5	7.5	1.0	2.1
Lake 3	WA	581	4	182.2	61.1	7.4	1.0	2.6
Lake 2	WE	208	3	206.6	89.0	5.1	0.99	3.8
Curl Lk.	WA	152	1	194.8	80.3	5.7	1.06	3.0
RW-13	WA	99	1	158.4	48.2	9.3	1.19	0.0
RW-3	WE	79	1	232.6	122.8	3.7	0.99	7.5

Values in Table 3.1.3 for length and weight are means for all the samples taken over the release period. Precocious males usually migrated out toward the end of the release period, with almost no precocious fish being found on the first sample day when fish began migrating volitionally. Figures 3.1.1- 3.1.4 depict the range and variation of samples of fish length and weight taken from lakes, raceways and conditioning ponds in 1985.

3.1.3 Fish Marking

Fish marked for release in 1984 are listed with other releases in Table 3.1.4. Only Wallowa stock fish were tagged this year. The fish averaged 170mm fork length (range 130-212mm) and between 7.5-12 fish/pound at the time of marking. Ten percent of the fish handled were rejected because they were either too small to accept a brand or they were too large already and males were becoming precocious. Approximately equal numbers of small and large fish were rejected.

Tag loss from tagged groups was highly variable for the 1985 releases (Table 3.1.4). The reason for the increased tag loss may be the larger size of Wells stock fish in March versus the Wallowa



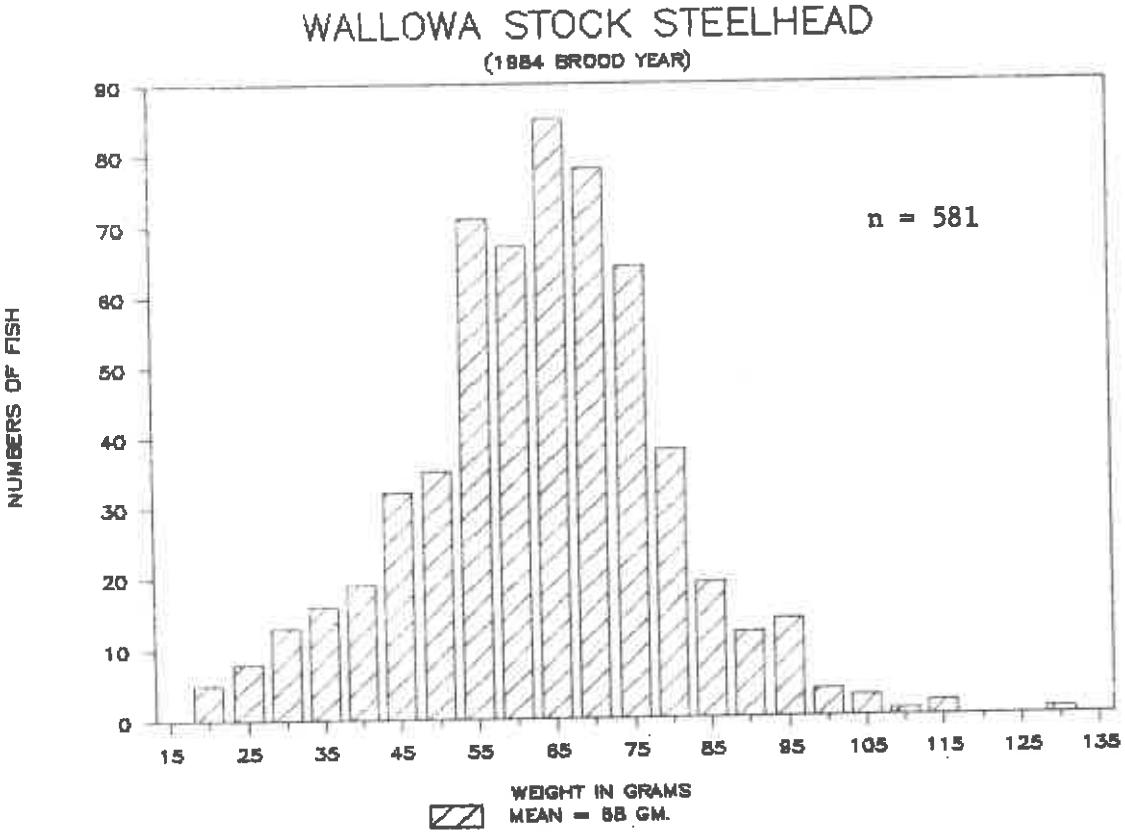
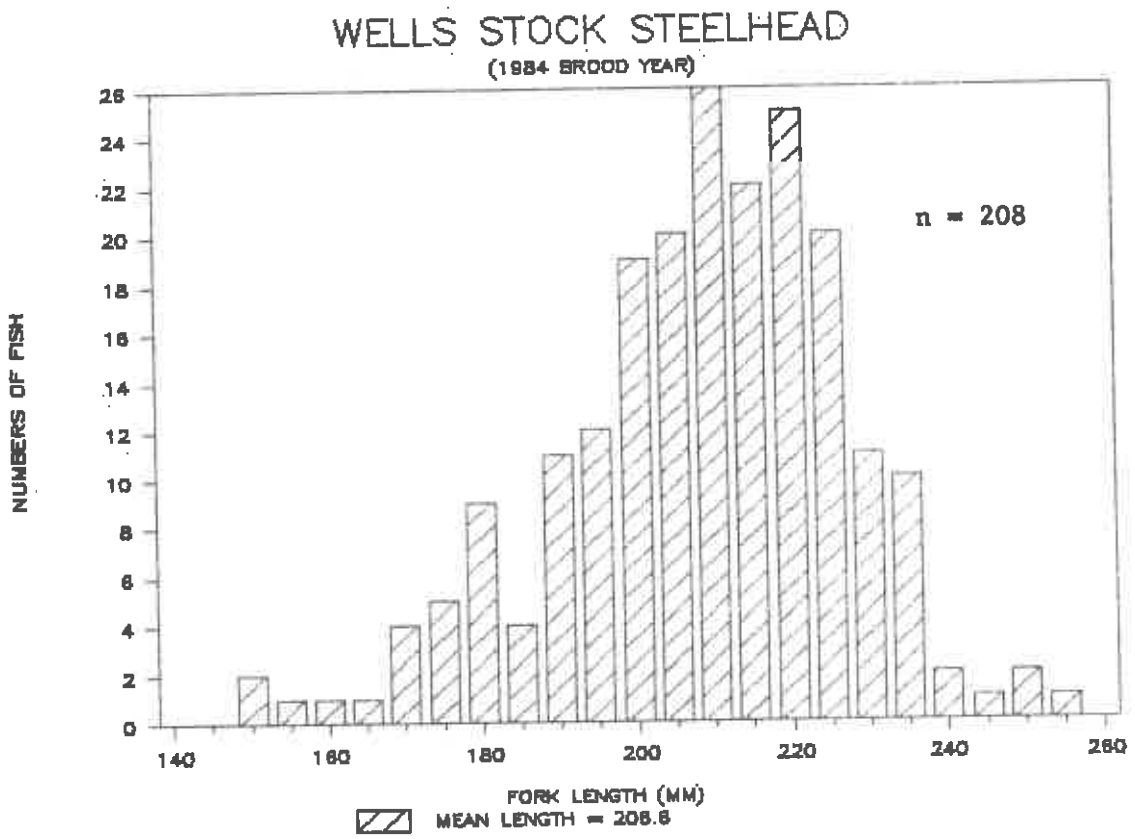


Fig. 3.1.1. Length and weight histograms for Lake 3, Lyons Ferry Hatchery, 1985.



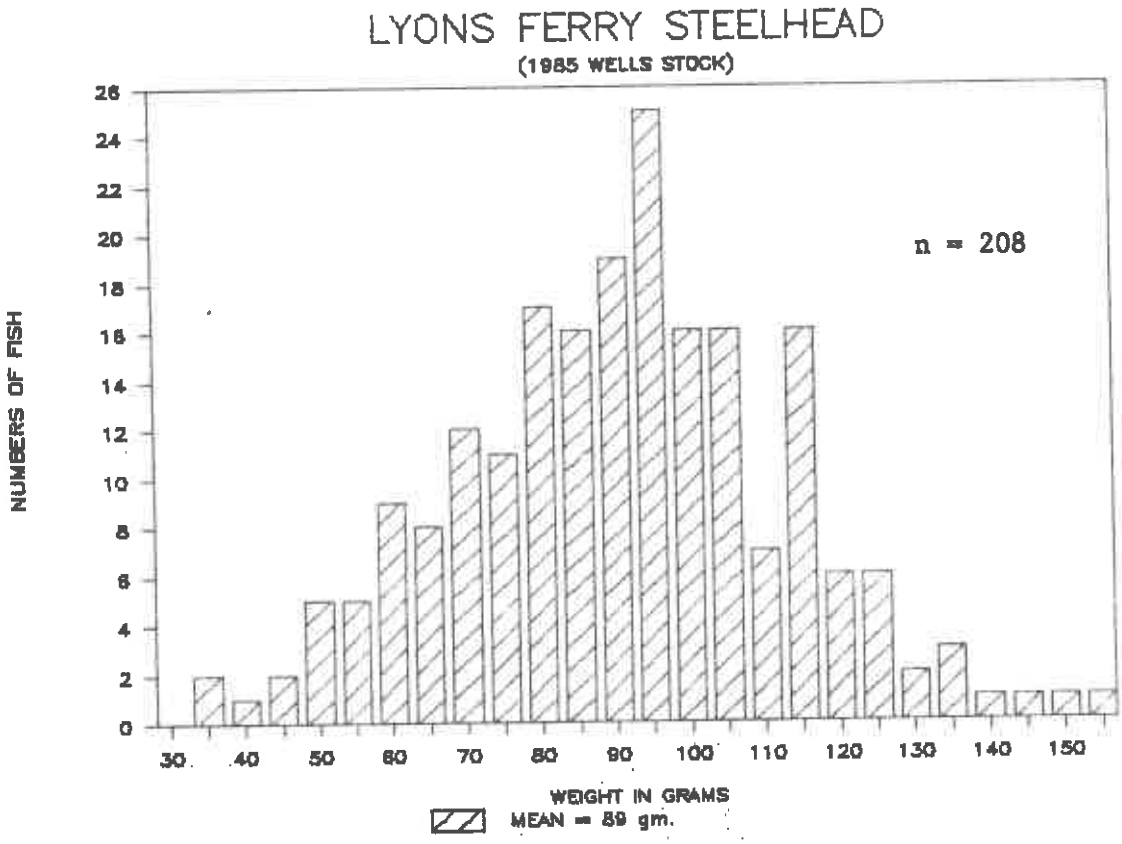
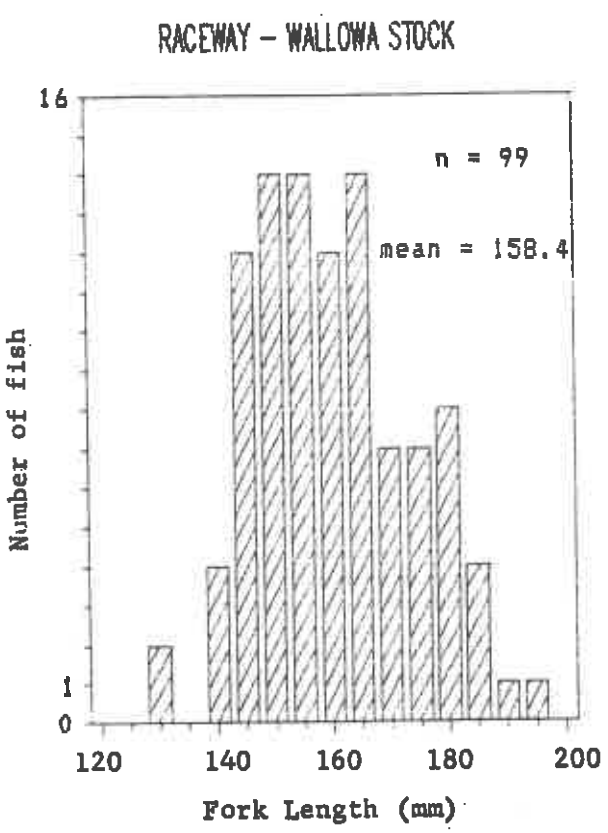
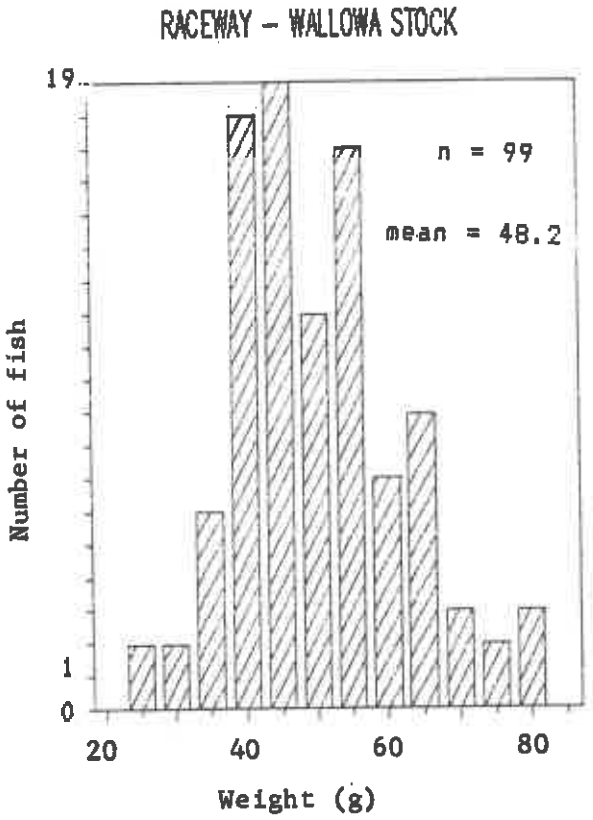
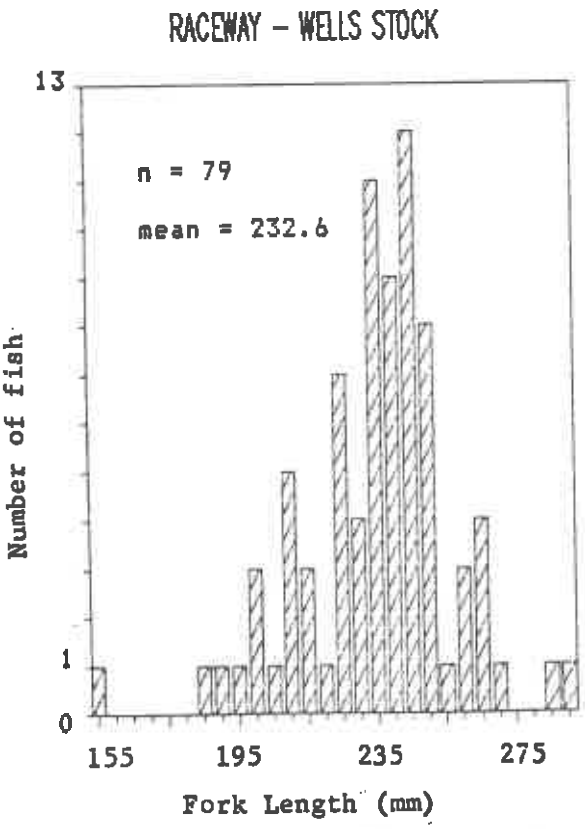


Fig. 3.1.2. Length and weight histograms for Lake 2, Lyons Ferry Hatchery, 1985.







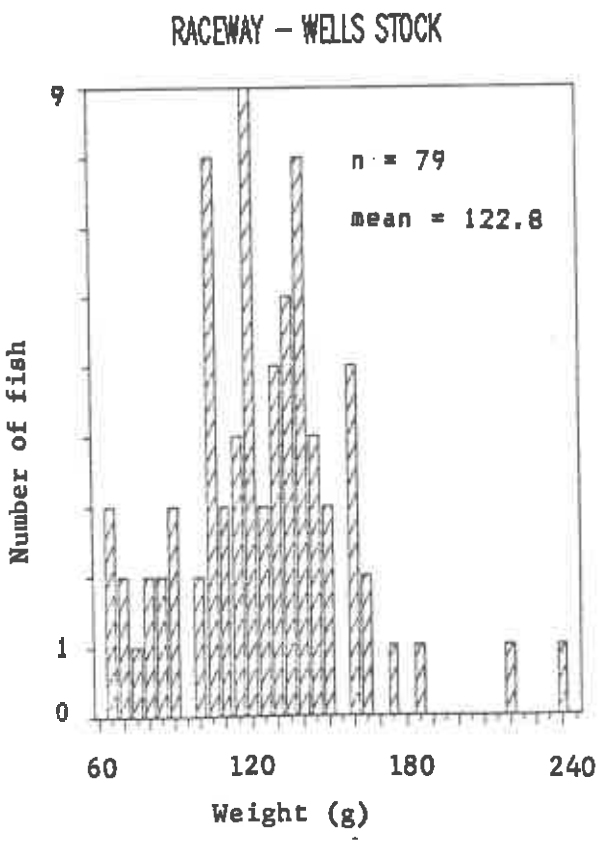
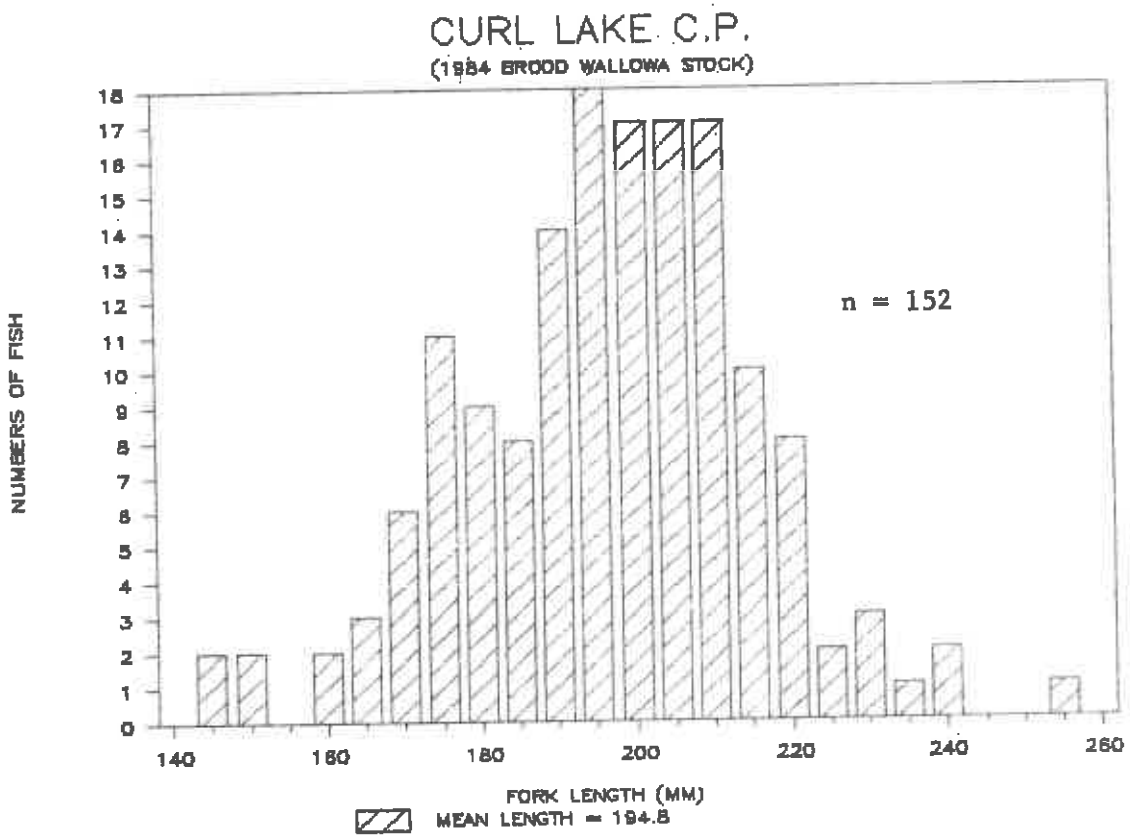


Fig. 3.1.3. Length and weight histograms for raceway reared steelhead at Lyons Ferry Hatchery, 1985.



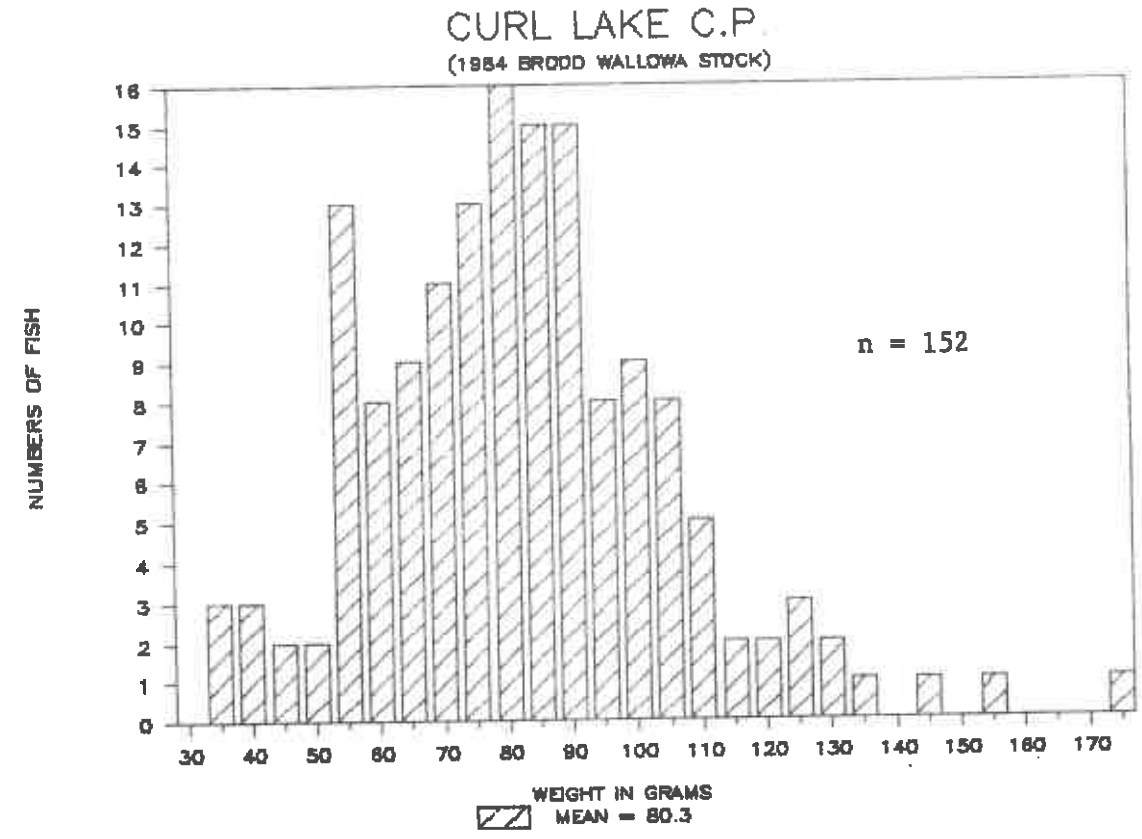


Fig. 3.1.4. Length and weight histograms for steelhead at Curl Lake Conditioning pond, 1985.

Table 3.1.4: Lyons Ferry/Tucannon Hatchery steelhead smolt releases and Mark groups

RELEASE YEAR	LOCATION	NUMBER	POUNDS RELEASED	DATE (MM/DD)	STOCK	TAG CODE	BRAND	FIN CLIP(S)	SIZE #/LB.	TAG LOSS(%)	BRAND LOSS(%)
1982	G.ROMBE @C-WOOD	35,155	3,615	5/12-18	WALLOWA	62/16/50	LA-IJ-1	AD	9.7		
	LYONS FERRY	27,940	3,660	5/6-11	WALLOWA	62/16/50	LA-IJ-3	AD	8.0		
	"totals"	63,095	7,275				Mean fish/pound =		8.7		
1983	LYONS FERRY	52,253	12,152	5/1-20	WELLS		LD-S-1		4.3		
	LYONS FERRY	50,597	11,772	5/1-20	WALLOWA	63/28/38	LA-S-1	AD	4.3	3.18	
	ENTERPRISE,OR.	34,431	5,975	5/02	WALLOWA	63/28/39	RA-S-1	AD	5.8	3.30	
	ENTERPRISE,OR.	32,078	6,025	5/03	WALLOWA	63/28/40	RA-S-2	AD	5.3	2.74	
	ENTERPRISE,OR.	44,330	2,860	5/04	WALLOWA				15.5		
	ENTERPRISE,OR.	72,943	9,710	5/05	WALLOWA				7.5		
	WALLA WALLA R.	91,260	12,950	5/10	WELLS				7.0		
	TUCANNON R	148,275	21,600	5/4-12	WELLS				6.5		
	LYONS FERRY	35,680	5,134	5/1-20	WELLS				7.0		
	TOUCHET R.	76,250	10,950	5/6-12	WELLS				7.1		
	MILL CREEK	28,200	4,000	5/11	WELLS				7.1		
	ASOTIN CREEK	36,774	5,385	5/3-11	WELLS				6.8		
	"totals"	703,071	108,513				Mean fish/pound =		6.5		
1984	TUCANNON R.	30,473	6,219	5/09	WALLOWA	63/32/12	RA-IJ-1	LV	4.9	5.1	
	TUCANNON R.	15,680	2,850	4/26	WALLOWA	63/32/13	RA-IJ-2	LV	5.5	6.3	
	TUCANNON R.	11,442	2,159	5/09	WALLOWA	63/32/13	RA-IJ-2	LV	5.3	6.3	
	TUCANNON R.	31,790	6,113	4/26	WALLOWA	63/32/14	RA-IV-1	LV	5.2	5.8	
	TUCANNON R.	30,938	6,312	4/26	WALLOWA	63/32/15	RA-IV-3	LV	4.9	5.2	
	TUCANNON R.	36,000	4,000	5/08	WALLOWA				9.0		
	TUCANNON R.	39,000	4,699	5/10	LF/WELL			AD	8.3		
	LYONS FERRY	50,450	15,288	4/30	WELLS		RD-IT-3		3.3		
	LYONS FERRY	5,193	1,573	4/30	WELLS				3.3		
	LYONS FERRY	24,920	4,450	4/21	WELLS				5.6		
	LYONS FERRY	30,400	9,212	4/30	WALLOWA		RD-IT-1		3.3		
	LYONS FERRY	20,605	3,887	4/30	WALLOWA		RD-IT-1		5.3		
	LYONS FERRY	6,810	1,718	4/30	WALLOWA				4.0		
	TOUCHET R.	21,360	4,450	4/10	WELLS				4.8		
	TOUCHET R.	32,900	7,000	4/11	WELLS				4.7		
	TOUCHET R.	27,685	5,650	4/16	WELLS				4.9		
	TOUCHET R.	32,775	5,750	4/16	WELLS				5.7		
	TOUCHET R.	29,945	5,650	4/18	WELLS				5.3		
	WALLA WALLA R.	55,370	11,300	4/17	WELLS				4.9		
	WALLA WALLA R.	52,945	11,300	4/12	WELLS				4.7		
	WALLA WALLA R.	24,920	4,450	4/20	WELLS				5.6		
	MILL CREEK	30,510	5,650	4/18	WELLS				5.4		
	ASOTIN CREEK	33,005	4,025	5/07	WALLOWA				8.2		
	ENTERPRISE, OR.	330,667	50,775	4/23-30	WALLOWA				6.5		
	ENTERPRISE, OR.	170,785	20,050	5/1-3	WALLOWA				8.5		
	"totals"	1,176,560	204,530				Mean fish/pound =		5.8		

Table 3.1.4: Lyons Ferry/Tucannon Hatchery steelhead smolt releases and Mark groups

RELEASE YEAR	LOCATION	NUMBER	POUNDS RELEASED	DATE (MM/DD)	STOCK	TAG CODE	BRAND	FIN CLIP(S)	SIZE #/LB.	TAG LOSS(%)	BRAND LOSS(%)
1985	TOUCHET R.	23,400	4,500	4/15	WELLS			AD	5.2		
	TOUCHET R.	17,680	3,400	4/16	WELLS			AD	5.2		
	TOUCHET R.	28,350	4,500	4/16	WELLS			AD	6.3		
	TOUCHET R.	23,400	4,500	4/16	WELLS			AD	5.2		
	TOUCHET R.	40,119	6,403	4/19	WELLS			AD	6.3		
	TOUCHET R.	16,716	1,990	5/08	WALLOWA			AD	8.4		
	WALLA WALLA R.	67,600	12,000	4/17	WELLS			AD	5.6		
	WALLA WALLA R.	22,800	4,000	4/18	WELLS			AD	5.7		
	WALLA WALLA R.	24,800	4,000	4/19	WELLS			AD	6.2		
	MILL CREEK	24,000	4,000	4/18	WELLS			AD	6.0		
	ASOTIN CR.	31,500	3,750	4/24	WALLOWA			AD	8.4		
	SNAKE R. @ L.GOO	21,035	3,626	5/06	WELLS		RA-7N-1	AD	5.8		
	SNAKE R. @ L.GOO	20,309	3,626	5/10	WELLS		RA-7N-3	AD	5.6		
	SNAKE R. @ IHR D	4,159	815	5/08	WELLS		LA-7S-1	AD	5.1		
	SNAKE R. @ IHR D	4,038	776	5/09	WELLS		LA-7S-3	AD	5.2		
	SNAKE R. @ IHR D	4,378	858	5/10	WELLS		RA-7S-1	AD	5.1		
	SNAKE R. @ IHR D	4,050	810	5/13	WELLS		RA-7S-3	AD	5.0		
	SNAKE R. @ IHR D	4,020	804	5/13	WELLS		LB-7S-3	AD	5.0		
	SNAKE R. @ IHR D	4,219	796	5/14	WELLS		RB-7S-1	AD	5.3		
	LYONS FERRY	22,394	8,613	5/06	WELLS		RD-H-1		2.6		
	LYONS FERRY	28,191	10,842	to	WELLS	62/16/44	RA-H-1	LV	2.6	11.00	
	LYONS FERRY	25,540	4,643		WALLOWA		RD-H-2		5.5		
	LYONS FERRY	28,373	5,158	5/13	WALLOWA	62/16/45	RA-H-2	LV	5.5	5.70	
	G.RONDE @ C.WOOD	41,028	7,460	5/04	WALLOWA	62/16/27	RA-17-1	AD-LV	5.5	2.90	
	G.RONDE @ C.WOOD	40,201	7,309	to	WALLOWA	62/16/28	RA-17-3	AD-LV	5.5	4.00	
	G.RONDE @ C.WOOD	46,717	8,494	5/10	WALLOWA			AD	5.5		
	TUCANNON R.@CURL	39,094	6,859	5/17	WALLOWA	62/16/29	LA-S-1	AD-LV	5.7	3.20	
	TUCANNON R.@CURL	39,094	6,859	to	WALLOWA	62/16/30	LA-S-2	AD-LV	5.7	4.10	
	TUCANNON R.@CURL	73,421	12,880	5/22	WALLOWA			AD	5.7		
	ENTERPRISE, OR.	379,353	48,975	4/2-26	WALLOWA			AD	7.7		
	G.RONDE BLW C.WO	21,462	2,125	5/17	WALLOWA			AD	10.1		
	"totals"	1,149,979	193,246				Mean fish/pound =		6.0		
								SD =	1.2		

stock. Brand retention was good for tagged fish, with brand loss ranging between 0.4-4.9 %. Brand loss is generally equivalent or greater than tag loss. The brand-only fish lost their brands at a greater rate than cwt/branded fish; 5.7 % for RD-H-2 Wallowa fish, and 6.7 % for the RD-H-1 Wells fish. Both these groups of fish were slightly larger at the time of branding than the cwt/brand fish. Brand loss averaged 4.6 % for all groups in 1985.

An additional 64,000 Wells stock fish were branded by Fish Passage Center personnel as part of the migration rate and smolt survival studies being done in the Columbia River basin. Brand quality and specific data on those groups are available in the 1985 Fish Passage Center report (FPC, 1986).

Paired releases of 50,000 fish were made from Lyons Ferry Hatchery again this as part of the brood stock development and testing program (Table 3.1.4). We began coded wire tagging some of these fish this year to improve our ability to distinguish adult spawners returning to the hatchery ladder or passing Dams on the Columbia and Snake Rivers by the use of freeze brands. The tag is necessary to allow trapping of the adults at the dams as they pass through the ladder. This will allow us to spawn each stock separately and also to compare return rates to the point of release. We were unable to tag all the fish released from the hatchery, therefore untagged fish were branded in the dorsal position to facilitate easier identification.

3.1.4 Discussion

The production year went very well. Rearing large numbers of smolts and catchable size fish created space problems as it had in 1984. Densities of fish reared were not excessively above design capacity, although there are certain critical times when more fish would almost be unmanageable. Timing fry transfer in the spring from the hatchery to outside raceways is hampered by the catchable rainbow which must be reared in the same raceways. It becomes critical to remove enough rainbow to planting sites in time for the juvenile steelhead to be moved. This activity was hampered again this year by having several raceways filled with smolts to be released from Lyons Ferry for brood stock returns. Making sufficient raceway space available for the tagging and branding program is also difficult. Experience from 1983 and 1984, and limiting the tagging to only 240,000 fish annually, allowed the work to proceed smoothly

Spring smolt releases have been a critical time in past years. The release structure below the three steelhead lakes appeared to be in imminent danger of overcrowding and possible stress mortalities during several days. We utilized the remote conditioning ponds this year, which allowed us to remove over 270,000 smolts from the hatchery by early April. This caused less crowding of the release structure during late April when the remainder of our steelhead stocking occurs.

Fish growth and performance during the year was excellent. Feed conversions were below values for 1984 but still good. Performance is probably due to an excellent water supply, minimal disease problems throughout the year, and careful cultural practices. Smoltification at time of release appeared to be very good for most fish with greater continuity of size within each stock than for the 1984 releases. Differences in stock performance are evident but there is no indication that either stock would be unsuitable for continued culture at this facility. Wallowa stock fish showed improvement in their size and weight continuity which was probably due to more rearing time in the lakes than for 1984.

Raceway reared fish still have a much higher incidence of precocialism than do lake reared fish. This may be due to the increased average size of raceway fish; 2.6 fish/lb for the Wells stock and 5.5 fish/lb for Wallowa stock versus 5.4 and 6.4 fish/lb. averages for Wells and Wallowa lake reared fish, respectively. Both 1984 and 1985 released groups were branded and released for brood stock returns to the hatchery, and therefore had to be kept separate. Because of the precocialism problem, this practice will be discontinued in 1986 when one lake will be available to accept the brood stock releases after conditioning ponds are filled.

Tagging/ branding programs continue to be a problem. Removing fish from large rearing lakes in January or early February is difficult and stressful for the fish. Unfortunately there is no alternative if the hatchery is to be used as it was designed. Tag loss was disappointingly high this year and there is little evidence for specific causes that might be improved in future years. Aging tagging machines may be part of the problem as it was common to have one machine "down" at any time of the day being fixed. Purchase of a new tagging trailer with WDF this year should solve this problem and make scheduling of tagging, clipping, and branding easier. The new trailer will be available for the 1986 tag groups.

Brand loss seemed excessively high this year, up to 11 % in one group, and averaged 5.15 % loss for the six groups. Brand quality was better than experienced in 1984 but still poorer than we had hoped. Such loss constitutes a substantial potential loss of migration data and is not cost efficient. We suspected that the losses were due primairly to improper branding procedure in 1984, but reinforcement of procedures and training for the branders solved only part of the problem. We will try to stress still greater branding quality in subsequent years. We would hope that careful branding procedure could reduce brand loss or unreadable brands incidence to less than 3 %.

3.2 Smolt Outmigration

3.2.1 Hatchery Operations

All smolt plants for 1985 are summarized by release day in Table 3.1.4. Three types of releases occurred this year. 1) Brood stock smolt releases from Lyons Ferry were allowed to volitionally migrate from the raceways; 2) The majority of fish this year were pumped from the release structure into tank trucks and hauled directly to various streams and rivers in Southeast Washington or Wallowa Hatchery in Oregon; and 3) fish were pumped from the release structure into tank trucks, then transferred to conditioning ponds on the Tucannon and Grande Ronde Rivers.

The conditioning ponds were watched closely to ensure that any problems that might occur with a new facility would not jeopardise the fish. Fish were transferred to the Cottonwood Cr. facility on the Grande Ronde the last week of March. The fish responded well to the facility. A retired WDG hatchery manager was hired to operate the pond. His expertise and knowledge of fish were important to ensure the safety of the fish and proper operation of the facility. The screens were removed from the outlet structure on May 6, which would allow fish to outmigrate at will and the pond level was lowered 8 in.. Only small numbers of fish were noted exiting the pond for the next 5 days. On May 11, large numbers of fish were migrating from the pond throughout daylight hours. The manager estimated that 30% of the fish had migrated in that 24 hour period. The pond was empty by May 13. Dipnet samples were used to estimate size at release (5.5 fish/lb.).

We observed a less than one % scale loss on fish sampled during release. As noted in our 1983-84 reports, there is an occasional fish that can be categorized as descaled (>40% scale loss from 2 body sections). Most scale loss at the hatchery appears to be caused by fish jumping against aluminum fingers in the release structure (designed to keep fish from moving back up into the release channel), or by occasional abrasion from pipes or crowders. We observed no additional descaling on fish released at Curl lake C.P.. Cottonwood pond was not sampled.

3.2.2 Migration Through Dams

All tagged and branded fish released in 1984 migrated from the lower Snake River area and were not available to the two upper Snake R. transportation dams (Lower Granite and Little Goose). Juvenile passage estimates and transportation information is available only from McNary Dam on the Columbia R.. In 1985, however, there were groups released into both areas. Table 3.2.1 summarizes passage estimates for each brand group for 1984 and 1985. In 1985, "H" brands were released from Lyons Ferry Hatchery, "S" brands were released from Curl Lake C.P. on the Tucannon R. and "17" brands were released from Cottonwood C.P. on the Grande Ronde River.

Table 3.2.1 Estimated Passage of Branded Lyons Ferry Steelhead at McNary Dam in 1984 and 1985, and Lower Granite dam in 1985. (Harmon, 1985)

Brand	Year	Number[1] Collected	Est. Passage	Number Released	% of Release	Size #/lb.	Stock
McNary							
RA-IJ-1	84	1,081	3,669	30,473	12.0	4.9	WA
RA-IJ-2		983	3,264	27,122	12.0	5.4	WA
RD-IT-1		4,930	16,855	51,005	33.0	4.2	WA
RD-IT-2		3,530	12,008	50,460	23.8	3.3	WE
RA-IV-1		1,728	5,691	31,790	17.9	5.2	WA
RA-IV-3		1,715	5,771	30,930	18.7	4.9	WA
RA-H-1	85		10,526[2]	28,191	37.3	2.6	WE
RA-H-2			6,302	28,373	22.2	5.5	WA
RD-H-1			6,467	22,394	28.9	2.6	WE
RD-H-2			6,963	25,540	27.3	5.5	WA
LA-S-1			6,503	39,094	16.6	5.7	WA
LA-S-2			6,586	39,094	16.8	5.7	WA
Lower Granite							
RA-17-1	85		12,142	41,028	29.6	5.5	WA
RA-17-3			12,066	40,201	30.0	5.5	WA

1 This number would equal number of fish transported, a change in report format did not provide this number in 1985.
2 This number is the Passage Index number for each group, and does not represent total survival to the dam.

First arrivals of fish at McNary dam occurred six days after release from Lyons Ferry hatchery and nine days after release from Tucannon Hatchery. Fifty percent (50%) passage of the fish from all groups passed the first collector dam within 20 days of release, but individuals from various groups continued to pass the dams through the end of July. Peak flows for both the Snake and Columbia Rivers occurred between early May and Mid June, coinciding well with the steelhead migration. Peak spills to encourage migration and discourage passage through the turbines were also available at these same times, although low flow in the Snake in 1985 kept passage spills to a minimum. Average daily travel rates for various brand groups ranged between 4.0-5.9 miles per day in the mid Snake River and 9 miles per day in the upper Snake River below the Grande Ronde River (FPC, 1985,1986).

3.2.3 Discussion

Average fish size for 1985 was down slightly from the 1984

release, however the fish were of a more consistent weight (Coeff.of Var.for all groups: V=25.86 in 1984; V=20.0 in 1985.). There was some problem with large fish (2.6/lb.) from the hatchery raceways, however precocious males were not more than 9 % of the fish sampled. Most fish released appeared to migrate quickly from the site and to continue downstream without delay except for the Tucannon River releases. Very cool rainy weather in early May lowered river temperatures to near 40°F. Fish held in the Curl Lake C.P. reacted to the cooling temperatures with decreased activity and unwillingness to migrate from the pond. We delayed emptying the pond late into the month (22-May) and still were unable to completely remove all the fish. Residualism of these fish was excessively high as schools of fish were observed in river near the hatchery in June. An assessment of residualism and how the estimates were made are included in Section 3.6 Catchable Trout. These residual steelhead contributed heavily to the summer trout season. Also, a limited assessment of residualism and Wild smolt migration was made in Asotin Creek tributaries (Appendix T). Few 1^+ steelhead/rainbow could be captured with electrofishing even with repeated effort, particularly on the North Fork where the electricity seemed to be ineffective. Sites on Charlie Cr. and main Asotin Cr. were electrofished on 7 May in an attempt to find Ad-clipped smolts. Very few 1^+ age trout were found below our stocking site (fish released at Forks bridge 24 April).

Total Passage Index (P.I.) at McNary and Lower Granite dams indicate either mortality at the dams, residualism to the river or stream, inaccuracies in the estimating procedures for passage numbers, or a combination of all of the above. Unfortunately the passage index is not an indicator of survival. If the estimates made in 1983 by NMFS personnel are accurate, the P.I. is only about 45-60 % of actual total survival or passage to that point. What the P.I. can be useful for is comparison of groups released at different locations. There are obvious differences between apparent survival to McNary Dam of groups released at Lyons Ferry and on the Tucannon River. It seems that utilizing the Curl Lake C.P. did not encourage out-migration of smolts this year. We are unsure however, whether this is the result of natural occurrences within the system or if we artificially induced residualism by holding these fish until late May.

Migration rates and the P.I. for similar groups were quite consistant (Table 3.2.1). The migration rate for the Grande Ronde fish was noticeably higher than for the lower Snake releases and very similar to that measured in 1983. This may be the result of greater currents in the upper Snake or better smoltification because of more temperate water conditions in Cottonwood Cr. than in the Tucannon River. One thing noted by the F.P.C. was that migration rates increased dramatically for all our groups once they passed the first pool encountered in their migration (FPC,1986). This response is consistant throughout the basin for both steelhead and chinook.

There was no indication in the smolt samples for either length, weight, condition factor, or their apparent smoltification process (except as previously noted for the Tucannon R.) that the fish would not perform well during migration. Additional information from tag groups released by the F.P.C. indicated that the travel time index for the Snake R.(L.Granite Dam to McNary Dam) was 9.3 days at an average speed of 15.6 miles/day (FPC,1986). Two of these groups were our Cottonwood C.P. released fish. Our fish migrated more slowly than the Dworshak NFH released fish, but survived in larger numbers.

The early 1984 Tucannon River release (RA-IV-1,3) emigrated in late April on moderate spring flows and consistantly performed better than the later releases from both Lyons Ferry and Tucannon hatcheries. The early migrating fish appear to have survived, or migrated, in 50 % greater numbers through both McNary and John Day facilities. Because of this apparent increased survival, our intent was to make our releases earlier in 1985. Complicating factors and weather however, delayed most releases.

Adult returns to the project area for each year class will have to be the final measure of whether smolt survival was significantly different from 1983 through 1985. The facility was constructed to allow sufficient production to offset high juvenile mortality throughout the river. If adult return goals can be achieved within current migration, residualism, and mortality rates, we should not have serious concerns.

3.3 Adult Returns

3.3.1 Passage at Dams

Sampling of adult steelhead as they pass through lower river dams has some application for tracking returns if the sample data is complete and systematic enough to be reliable from year to year. Sampling at Bonneville Dam is conducted annually, however inconsistencies in sampling procedures or trap efficiency at different flows make this data of little use except for run timing. Recoveries of brands passing the dam in 1985 were very few, and therefore unreliable as an indication of run strength or timing. A similar situation occurred at McNary Dam.

Passage of marked (cwt) groups of fish at Lower Granite Dam (LGR) have great significance since it is the uppermost dam in the lower Snake River and the point which is considered the LSRCP project location. Fish escaping to this location can be considered fulfilling their comittment to meeting compensation goals. Table 3.3.1 lists estimated escapement of Lyons Ferry fish to above LGR, by release year, for each mark group and the percentage age of release that these fish represent.

Table 3.3.1 Adult Returns of Lyons Ferry Steelhead to Above Lower Granite Dam, 1983-85. (Harmon, 1985)[1]

Release year / Brand	Return year[2] Number adults						Total adults	% survival[3]
1982	FALL 83	SPR. 84[4]	FALL 84	SPR. 85	FALL 85	SPR. 86		
LA-IJ-1*	65	9	39	15	1	0	129	0.37
LA-IJ-3	150	63	120	76	3	0	412	1.47
1983								
RA-S-1			118	24	107	25	274	0.82
RA-S-2			95	16	90	17	218	0.70
LA-S-1			172	116	147	64	499	1.02
1984								
RA-IJ-1					100	21	121	0.42
RA-IJ-2					87	12	99	0.39
RA-IV-1					152	24	176	0.59
RA-IV-3					174	28	202	0.69

* 1982: IJ-1 Grande Ronde R.; IJ-3 Lyon's Ferry
1983: RA-S Wallowa R. Oregon; LA-S Lyon's Ferry
1984: All brands released in Tucannon River.

1. No current estimate of trap efficiency exists for the L. Granite bypass. Past studies indicate 85-90% (Harmon, Pers. Comm). These numbers are not expanded.
2. Fall trapping dates are July 1- Dec. 31. Spring trapping Jan. 1- June 31.
3. Smolt to adult survival is based on numbers of tagged juveniles released with a corresponding brand. (Adjusted for tag and brand loss)
4. Spring passage at Lower Granite Dam represents the completion of passage for the previous years summer run steelhead.

3.3.2 Characteristics of Returning Adult Steelhead

We now have complete adult Wallowa stock steelhead return data on the 1982 and 1983 releases from Lyon's Ferry Hatchery. The data for this characterization was collected primarily at Lower Granite Dam from coded wire tagged/branded adults as they passed through the fish ladder. Additional length at age data were collected during our creel survey of the Snake River (Mendel, et al., 1987), and are based on scale analysis for age class grouping. Those creel data are not stock specific, and therefore cannot be used to directly compare with the Wallowa stock data.

Length at age for several groups reared at Lyon's Ferry Hatchery are presented in Table 3.3.2. The size of fish appear to be consistant over the three years represented. One year ocean rearing fish averaged 53.9 % of total adult returns while two ocean and three ocean fish averaged 45.8 % and 0.7 % respectively.

Table 3.3.2 Average Lengths for Lyons Ferry Hatchery Adult Wallowa Stock Steelhead Returning to LGD Trap.

Release year	Release site	Brand	Mean length(cm) one ocean n[1]	one ocean L	two ocean n	two ocean L
1982	G. Ronde R.	LA-IJ-1	34	57.3	16	69.6
	L.Ferry H.	LA-IJ-3	50	60.2	75	76.2
1983	L.Ferry H.	LA-S-1	100	59.9	150	71.7
	Wallowa R.[2]	RA-S-1,2	115	58.4	100	70.7
1984	Tucannon R.	RA-IJ-1,2	100	57.8		
	Tucannon R.	RA-IV-1,3	100	58.1		
	Combined Mean		6	58.6 ±1.1	4	72.0 ±2.5

1 Sample size, does not indicate total return.

2 Reared at Lyon's Ferry Hatchery but released in Oregon.

Run timing for the Wallowa stock fish generally follows passage norms at Lower Granite Dam as characterized by the 1985-86 steelhead passage graph in Appendix H. Eighty five percent (85%) of the 1983 release (1 and 2 ocean fish) passed the dam September through November, with the peak month being October. An additional 14.6 % passed the dam during March and April, with the fractional remainder passing in either August or December. The ladder at the dam is closed for repairs in January and February.

3.3.3 Returns to Other Locations

A total of 30 adult steelhead were seen crossing Headgates Dam during our counting periods from 10 March to 9 May. Our highest count was 12 steelhead crossing the dam during the afternoon of 18 March. We estimate that 220 steelhead (± 205, 95% C.I.) crossed the dam in March. Only 2 mornings and 3 afternoons were sampled in March. Only 3 scheduled counts were completed in April. No attempt was made to estimate the number of fish passing in April. Only 1 day in May was sampled. Counts on the afternoon of May 9 produced 6 steelhead (total expanded estimate of 9 fish) and 43 adult suckers.

The WDF weir was installed in March to trap migrating adult steelhead but high flows washed the weir out two days later. Only a few steelhead were caught during this time.

Many other fish bound for the Snake river were intercepted in consumptive fisheries or strayed into other stream systems where they were sampled. Table 3.3.3 summarizes this data and provides an idea of the migratory pattern and importance of these fish in other locations and fisheries.

Table 3.3.3 Adult Returns of Lyons Ferry Steelhead to Locations and Fisheries within the Columbia River Basin, 1985. @

	Estimated recovery or harvest (% of release)						
Tag Code Brand	63/28/38 (LA-S-1)	63/28/39 (RA-S-1)	63/28/40 (RA-S-2)	63/32/12 (RA-IJ-1)	63/32/13 (RA-IJ-2)	63/32/14 (RA-IV-1)	63/32/15 (RA-IV-3)
Location							
L.Col. Sport	17(.035)					9(.030)	
Zone 6 Net	142(.289)	51(.153)	84(.269)	24(.082)	36(.123)	29(.097)	69(.235)
Deschutes R. caught							
escaped		7(.021)*	5(.016)*				
L.Ferry Ladder	43(.087)*	3(.009)*	2(.006)*	2(.007)*	3(.010)*	2(.006)*	2(.007)*
Upper Snake R. Sport	38(.084)	16(.052)	9(.029)[1]	19(.065)[1]	15(.051)[1]	49(.166)[1]	43(.146)
Idaho Sport[2]	54(.119)	29(.087)		34(.117)	70(.238)	6(.020)	13(.044)
Wallowa Hatch.		19(.057)	15(.048)				
Totals	287(.636)	117(.354)	115(.368)	79(.271)	124(.422)	94(.318)	127(.432)

@ tag recoveries are based on sample data collected by several agencies and forwarded to WDG through each states' tag coordinator.
* Indicates that no sample rate could be obtained and the number listed is for fish collected.
[1] No in-sample sport recoveries. Number listed here is jaw tags returned to NMFS at L. Granite dam for a $5.00 reward.
[2] IDFG data for rivers other than the Snake R.

Table 3.3.4 is a summation of tag recoveries for various locations and fisheries and is the essence of returns for 1985.

Table 3.3.4 Estimated Return Rates to the Columbia River System by Tag Code in 1985.

Tag Code	63/28/38	63/28/39	63/28/40	63/32/12	63/32/13	63/32/14	63/32/15
% Return from Release	0.829	0.579	0.636	0.508	0.543	0.718	0.931

3.3.4 Returns to Lyon's Ferry Hatchery

The ladder at the hatchery was open and operational for the entire fall run of steelhead in 1985. During that time, 524 adult steelhead were trapped and retained for the winter in the adult

holding raceways. The ladder was dewatered mid-December due to extreme cold and failure of any fish to enter the trap.

The ladder was reactivated between March 11, 1986 and April 14, 1986 to trap additional adults. During that time period, 1,235 adult steelhead were trapped and inspected for brands, fin clips, sex and wild/hatchery origin. An additional 125 adults were returned to the river without inspection. A total of 1,884 fish, representing 1.63 % of the Snake River steelhead run passing Lyon's Ferry Hatchery, entered the facility.

The fall fish sorted for spawning were comprised of 76 % females and 24% males. One hundred eighty six (186) females were spawned yielding 827,700 eggs (mean =4,450/female). Thirteen females were either positive IHN carriers or were over ripe and had to be discarded. The remaining 173 females yielded 705,000 eggs after first picking, for an average of 4,075 eggs/female with an 8.4% egg loss from spawning to incubation tray. Females spawned were 34.4% wild origin and 65.6% hatchery origin, as determined by dorsal fin examination.

Other fish sorted from fall and spring trapping were comprised of 78% females and 22% males. Wild origin fish were 17.2% of the sample and tagged/branded fish represented 5.75% of the total fall and spring trapping. Branded Wallowa stock fish (RD-IT-1) returning to Lyons Ferry Hatchery as brood stock were trapped at a 0.05 % return rate (24 fish) while branded Wells stock fish returned to the hatchery at a 0.014 % return rate (7 fish).

3.3.5 Discussion

Unfortunately, our attempts at counting adult steelhead were relatively unsuccessful because of inadequate sample size in March and high turbid flows in April. Anglers have reported steelhead crossing the dam as late as the second week of June. Counts of adult steelhead would provide much needed information regarding escapement levels into Asotin Creek and the timing of the run. We will attempt to modify our methods and conduct a counting station in Asotin Creek again in 1986. The large spawning run of suckers was unexpected. Adult suckers were not observed at Headgates Dam prior to late April - the dam appears to be a partial barrier for this spawning run. We have attempted to locate some steelhead trapping records from the late 1950's and early 1960's at the Headgate Dam fish ladder but we have been only partially successful. These records could be very valuable for characterizing wild native steelhead and run timing in Asotin Creek. We will continue to attempt to locate these reports.

No attempt was made to count steelhead crossing Starbuck Dam because of other commitments. We require trapping facilities for adult steelhead on the Tucannon River to estimate escapement and to assess the impacts of our stocking programs on the native steelhead

runs. A more substantial trapping weir than the present temporary structure at the hatchery will be required to satisfy our needs during high spring flows.

The actual performance of the various mark groups of LFH steelhead is very encouraging and it appears that we are close to meeting our mitigation/ compensation goals. For all the tag codes listed, we met or exceeded the production escapement goal of survival back to the Columbia River system. This is, however, only for one years return and the final overall return rates should be higher. Unfortunately many of the fish we have returns for were taken in downriver fisheries (Table 3.3.3) and therefore could not contribute to the Lower Snake project area. Sampling Lower Columbia River harvest is crucial to tracking the performance and contribution of our releases. These fisheries capture substantial percentages of total returns into the system and are also subject to wide fluctuations in season length and gear restrictions from year to year. These fisheries also may jeopardize ultimate achievement of LSRCP goals if they prevent escapement of enough fish into the project area. Estimates of return performance for the LSRCP fish would be incomplete at best without lower river harvest estimates.

Fish passage data collected at Lower Granite dam is very useful for many reasons. The dam provides an excellent way to sample adult steelhead under controlled conditions to determine their origin by the presence of freeze brands. We have complete return cycles for LFH released steelhead (1982-83) passing the facility that indicate we are meeting our steelhead goals for the hatchery (Table 3.3.1). Unfortunately, many of the fish passing the dam were released downriver from the hatchery as smolts and are exhibiting apparent strong tendancies as adults to "stray" considerable distances from their point of release. This behavior is also exhibited by fish released in 1984 from the Tucannon Hatchery, although we have only one return year for those fish at this writing.

We must conclude that smolt survival from our hatchery has been at least acceptable as evidenced by very good smolt to adult survival rates through three release years. Our fish are contributing to fisheries throughout the lower basin upon their return but at present, those fisheries have not harvested sufficient numbers to place LSRCP goals for returning adults in jeopardy. We estimate that for run years 1983, 1984 and 1985, adult returns from Lyon's Ferry Hatchery smolt releases were 287, 3,515 and 8,863 fish respectively to the project area (above Lower Granite Dam or into an appropriate tributary, based on return rate information in Table 3.3.1).

3.4 Juvenile Salmonid Populations in Project Rivers

Electrofishing site locations are presented in Appendix I. Our electrofishing samples were collected between late August and mid October 1985. Water quality and substrate data, as well as estimates of the % run, riffle and pool, cover types, and % eroding banks at each site were collected but are not reported here. These data may be included in a future report that deals with habitat improvement for the LSRCP in southeastern Washington. The data are currently available in our files if desired. Other habitat data are reported in Appendix J.

We used length frequencies to determine ages of gamefish species for age-specific population and density estimates (Figs 3.4.1 - 3.4.4). Data used for calculating salmonid density estimates are presented in Appendix K. Estimated densities are presented in Table 3.4.1. Biomass estimates are in Appendix L. The relative abundance of non salmonid fish are presented in Appendix M.

Length-frequencies for rainbow trout captured at sites electrofished by WDF are presented in Appendix N. Population and density data for game fish collected by WDF are included, as are site locations. Mean rainbow trout densities were similar for runs (31.2 fish/100m^2, SD=12.0,n=12), riffles (26.6 fish/100m^2, SD=10.3, n=3) and pools (27.9 fish/100m^2, SD=18.2, n=9) at sites electrofished in the wilderness section of the Tucannon River.

Seven of 10 sites on Panjab Creek and 8 of 24 sites in the Tucannon River wilderness section electrofished by WDF contained adipose clipped steelhead smolts that had been released from Curl Lake C.P.. Adipose clipped steelhead comprised 63.5% (mean FL=196.8mm, SD=17.9,n=33) and 26.7% (mean FL=192.9, SD=20.9, n=27) of the rainbows $\geq$150mm FL. on sites electrofished on Panjab Cr. and the wilderness section of the Tucannon R. respectively. (Appendix N)

Our electrofishing efforts on Meadow and Cottonwood Cr.(tributary to the Grande Ronde) produced results similar to those of WDF. Adipose clipped steelhead comprised 86.7% of the rainbow trout over 154mm FL. (mean FL=191.1, SD=19.6, n=15) on Meadow Cr. while 95.2% of the rainbows on Cottonwood Cr. >155mm were adipose clipped (mean FL=187.8mm, SD=14.4, n=21). No adipose clipped steelhead were found by WDF or WDG on any Cummings Cr. sites.

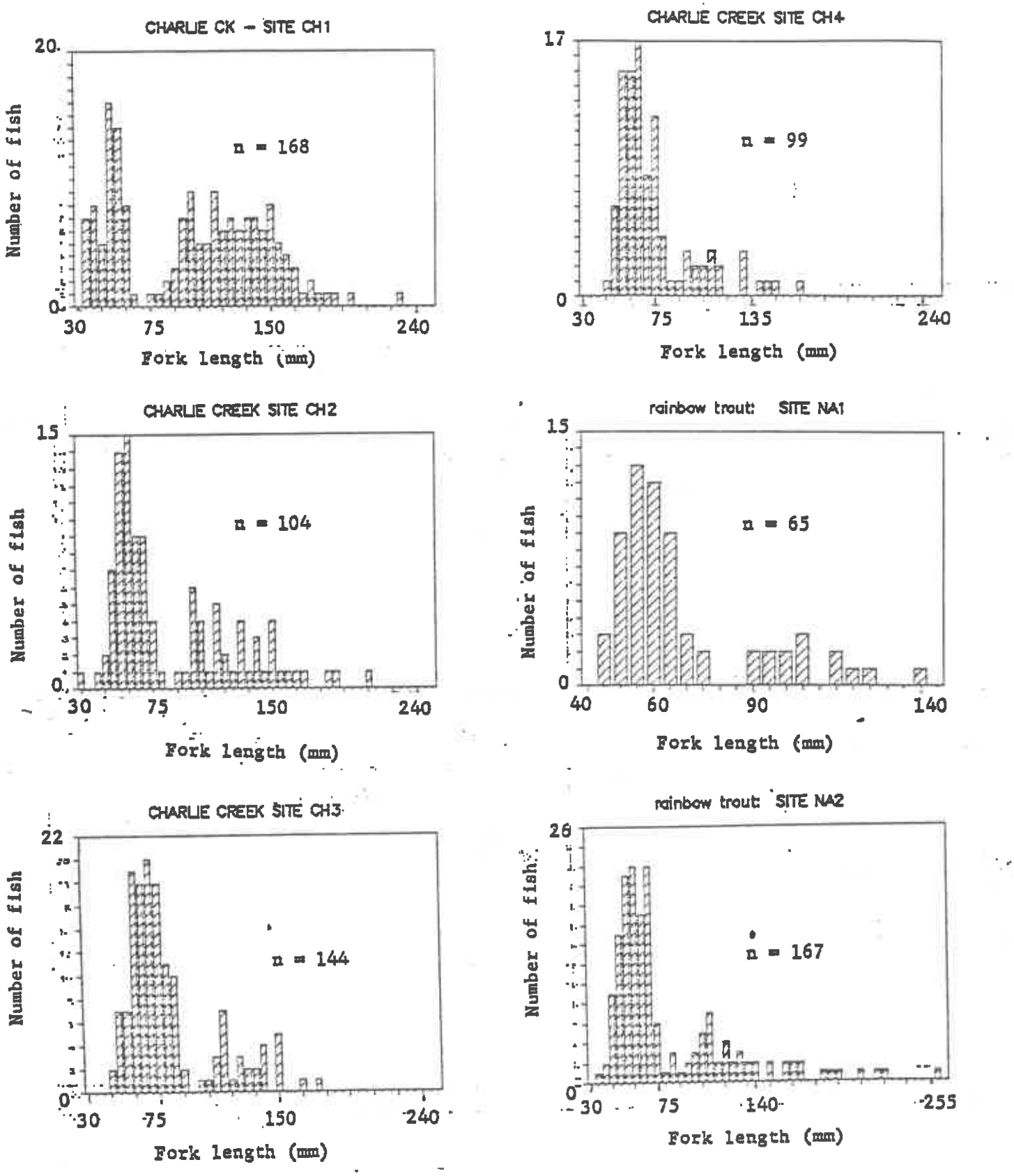


Fig. 3.4.1. Length-frequencies of rainbow trout electrofished at sites on Charlie Creek and the North Fork of Asotin Creek, Sep. 5 to 24, 1985.

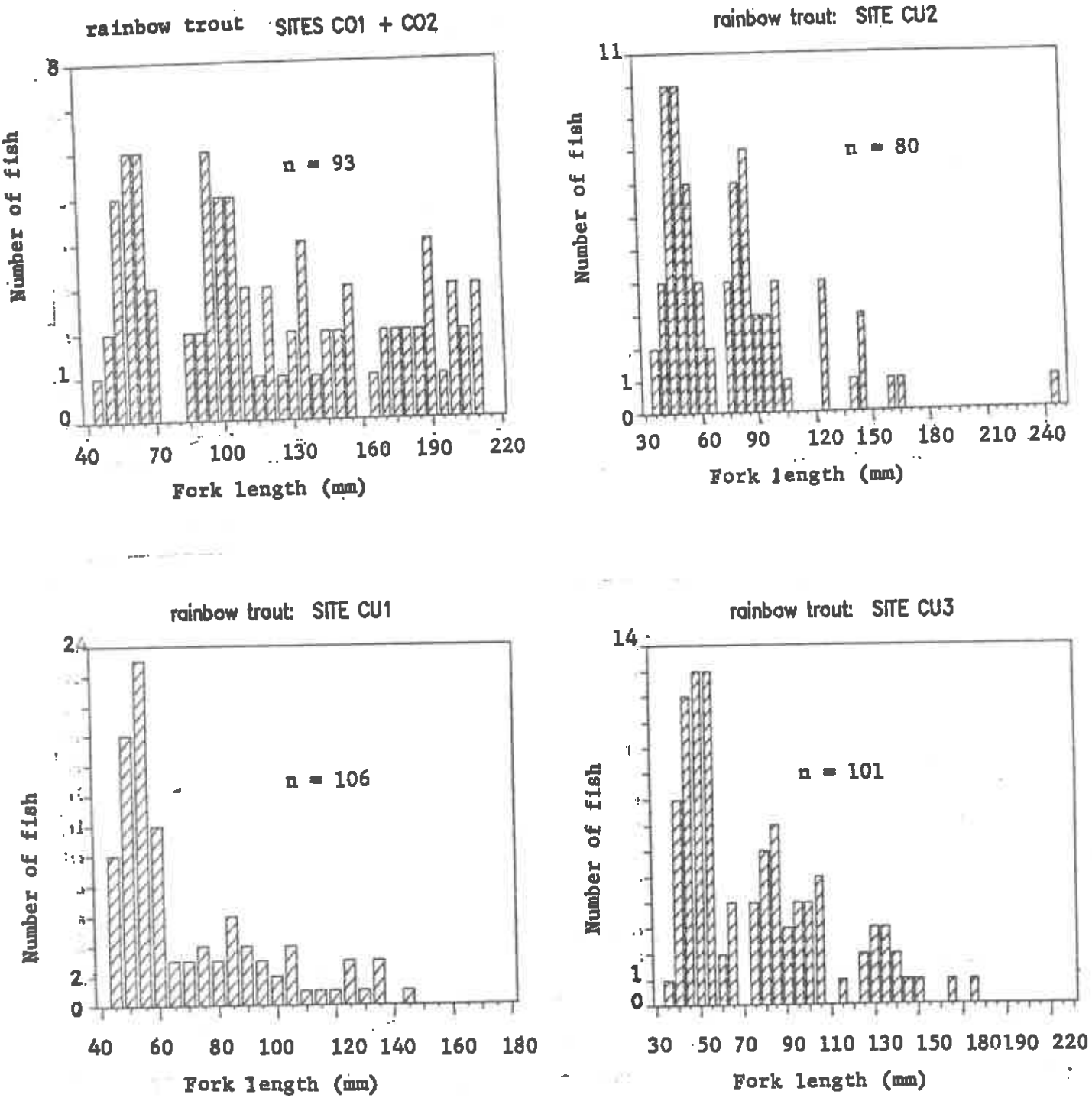


Fig. 3.4.2 Length-frequencies for rainbow trout captured by electrofishing at sites on Cottonwood Creek (trib. to Grande Ronde R.) and Cummings Creek (trib. to Tucannon R.), Sept. 25 to Oct. 11, 1985.

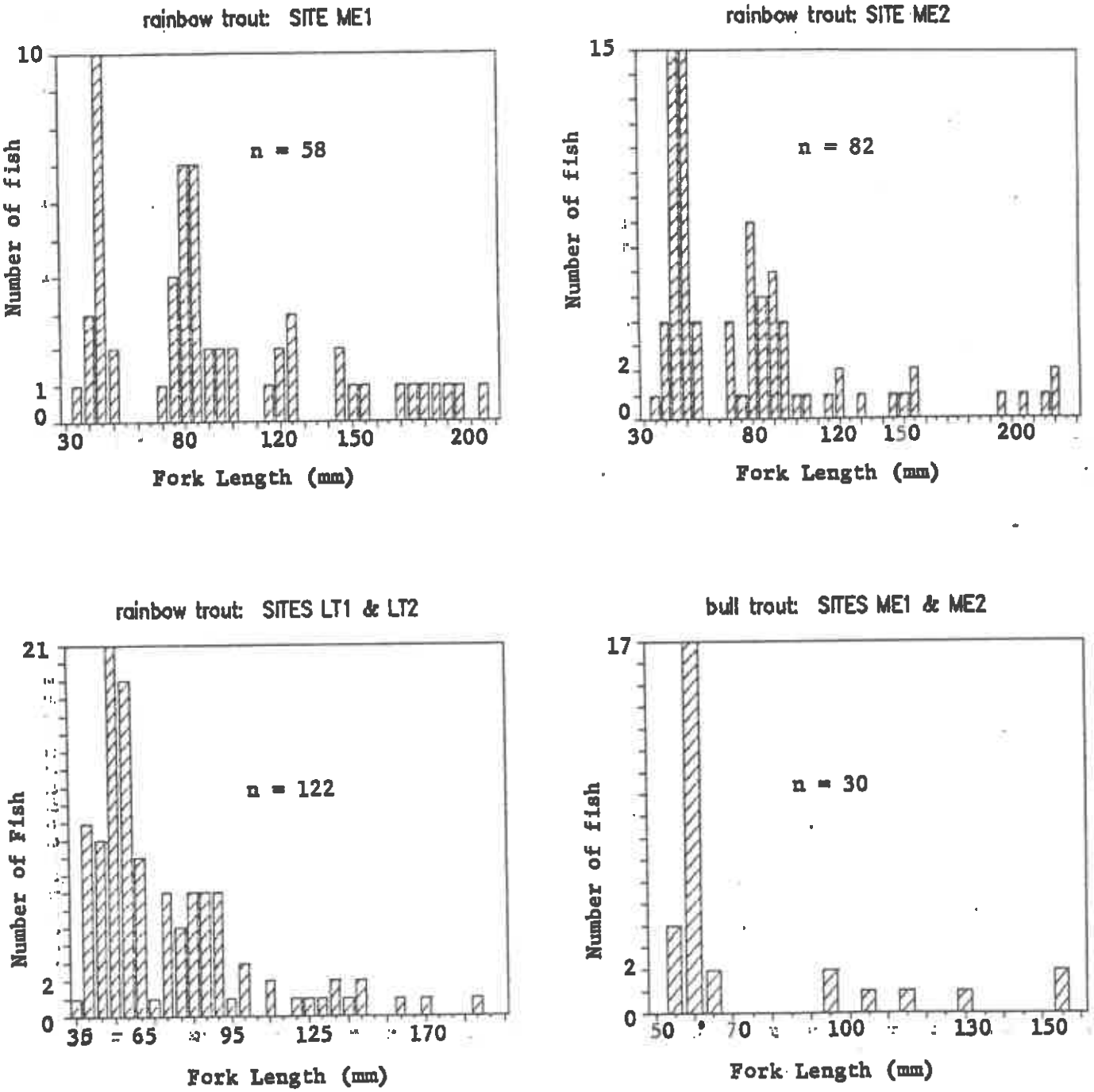


Fig. 3.4.3. Length frequencies of rainbow trout and bull trout captured by electrofishing sites on Meadow Creek and the Little Tucannon River, Sept. 3-4, and Oct. 1, 1985, respectively.

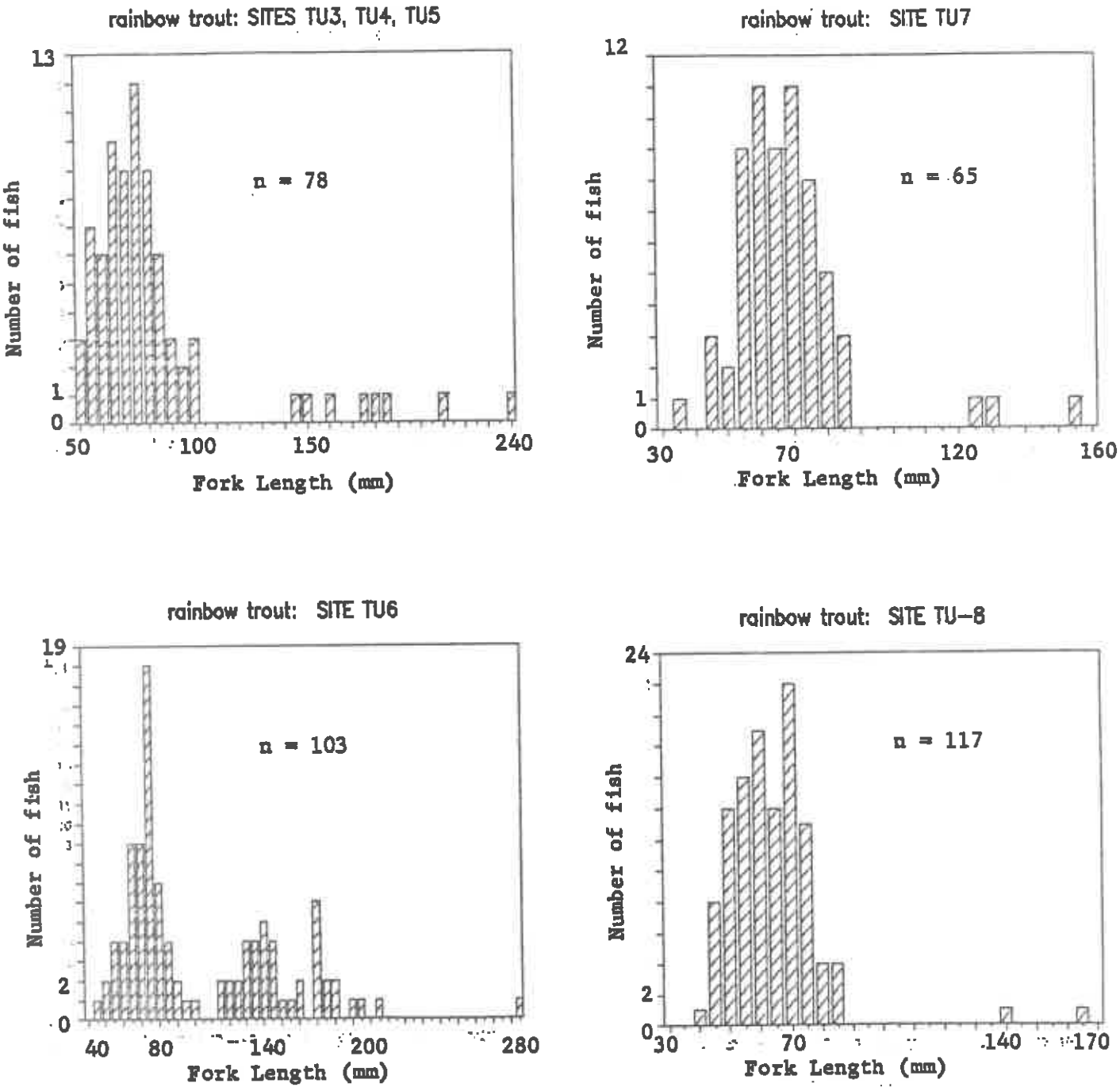


Fig. 3.4.4. Length-frequencies of rainbow trout captured by electrofishing sites on the Tucannon River, August 1985.

Table 3.4.1. Salmonid Density Estimates (number of fish/100 m² and 95 % confidence limits) for Sites Electrofished in 1985.

	Rainbow Trout						Other Species		
	Age 0+		Age >= 1+		Total RBT				
Site@	#/100m²	C.I.	#/100m²	C.I.	#/100m²	C.I.	Specie	#/100m²	CL
CH4	79.3	5.6	18.1	2.2	99.4	7.1			
CH3	125.4	4.4	35.7	8.2	159.9	6.7			
CH2	52.3	1.8	32.7	1.1	85.9	2.5			
CH1	35.1	2.2	63.8	1.0	99.5	2.3			
NA1	29.6	5.7	7.2	1.1	35.9	3.7	CH[c]	2.1	0
							DV[c]	0.4	0
NA2	68.7	4.9	27.6	3.6	106.5	15.0	CH	22.7	3.0
CO1	13.6	0.5	38.2	1.9	51.9	1.9			
CO2	14.6	3.3	33.1	1.8	47.7	3.1			
Tucannon Tributaries									
CU1	82.9	3.7	50.5	10.4	132.2	7.8			
CU2	34.0	1.9	35.7	0.6	69.8	1.7			
CU3	62.5	34.4 [a]	39.8	2.8	94.1	14.6			
LT1 *	0	0 [b]	33.7	1.6	33.7	1.6			
LT2 *	74.1	4.7	14.2	1.3	98.5	4.4			
ME1 *	13.8	2.2	37.1	2.9	51.8	4.3	DV 0+	4.3	1.3
							DV 1+	2.6	2.8
ME2 *	25.5	1.0	23.2	0.6	48.7	1.1	DV 0+	10.7	0.6
							DV 1+	2.4	1.2
Tucannon River									
TU1 *	0	0	0	0	0	0	SMB [c]	0.4	?
TU1 *	0.4	0	0	0	0.4	0			
TU3 *	3.5	0.3	0.2	0	3.7	0.2			
TU4 *	11.7	3.1 [a]	1.2	0.2	12.8	2.9 [a]	WF [c]	0.6	?
TU5 *	5.6	1.2	0.8	0.8	6.4	1.2			
TU6 *	12.5	2.6 [a]	7.9	1.9	20.9	3.6 [a]	CH	3.0 [a]	1.2
							WF 0+[c]	0.3	?
							WF 1+	0.3	?
TU7 *	43.6	41.3 [a]	1.1	1.1	44.0	37.7 [a]			
TU8	36.0	3.5 [a]	0.6	3.7	36.8	3.7[a]	CH	11.1	1.4
							BT [c]	0.3	?

[a] < 60 % reduction between passes, use density estimate with caution.

[b] See graphs for LT1 and LT2, it appears no zero age fish at LT1. A debris jam was 100 ft or so below this site.

[c] SMB =small mouth bass (56, 58mm fork length), WF =whitefish (105,106mm FL at TU4), (115, 117, 356, 381 AT TU6), BT =brown trout (78 mm FL), CH=chinook, DV=bull trout

* LT1 had 189mm H?, LT2 had 1 ad. clipped RB below site, ME1 8 ads- everything over 148 was ad. clipped, ME2 5 ads- everything >= 155, TU1 problems with nets, TU2 too deep to shock well, TU3 nets failed 240mm S brand, TU4 1 ad, TU5 209mm M brand (or S in 3rd), TU6 changed to different shocker - not same between passes- 1 H RB, TU7 gaps in nets.

@ CH=Charlie Cr., NA= N.F.Asotin, CU=Cummings Cr., LT=L.Tucannon, ME=Meadow Cr., TU=Tucannon River.

3.4 Discussion

Few trout or other gamefish were captured in the lower Tucannon River (below Pataha Creek) during the late summer or fall. Densities of trout above Marengo far exceeded densities within the section from Pataha to Marengo. This is likely related to marginal water temperatures known to exist below Marengo (Hecht et al. 1982; Kelley et. al. 1982).

Brown trout stocked in the Tucannon River in 1984 have had limited spawning success as evidenced by the capture of young brown trout a short distance below the Wooten HMA as well as in the Wilderness section above Panjab Creek (WDF data Appendix N).

Steelhead densities were very similar at site CH-3 on Charlie Cr. for 1981 (166 fish/100m^2) and 1985. This confirms the high densities we found here in 1981 that we believed may have been in error.

Few gamefish over 200 mm (7.9 in.) were captured at any sites. Most of the larger fish that we captured on Meadow and Cottonwood Creeks were adipose-clipped steelhead that had moved upstream from our conditioning pond. In the case of Meadow Creek, hatchery steelhead smolts had migrated upstream 7 miles or more. The same type of movement was seen in the South Fork of Asotin Creek in 1984 (Hallock and Mendel 1985; Schuck and Mendel 1986), and in the Tucannon R. (WDF, 1985). Thus we are actually stocking streams with steelhead that we did not intend to stock. Meadow Creek appears to be an important bull trout spawning and rearing area for the Tucannon River system and only rainbow trout and bull trout were found in this stream. No other piscine prey base was evident. Consequently we could be negatively affecting wild rainbow/steelhead and bull trout populations in some streams because of competition or predation by hatchery steelhead smolts. The spread of diseases and genetic interaction are also possible negative impacts on wild trout.

3.5 Redd Counts

We conducted a spawning ground survey on the upper Tucannon River on 31 March 1985. High flows and turbidity precluded adequate visibility for spawning surveys. Our first observed redd was on Main Asotin Creek on 27 March. We walked approximately 0.2 - 0.3 miles on each of the lower N. Fork, the lower S. Fork and Main Asotin Creek, but we found no other redds or adults that day. Flows were often high and it was difficult to see well enough to conduct spawning surveys (Appendix.O). On March 23 we spot checked several areas on both the N. and S. Forks: 5 adult steelhead and 6 redds were observed on the South Fork and 2 adults on the N. Fork. On 26 April a spawning survey conducted on the lower 1.8 miles of the S. Fork of Asotin Creek produced 9 adults and 5 redds (2.8 redds/ mile) plus another four adults, one carcass, and one redd

were found at spot checks of other areas of the lower S. Fork. Three more redds, 1 adult and 1 carcass were found on the S. Fork and 1 fresh redd on the N. Fork on 1-May. Also many adult suckers were found spawning on the S. Fork on 7-May.

3.5 Discussion

Redd counting continues to be a frustrating and unreliable means of collecting data on adult escapement into project streams. High and murky flows have severely limited visibility to see redds or spawning adults and frequently kept us completely out of the water for much of the last two years. If weather patterns do not change to allow us to wade streams and have clear visibility, all we can conclude is that fish are eacaping into these two rivers to spawn, and that spawning activity is occurring during March through May. Total escapement and what percent of the fish are hatchery fish released from Lyons Ferry cannot yet be determined. Counting fish into the system by trapping would be a much more exact means to assess adult escapement and determine the percentage of the fish returning from hatchery releases. Some trapping opportunity may occur on the Tucannon R. near the Tucannon Hatchery in future years and we will trap fish if possible. We will attempt spawning surveys for a third and possibly final year in 1986.

3.6 Catchable Trout Program

3.6.1 Production

Production of legal or catchable size rainbow trout at the Lyons Ferry/Tucannon complex totaled 198,453 fish weighing 63,895 pounds. Fish planted directly from Lyons Ferry averaged 2.5 fish per pound and fish planted from the Tucannon Hatchery averaged 3.4 fish per pound. The cumulative average weight for catchable trout was 3.1 fish/lb for 1985. Appendix F gives a listing of streams and lakes in southeast Washington which received Compensation Plan plantings, the number and pounds of fish they received, and the number of different stockings into each water. Total Compensation Plan production would be 84,000 pounds of fish total, with 3,100 pounds of catchable fish and 100,000 fingerling provided to Idaho. The program this year accounted for about 76 % of that goal and no catchable sized fish were raised for Idaho. We expect to rear a full program of fish for Idaho beginning in 1986.

3.6.2 Tucannon River Creel Survey

Angler effort, catch rates and harvest estimates within the Wooten HMA and the mid Tucannon River are presented in Tables 3.6.1 and 3.6.2, respectively. Total estimated harvest through August was 42,641 trout (± 11,563, 95% CI.) in the HMA and 3,900 trout (± 2,871, 95% CI.) in the mid Tucannon River through August 1985. Angler effort and catch rate data, and sampling information are presented in Appendix P. Mean completed fishing trip length was approximately 2.0 hours within the HMA and 1.7 hours in the mid Tucannon River. Thus, anglers expended 17,191 angling days within

the HMA and at least 1,651 angling days in the mid Tucannon River between opening day and the end of August.

Nearly 56 % of the Tucannon River harvest within the HMA was comprised of hatchery rainbow trout released during the fishing season as "catchable-sized" trout (Table 3.6.3). Branded steelhead smolts were caught in abundance during the season and some of those fish had moved upstream. Branded fish were caught as far upstream as the Cow Camp area by early June, and by the end of the creel survey they had been caught at least as far upstream as Panjab Creek. Wild rainbow trout/steelhead (fork length of about 8 inches) comprised only about 0.6 % of the fish retained by anglers. Some brown trout up to 38.5 cm in fork length were harvested that had survived from the previous years stocking within the HMA, as well as at least one RA-IV branded 1984 release steelhead smolt. Wild bull trout up to 38.5 cm (fork length) comprised another nearly 0.6 % of the harvest. The ratio of kept fish to released fish (Table 3.6.4) changed from 2.75 in June to 0.52 in August as more small fish were caught and kept by anglers.

The exploitation rate for "catchable" rainbow trout plants within the HMA was 78.28 % in just over 3 months (Table 3.6.3).

3.6.2 Discussion

The angler counts for the June weekend strata within the HMA were highly variable because it included opening day data (only 1 weekend day was sampled from the entire 3 days of opening weekend). Opening day counts before multiplying by correction factors were 118 and 96 anglers during AM and PM, respectively. The means for other weekends in June were 25.5 (S.D. = 6.35) and 21 (S.D. = 7.81) for AM and PM's, respectively.

Our reported confidence limits for estimated harvests for the Tucannon River within the HMA are artificially low because we did not account for variability of the means for those correction factors. Correction factor means were used as constants with no variance included in the harvest calculations. At this time we do not know the necessary corrections needed in our harvest variance formulas. Another problem with our estimates is that we used "party" as the sampling unit for catch rates instead of AM or PM. We decided to use party because of the lack of catch rate data for some strata. Generally the use of party as the sampling unit should mean the reported confidence limits are larger than if full day or half day had been used (See Appendix C, Mendel et al. 1987).

The mid Tucannon River angler effort estimates are probably conservative because we used vehicles to indicate the presence of anglers. This ignores those anglers from nearby residences who can walk to their fishing areas in this portion of the river.

Table 3.6.1 Angler effort, catch rate and harvest estimates for the Tucannon River within the Wooten HMA, May 25, to September 1, 1985.

Date	Day Type	Angler Effort: Angler Hrs.	Angler Effort: 95% C.I.	Catch Rate: Fish/Hr.	Catch Rate: 95% C.I.	Harvest: # Fish	Harvest: 95% C.I.
June	WE (AM)[1]	5,821.53	3,874.047	1.8254	0.33928	10,627	7,372
	WE (PM)	7,348.12	5,850.784	0.9133	0.29280	6,711	5,824
	WE TOT	13,169.65	7,017.116	1.3968	0.24644	18,395	10,361
	WD (AM)	1,643.04	703.004	1.4763	0.45720	2,426	1,291
	WD (PM)	1,979.52	830.337	1.5315	0.53416	3,032	1,669
	WD TOT	3,622.56	1,087.968	1.5100	0.36734	5,470	2,124
June Total		16,792.21	7,100.957	1.4177	0.21192	23,806	10,704
July	WE (AM)	2,167.83	1,000.917	1.1448	0.44533	2,482	1,515
	WE (PM)	3,782.52	2,703.584	1.3201	0.32618	4,993	3,802
	WE TOT	5,950.35	2,882.916	1.2687	0.26347	7,549	3,997
	WD (AM)	1,957.78	879.456	1.4068	0.74210	2,754	1,936
	WD (PM)	3,989.48	3,282.624	1.1354	0.35900	4,530	4,036
	WD TOT	5,947.26	3,398.392	1.2237	0.33041	7,278	4,634
July Total		11,897.61	4,456.486	1.2503	0.20622	14,876	6,106
Aug.	WE (AM)	1,587.69	1,037.073	0.8490	0.41087	1,348	1,116
	WE (PM)	1,433.34	444.975	0.8581	0.52140	1,230	847
	WE TOT	3,021.03	1,128.504	0.8484	0.31865	2,563	1,370
	WD (AM)	897.38	458.863	1.6408	1.53289	1,472	1,607
	WD (PM)	1,774.30	1,315.843	0.4695	0.29138	833	828
	WD TOT	2,671.68	1,393.556	0.6502	0.38584	1,737	1,399
Aug. Total		5,692.71	1,793.187	0.7513	0.25240	4,277	1,983
Season Total		34,382.53	8,573.178	1.2402	0.13115	42,641	11,563

[1] WE= weekends and major holidays; and WD= weekdays
AM= 0630-1230; PM= 1231-2030 hrs.

Table 3.6.2 Angler Effort, Catch Rates and Harvest with 95 % Confidence Intervals for the mid Tucannon River (Marengo to Wooten HMA), summer 1985.

			Angler Effort		Catch Rates		Harvest	
Period	Day-type	Time	Angler Hours	95 % C.I.	Fish Per Hr.	95 % C.I.	# of Trout kept	95 % C.I.
June [A]	WD*	AM	182	216	-- [B]	--	--	--
		PM	360	336	--	--	--	--
		Total	542	399	--	--	--	--
	WE	AM	550	329	--	--	--	--
		PM	489	289	--	--	--	--
		Total	1,039	438	--	--	--	--
	Monthly Total		1,581	592	1.893	1.685	2,993	2,934
July	WD	AM	231	338	--	--	--	--
		PM	70	124	--	--	--	--
		Total	301	360	--	--	--	--
	WE	AM	90	73	--	--	--	--
		PM	201	221	--	--	--	--
		Total	291	233	--	--	--	--
	Monthly Total		592	429	1.00	0.316	592	473
August	WD	AM	0	0	--	--	--	--
		PM	308	257	--	--	--	--
		Total	308	257	--	--	--	--
	WE	AM	263	464	--	--	--	--
		PM	63	38	--	--	--	--
		Total	326	466	--	--	--	--
	Monthly Total		634	532	0.250	0.250	159	217
Season Total			2,808	904	1.389	0.908	3,900	2,871

[A] Includes opening week in May (5/25 to 6/30).
[B] Catch rates and harvest were not calculated for these strata because of small samples and/or high variability.
* WE= weekend; WD= weekday; AM= morning; PM= afternoon

Table 3.6.3 The Estimated Number of Catchable Rainbow Trout Harvested and the Estimated Exploitation rates on the Tucannon River, May 25 to September 1, 1985.

Month	Number of catchable trout stocked	Estimated trout harvested	% of harvest as catchable trout	Estimated # catchable trout harvested
Wooten HMA				
May	11,200	---	----	----
June	9,746	23,806 [A]	53.87 [A]	12,824 [A]
July	9,300	14,876	70.10	10,428
Aug.	---	4,277	18.52	792
Total	30,346	42,641[B]	55.71	23,755[B]
	exploitation rate = 78.28 % for catchables in the HMA.			
Mid Tucannon River				
	4,165	3,900	72.84	2,841
Combined	34,411			26,596
	exploitation rate = 77.29 % for catchables from Panjab to Marengo.[C]			

[A] Data for May 25 to 1 June included in June estimates.
[B] Does not sum correctly because total trout harvested was recalculated with average catch rate. Total mean % catchables is a weighted mean.
[C] Could not calculate separate exploitation rate for the mid Tucannon because fish stocked in the HMA probably moved downstream into this area.

The average completed angling trip of two (2.0) hours confirms our observations that fishing trips were of short duration and that the river often had little or no fishing pressure for periods of a day. The close proximity of camping areas and the Tucannon lakes may increase total angling effort within the Wooten HMA but it probably causes completed angling trips to be relatively short. A completed fishing trip in the mid Tucannon River is only 1.7 hours but that is based on only 6 parties of 14 anglers so it may not be representative of the actual angling trip length. Also anglers in

Table 3.6.4 Composition of the Catch for the Tucannon River (Wooten HMA and HMA to Marengo) from creel surveys, May to September 1985.

Creel Period	Total fish of known origin	# of hatchery fish kept	(%) of known origin	Unbranded ad clipped fish kept	RA-S-1 brands kept	RA-S-3 brands kept	# of wild Rainbows kept	# fish of unk. orig.	other fish kept*	released fish
WOOTEN HMA										
Opening Day	521	358	(68.71)	98	30	32	0	52	IV BRAND 2 DV	1302
June	448	164	(36.61)	219	27	25	7	75	1 LV clip 2 DV 3 BT	269
Combined	969	523	(53.70)	317	57	57	7	127		399
July	612	429	(70.10)	164	6	7	3	124	2 DV 1 BT	421
August	189	35	(18.52)	147	0	0	2	30	5 DV	435
Season Total	**1,770**	**986**	**(55.71)**	**628**	**63**	**64**	**12+**	**271**	**11 DV 4 BT**	**1,255**
MID-TUCANNON										
Opening Day	30	25	(83.33)	5	0	0	0	0	2 BT	0
June	32	19	(59.37)	13	0	0	0	0	0	0
Combined	62	44	(70.97)	18	0	0	0	0	0	0
July	19	15	(78.95)	4	0	0	0	0	0	0
August	0	0		0	0	0	0	0	0	0
Season Total	**81**	**59**	**(72.84)**	**22**	**0**	**0**	**0**	**0**	**0**	**0**

* IV brand is a carryover from the 1984 steelhead release. DV = Bull trout, BT = Brown Trout, LV is 1. ventral clipped fish - could be a steelhead smolt that did not get adipose clipped or it could be a hatchery catchable that is missing a ventral fin.

\+ Total wild component of the catch (including wild Rainbow/Steelhead and Bull trout) = 1.30 %.

this area extended their fishing times 1 hour later in August than in the HMA but again that is based on a small sample of anglers.

The exploitation rates that we computed for "catchable" rainbow trout plants are surprizingly high for a stream the size of the Tucannon River. Yet these estimates do not include losses due to hooking mortality, which may be significant for trout caught with bait (Mongillo 1985). Most anglers fishing the Tucannon River use natural bait with or without small lures. It is obvious from our kept-to-released fish ratios that many fish are released during the season and we observed numerous dead fish along the shorelines that we attributed to hooking mortality. Anglers catching many fish but keeping only the largest ("high-grading") appears to be common along the Tucannon River. The changes in the kept-to-released ratios may reflect high-grading, or they may suggest that most of the larger rainbow trout stocked as "catchables" were caught by the end of July. Then, smaller hatchery steelhead smolts that may not have been of legal size to keep, predominated in the stream. Our reported exploitation rates also do not include those hatchery trout within the survey area harvested in September or October after the creel survey, or those fish that may have moved out of the survey areas and been harvested elsewhere. Therefore we feel the reported exploitation rates should be considered as conservative and that the program of stocking catchable trout into the river is a cost-effective use of the LSRCP hatchery trout.

However, the fish management implications of increased angling pressure and the impacts of large numbers of residual hatchery steelhead smolts on wild trout populations must be considered.

3.6.3 Asotin Creek Creel Survey

Because of low angler effort on the North and South Forks of Asotin Creek in our previous survey in 1984 we did not segregate our angler counts and catch rates by zones for the North Fork; nor did we sample weekdays for any Asotin Creek sections. In 1984, 21.5 % of the estimated harvest on the North Fk. occurred on opening weekend while weekends represented 79.4 % of the total harvest through early July. Distribution of angler effort during the season was similar to that observed for harvest on the North Fk.. Opening weekend on the South Fk. in 1984 comprised 45.8 % of the harvest (32.2 % of effort). All weekends contained 73.9 % of the total estimated harvest and 58.8 % of the angler effort in 1984. Therefore, we decided to improve the cost effectiveness of our creel surveys and sample only on weekends in 1985.

Estimated angler effort, catch rates, and harvest for weekends are presented (with 95% CI.) in Table 3.6.5. We were able to conduct only 1 angler count on the North Fk. of Asotin Creek during May 26th because of enforcement of regulations prohibiting retention of adult steelhead. Thus, the one count had to be used as representing afternoons (PM) on that particular day instead of using the average of two or three counts. The total angler effort for opening weekend on the North Fk. was greater than the 183.5 ($\pm$ 50) angler hours of 1984, while catch rates were approximately half of the 1.64 ($\pm$ 0.5) fish per hour of opening weekend in 1984 (Hallock and Mendel 1984). Similar differences occurred on the South Fk. during opening weekend, with angler effort in 1984 of 65.6 ($\pm$ 11) angler hours and a catch rate of 3.66 ($\pm$ 1.28) fish per hour. Completed angling trips averaged 3.0 hrs (n= 19 anglers, 56.1 hrs), and 2 hrs (n =23 anglers, 45.5 hrs) for Main Asotin and a combination of the North and South Forks, respectively.

Anglers appear to prefer to fish near habitat improvement sites (Table 3.6.6). Low angler effort often kept the confidence limits relatively wide, but comparisons of the grand totals of angler effort at improved and unimproved sites for both the North and South Fk. indicates anglers prefer improvement sites.

Wild trout comprised a substantial portion of the catch on the South Fk. and Main Asotin Creek (Table 3.6.7). We were unable to find any wild female trout in spawning condition. We estimated a minimum sport harvest exploitation rate for the North Fk. at 34-41 % (610 of 1500-1800 fish stocked) during weekends.

3.6.3 Discussion

The large differences in catch rates between 1984 and 1985 may reflect the change of the minimum size limit from six to eight inches in 1985. Although many anglers interviewed during 1984 perceived the minimum size limit to be 8 inches. All other fishing regulations remained similar during both years. Total harvest is approximately the same for both years.

The preference by anglers for fishing at instream improvement sites confirms the 1984 results (Hallock and Mendel 1985) on the North Fk. of Asotin Creek. This angler preference may be partially attributable to the ready access and visibility of improved sites on the North Fk., but South Fk. improvements were not particularly visible and access was about the same throughout the lower South Fk.. Natural pools are very scarce on the lower South Fk. so anglers may have been seeking out the man-made pools for fishing.

Only a few steelhead smolts are caught on the North Fk. of Asotin Creek during the fishing season. The North Fk. normally has swift waters during the spring so few smolts are likely to move the 0.1 mile upstream from their release location at the Forks bridge into the North Fk.. However, many smolts move several miles upstream into the South Fk. as evidenced by angler catches and qualitative electroshocking (WDW district files). Wild fish represented a larger percentage of the catch on the North and South Forks is 1985 than in 1984 (Schuck and Mendel 1986). A few fish classified as wild trout in 1985 may have been unmarked hatchery steelhead smolts from 1984 releases. Residualism of hatchery steelhead smolts appears to be less than from 1984 releases.

3.6.4 Tagging Study

We had return rates for usable tags of 18 and 23.1 % for Asotin Creek and the Tucannon River, respectively. All unusable recoveries on the Tucannon River occurred because of incomplete record keeping for tag release groups. Recoveries indicate that tagged hatchery fish generally moved downstream after release (Table 3.6.8). The greatest distance from release site for any recovered tags was 7.8 miles downstream in 30 days on Asotin Creek, and 1 fish had moved 1.1 miles downstream from its release location in 2 days. On the Tucannon River the maximum distance for any recovery was 5.9 miles downstream and another fish moved 5 miles upstream from its release point. A total of 12 taggged fish (19 % of the total recoveries) were caught in the Rainbow lake intake impoundment. One tagged fish had moved 4.5 miles downstream by opening day when it was recaptured.

Table 3.6.5 Asotin Creek Creel Survey Results for Weekends from May 25 to July 7, 1985.

	Angler Effort (hrs.)	95 % CL	Catch Rate (fish/hr)	95 % CL	# Fish Harvested	95 % CL
South Fork - Opening Weekend (5/25 - 5/27) N = 3 days, n = 2 days.[A]						
AM [B]	114.18	45.46	0.99547	0.46669	114	71
PM	101.53	3.99	0.89835	0.56119	91	57
Total	215.71	45.64	0.94691	0.36494	204	90
- 6/1 to 7/7 Weekends (N = 13 days, n = 4 days)						
AM [C]	58.09	66.35	2.03700	0.30346	118	137
PM	10.56	17.58	0.76923	0.19295	22	36
Total	68.65	62.17	1.40311	0.17700	96	97
- Grand Total (N = 16, n = 6)						
	284.37	82.55	1.31187	0.15926	375	118
North Fork - Opening Weekend (5/25 - 5/27) N = 3 days, n = 2 days.						
AM	264.37	58.46	0.82340	0.02337	218	49
PM	120.75	6.06	0.70707	0.09896	85	13
Total	385.12	58.77	0.76524	0.05084	295	49
- 6/1 to 7/7 Weekends (N = 13, n = 4)						
AM	190.12	73.19	0.88154	0.19685	167	75
PM	116.19	17.58	0.94000	0.07552	109	19
Total	306.31	75.27	0.91077	0.10542	278	76
- Grand Total (N = 16, n = 6)						
	691.44	95.50	0.88166	0.08618	610	103
Main Asotin Creek (5/25 - 7/7) N = 16 days.						
AM [D]	554.40	221.77	0.75419	2.59658	418	1830
PM [E]	913.17	472.19	0.85492	0.28652	781	1087
Grand Total	1,467.57	521.67	0.80456	2.88300	1181	5079

[A] N = # Weekend and holidays available, n = # days sampled.
[B] AM = 0600 - 1329 hrs. PM = 1330 - 2030 hrs.
[C] AM = 0700 - 1329 hrs. PM = 1330 - 2000 hrs.
[D] n = 5 days sampled - only 1 day of opening WE.
[E] n = 6 days sampled.

Table 3.6.6 Comparison of Angler Effort During Weekends at Instream Habitat Improvement Sites with Unimproved Portions of the North and South Forks of Asotin Creek, Summer 1985.

	Improved [A]		Unimproved [B]	
	Angler hours	95 % CL	Angler hours	95 % CL
South Fork - Opening Weekend (5/25 - 5/27)			N = 3, n = 2 [C]	
AM	56.2	64.9	61.9	19.5
PM	14.0	16.1	105.0	0.0
Total	70.2	66.9	166.9	61.9
hours/mile	175.5	167.3	53.8	20.0
- 6/1 - 7/7 Weekends	N = 13, n = 4			
AM	42.2	77.7	15.8	29.1
PM	0.0	0.0	10.6	19.4
Total	42.2	77.7	26.4	35.0
hours/mile	105.6	194.3	8.4	11.3
- Grand Total	N =16 n = 6			
	112.5	77.7	193.3	40.1
hours/mile	281.8	194.3	62.3	12.9 *
North Fork - Opening Weekend (5/25 - 5/27)			N = 3, n = 2	
AM	56.2	00.0	146.2	13.0
PM	35.0	16.1	66.5	44.5
Total	91.2	16.1	212.7	46.4
hours/mile	162.9	28.8	52.1	11.4 *
- 6/1 - 7/7 Weekends	N =13, n = 4			
AM	42.2	49.7	200.7	105.0
PM	21.1	20.3	190.1	133.1
Total	63.4	53.7	390.8	169.8
hours/mile	113.2	95.9	95.8	41.6
- Grand Total	N = 16, n = 6			
	154.6	66.1	603.5	147.9
hours/mile	276.0	100.1	147.9	36.2 *

[A] Total length of improved sites on South Fk. = 0.4 miles, North Fk. improved sites = 0.56 miles.
[B] Total length of unimproved area on South Fk. to barn = 3.1 miles, North Fk. to USFS = 4.08 miles.
[C] N = Total # days available, n = # days sampled.
* Large difference in effort between improved and unimproved areas with no overlap of confidence intervals.

Table 3.6.7 Composition of the Catch for Fish Seen During Creel Surveys on Asotin Creek and its Tributaries, Weekends, May 25 - July 7, 1985.

	Legal-sized hatchery rainbow trout	Adipose clipped steelhead smolts	Wild rainbows	Bull Trout	Rainbows of Unknown Origin [A]
NORTH FORK					
Opening Weekend (May 25 to 27)	54	1	6	2	2
Other WE 's	48	2	7	0	8
Total	102	3	13	2	10
% [B]	85.0 [E]	2.5	10.8	1.7	
Mean Length.[C] =		20.5	21.9 [F]	28.5	
(n,sd)[D] =		(2,0.7)	(8,3.2)	(2,0.7)	
SOUTH FORK					
Opening WE	15	2	12	0	10
Other WE's	4	7	4	0	0
Total	19	9	16	0	10
%	43.2	20.5	36.4	0.0	
Mean Length =			20.2		
(n,sd) =			(11,6.6)		
MAIN ASOTIN					
Opening	42	1	9	1	6
Other WE's	22	13	9	0	10
Total	64	14	18	1	16
%	66.0	14.4	18.6	1.0	
Mean Length =			22.3	28.0	
(n,sd) =			(10,3.8)		

[A] Origin not recorded or unidentifiable.
[B] % of fish of known origin.
[C] Mean fork length (cm).
[D] n = # fish used for mean, sd = std. deviation.
[E] Includes 1 LV clipped trout which may be a carryover from last year's catchable trout plant.
[F] Plus 1 58 cm wild male ripe steelhead in good condition - confiscated.

Table 3.6.8 Results of tagging studies for hatchery rainbow trout in Asotin Creek and the upper Tucannon River, summer 1985.

Distances moved (miles)*	Number of fish: upstream	no change	downstream	% of Total[A]
Asotin Creek (5/25 to 9/13) [B]				
0 - 0.5	7	12	8	75.0
0.51 - 1	2	0	0	5.6
1.01 - 3	1	0	3	11.1
> 3	0	0	3	8.3
Total #	10	12	14	
%	27.8	33.3	38.9	100.0
Tucannon River (5/25 to 9/1) [C]				
0 - 0.5	1	9	2	23.1
0.51 - 1	0	0	9	17.3
1.01 - 3	3	0	18	40.4
> 3	1	0	9	19.2
Total #	5	9	38	
%	9.6	17.3	73.1	100.0
Unknown [D]				
Camp 10	0	3	8	
Camp 7	2	0	9	

* Road distance, river distance would be slightly greater.
A % of recovered tags with usable information.
B recovered tags = 49 of 200 released (24.5 %), ususable tags = 36.
C recovered tags = 63 of 225 released (28.0 %), unusable tags = 52.
D Some tagged fish were released without tag #'s being properly recorded, therefore, it is not definite which of these fish were released at Camp 7 or Camp 10.

3.6.4 Discussion

The low recovery rate of tagged and fin clipped trout from a 1984 Asotin Creek study and the low estimated exploitation rate of only 13 % (Hallock and Mendel 1984) suggested that many stocked trout may have been dying or moving out of the North Fork of Asotin Creek (recaptured fish were found as much as 9 miles downstream). The 1985 results of our tagging studies do not strongly support the hypothesis that fish are being displaced downstream. However, this is based on only 18 % of the 200 tagged trout recovered with usable information. This small sample may or may not represent the total group of tagged fish or the total unmarked hatchery release group.

The Tucannon River study demonstrated a higher percentage of tagged trout moving downstream. The high percentage of tag recoveries from the impoundment at the Rainbow Lake intake dam suggest that tagged fish may have been holding in this slack water. Thus, tagged fish may not have demonstrated the amount of downstream displacement they would have otherwise shown without the impoundment. The chinook trapping weir near the Tucannon Hatchery also may have physically reduced the downstream displacement of tagged trout. The farthest downstream that a tagged trout was recovered was just above the trapping weir.

Several factors were in action during our study that may have induced bias and therefore altered the results. Stream flows were lower in 1985 than in 1983 and 1984 which may have been less conducive for trout to emigrate from their stocking area. Also the physical interruption of movement on the Tucannon River by a large slack water pool and the chinook trapping weir may have restrained fish from moving as far as they otherwise might have. All we can conclude from this years work is that stocked catchable rainbow trout exhibit some tendancy to move downstream from the original area of stocking, but it does not appear to be a severe problem at present.

3.6.5 Tucannon Impoundments

During opening day of the fishing season most angler interviews were made in the morning between 0700 and 1030 hours. Only a few interviews could be conducted after 1030 because of the possibility of reinterviewing some of the same anglers. Angler effort data were collected on a specially designed data form (Appendix Q). August data were not analyzed by AM and PM strata because the low sampling rate we used did not provide reasonable variances for these strata. We used angling party as the sampling unit for our catch per effort (CPE) estimates instead of time-of-day because we had few or no interviews for some days or times of day.

Angler effort, catch rates, harvest estimates and sampling data are provided in Appendix R. July and August accounted for a very small percentage of the season's total angler effort, except at Curl Lake which did not open until 25 May. Completed angling trips averaged 1.77 hours for all lakes during the sampled part of the summer season (Table 3.6.9). Consequently, we estimate that approximately 26,094 angler days (46,187 / 1.77 hrs) were expended by anglers within the Wooten HMA during the spring and summer of 1985.

Anglers harvested 52 to 107 % of the fish stocked for the legal trout program in most of the lakes (Table 3.6.10). Few fish carried over from previous years' stocking (Table 3.6.11). Brown trout harvested this year had been stocked in Spring and Blue Lakes in 1984. Some large rainbow trout were caught at serveral of the lakes. One large rainbow trout in Big 4 was adipose clipped, and therefore may have been an adult steelhead that got past the

Table 3.6.9 Average length of completed fishing trips for the Tucannon Lakes, spring and summer 1985.

Lake	# of Parties Interviewed	# of Anglers Interview.	Total hours fished	# of fish kept	# of fish rel.[A]	fish per angler	Mean hrs./ angler
Spring	19	32	64.0	109	5	3.41	2.00
Blue	9	16	28.3	64	4	4.00	1.77
Rainbow	19	43	98.8	115	23	2.67	2.30
Deer	23	42	59.2	131	1	3.12	1.41
Beaver	9	25	34.0	65	7	2.60	1.36
Watson	31	71	127.7	246	23	3.46	1.80
Big 4	26	45	85.9	28	43	0.62	1.91
Curl	24	66	103.3	224	45	3.39	1.56
Total for all lakes	160	340	601.3	982	151	2.89	1.77

[A] Fish released opening day not recored.

screens and entered the lake.

The 333 % exploitation rate for Curl Lake (Table 3.6.10) indicates that a substantial number of steelhead smolts remained in the lake during the fishing season. This is confirmed by the catch composition data for Curl Lake (Table 3.6.12). Approximately 68.11 % of all the harvested trout of known origin examined during the season were adipose clipped steelhead. Thus, over 11,800 steelhead smolts (.6811 x 17,376 harvested trout) were harvested during the fishing season from Curl Lake. This estimate does not include the hundreds of steelhead smolts that died from hooking mortality and lined the lake's shore. This would also indicate nearly a 100 % exploitation rate for the catchable sized trout stocked in Curl Lk.

Table 3.6.10 Sport Fishing Exploitation Rate Estimates for the Tucannon Lakes, Summer 1985.

Lake	# Trout stocked in April[A]	Harvest opening day[B]	95% C.I.	% exploi-tation	Total trout stocked[C]	Total harvest[D]	% exploit.
Spring	5,973	847	617	14.2	10,140	7,035	69.4
Blue	6,006	1,002	624	16.7	12,072	6,817	56.5
Rainbow	7,986	2,108	1,274	27.3	15,870	12,327	77.7
Deer	2,492	517	323	20.8	5,980	4,942	82.6
Watson	6,600	2,215	1,071	33.6	12,012	12,814	106.7
Beaver	1,980	365	138	18.5	3,670	3,245	88.4
Big 4	2,508 250 [E]	190 137	122	6.9 54.8	2,758	1,434	52.0
Curl	----	---	---	---	5,211	17,376	333.4

[A] Rainbow trout catchables stocked before the fishing season opened.
[B] Estimates from our creel surveys.
[C] Total rainbow trout catchables stocked for the fishing season - from hatchery records.
[D] Combined harvest estimates for all period during the sampled portion of the fishing season - 4/21 to 1 Sept. except Curl Lake fishing season did not open until 5/25. Assumption of 100% of harvest was hatchery catchables.
[E] Approximately 250 hatchery broodstock were stocked. Harvest and exploitation are presented separately for these fish for opening day.

Table 3.6.11 Catch Composition from Creel Surveys on the Tucannon Lakes, Summer 1985.

Lake	# Hatchery Rainbows[A]	% Hat. Rainbows[B]	Large Trout	Species	Mean Fork Length (sd) [C]
Spring	724	99.2	3	RB	66.9 (5.3)
			3	BT	40.5 (6.6)
Blue	709	99.7	2	BT	41.9 (12.6)
Rainbow	936	100.0	0	RB	(35.6 cm max)
Deer	458	99.8	1	RB	50.8
Beaver	341	100.0	0	RB	(35.6 cm max)
Watson	1,219	100.0	0	RB	(38.1 cm max)
Big 4	192	?	?	--	-----
April			?	RB	38.1-67.3
			1	BT	67.3
May			?	RB	45.7-57.1
June + July			?	RB	40.6-45.7
			Plus 1	RB	59.7 Ad clip

[A] Total hatchery fish kept that had been stocked as "catchables".
[B] % of total fish of known origin.
[C] Mean fork length (cm) of hatchery fish that survived the winter and (Standard deviation). Or max. or range of fork lengths for rainbows kept that were stocked in 1985.

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Table 3.6.12 Catch Composition for Curl Lake, Summer 1985.

Period	# Hatchery Rainbows (%)[A]	# Ad clipped steelhead[B]	# Branded steelhead	# Wild rainbows	# Unk. orig.
Opening WE	78 (58.2)	56 (41.8)	27	0	0
May WD	17 (36.2)	30 (63.8)	16	0	0
Tot. May	95 (52.5)	86 (47.5)	43	0	0
June	189 (32.2)	397 (67.7)	259	4	1
July	105 (28.3)	264 (71.2)	75	2	0
Aug	3 (2.8)	103 (97.2)	?	0	22

[A] Rainbow trout stocked as "catchables". % of total known origin fish caught.
[B] Total adipose clipped steelhead kept by anglers (includes branded fish)

3.6.5 Discussion

Some fishing effort is not accounted for in our estimates. A few anglers fished earlier in the morning or later in the evenings than we sampled. Also, we did not sample any of September or October, although the season was still open. Very little angler effort is likely to have occurred except possibly the first 2 weeks of September. Angler effort at Rainbow Lake was probably artificially low compared with other years. A sign along the road indicated that the Hatchery was closed and many anglers understood that to mean the road was closed.

Angler effort and success during the summer is influenced at several of the lakes by warm water temperatures and algae blooms as early as mid June. Limited limnological data are available for the lakes but it appears that the lakes have become shallow and warm and their volume is much less than when they were constructed in the 1950's. Angling opportunities, especially during the late summer, could be increased by deepening the lakes and increasing the water flow through them. The average complete trip length is short, possibly due to the camping and river fishing opportunities available in the area.

Catch composition data indicates that the lakes are primarily a "put-and-take" fishery with very few wild or carry-over fish harvested. Additionally a few adult steelhead may be able to get past the screens and be harvested in some of the lakes. The exploitation rates do not account for hooking mortality for released fish, nor do they include fish that may have died from natural causes (such as lack of oxygen) throughout the summer. Fish harvested during the fall also are not represented in these exploitation rates. However, these rates do indicate that the angling public is harvesting most or all of the trout stocked during the season.

The cost effectiveness of a catchable trout program is sometimes questioned. We therefore calculated a cost/benefit ratio of direct production and stocking costs to the projected value of the number of angler days use provided by the program. We chose to develop the cost/benefit figure for the Tucannon Impoundments only since there would be no additional fishing success attributable to natural populations like would occur in the river fisheries. We stocked 79,513 trout weighing 22,664 pounds into the impoundments at an estimated cost to the program of $56,660. Those trout provided an estimated 46,186 hours of angler recreation. Our computed average angler day of use was 1.77 hours yielding 26,094 fishing days of recreation. The U.S. Fish and Wildlife Service (1980) estimates the value of a fishing day to the local economy at $28.36, adjusted to 1985-86 figures. This computes to $740,025 worth of value to the local economy from this fishery. This seems excessively high to us and we believe it is artificially inflated by the short complete trip fishing day we measured. Other lowland lake fisheries throughout Washington average 3-4 hours per complete trip versus our 1.77 hours. By using this larger figure for

fishing day, we compute the value of the fishery to be $374,246. We would reasonably expect the true value to fall somewhere between these figures for a cost/benefit ratio somewhere between 1/6.6 and 1/13.1. It should also be noted that the value of an angler day we used is lower than the value determined for the State of Idaho for a coolwater fishing day (Sorg et al, 1985). Using that value would make cost/benefit ratios even more favorable.

We therefore believe that stocking these impoundments is a cost effective use of Lyon's Ferry Hatchery trout and a cost effective use of LSRCP funds.

4.0 SUMMARY & CONCLUSIONS

The 1985 production and evaluation year represent a significant amount of work and results toward meeting the goals for mitigation. Production at the hatchery increased significantly, with overall steelhead smolt production above the proposed long term level. Catchable trout production increased, but is still below the mitigation goal. Evaluation work on all aspects of the program went much more smoothly this year. Substantial data were collected that provides an expanding overview of how the program is benefitting fishery management goals in southeastern Washington. Comments and summary statements concerning our evaluation work will be presented here, listed by objective as outlined in Appendix A.

Objective 1: Fish cultural practices at the hatchery have not changed significantly over the last three years. Operation of the hatchery however has changed constantly to accomodate ongoing repairs and alterations to the facility. The one aspect of hatchery operation that has required adjustment of cultural practices is the rearing of two different steelhead stocks. The Wallowa stock is an Oregon developed stock of fish with some wild and hatchery stock fish used in the development. These fish differ primairly from the Wells stock used at Lyon's Ferry Hatchery in their spawning time. Wells stock peak spawning is in January, Wallowa stock not until May. This delayed spawning is indicative of native Snake River fish but causes difficulty in a hatchery where there is an expectation for smolts to be released in approximately one year. A rearing time of only 11 months has required special care for the Wallowa stock and their average size has generally been less than that of the Wells stock.

Disease at Lyons Ferry has not been a problem. Minor outbreaks of coldwater disease at LFH, and IHN at the Tucannon Hatchery have not caused serious mortality. Rearing pond mortality at Lyons Ferry has been suprisingly low. Avian predation is only a serious problem at the hatchery during the spring when rearing ponds are lowered to remove the fish, thus making the fish more susceptible to predation. Stocking estimate errors are generally of less than 1 %. Condition factors (C.F.) on most smolt groups are acceptable (C.F.<1) except for raceway reared fish which tend to be heavier (C.F.>1), and also have a higher percentage of precocious males in the samples. Every effort will be made to limit the need for rearing steelhead in raceways. Descaling at release is not a problem for either hatchery or truck releases.

Objective 2: Smolt size and weight were more consistant this year than in previous years. We attribute this improved consistancy to a greater amount of time the smolts reared in the rearing ponds. Smolts reared in the raceways were again larger and heavier than the fish released from the ponds. Such large fish are not likely an improvement since condition factors and precocious male rates indicate these fish are not of the highest quality. Starting in 1986 we will attempt to place the brood fish smolts back into a rearing pond for the last two months prior to release to prevent

the over size and over weight condition.

This first year for the Curl Lake C.P. release did not go well. A high residualism rate in the pond and in the Tucannon River after release, as determined by our creel surveys, does not indicate that the conditioning pond helped fish emmigrate better by being exposed to natural water conditions. Very cold weather and water is probably the cause, complicated by our hesitance to release the fish earlier into such water conditions. We believe that it would be best to release fish by no later than May 1, to ensure the fish every chance of emigrating at their own rate and time.

Freeze branding juvenile fish to assess migration rates through the river system seems to be an effective tool. Information obtained by the Fish Passage Center does provide insights into migrational behavior from year to year. Relying on this information to determine survival, as we first proposed, is however, not possible. Variables in estimating passage of marked groups at the dams are too numerous and too difficult to estimate accurately throughout the season. We no longer believe that the sampling program in place at the dams is capable of providing us an accurate estimate of survival. The best we can determine from the juvenile sampling is an assessment of year to year variation of groups as represented by the Passage Index.

In our original proposal we anticipated administering an experimental morpholine drip to aide imprinting of our Lyons Ferry released fish to the hatchery water. Perceived straying problems for 1983 and 1984 returns had raised questions about their ability to find the water source. Because of several unknowns concerning the differences in stocks in use at the hatchery and how these same stocks would react after conditioning at the remote ponds, we delayed this experiment until we could be more sure of the nature of the straying behavior. This morpholine study may be conducted in the future.

All smolt trapping and electrofishing to measure residualism results will be presented in the 1986 annual report.

Objective 3: Tagging, fin clipping and branding are still important tools to allow our evaluation of the different stocks of fish and different release strategies. Adipose clipping and coded wire tagging went smoothly, although brand quality on some of the groups is still a problem. Branding requires greater concentration on the part of the individual doing the work, than does tagging or fin clipping. The key to improved brand quality in the future is increased supervision of branders and emphasizing more concentration by them during their work.

Returns of tagged and or branded adult steelhead to the hatchery are disappointingly low. All releases from the hatchery starting in 1983 received some type of distinct mark to allow positive identification upon return to the hatchery and separation

of different stocks of fish for spawning. We, therefore, expected a majority of adults returning to the ladder at the hatchery to be marked. That was not the case. Only 5.75 % of the entire 1800 fish that were trapped from the 1985 run were externally marked. A complicating factor was the absence of other tagged or branded fish in the samples that might indicate a possible source or origin for the large number of unmarked fish. An interesting aspect of the trapping was the breakdown of fish trapped in the fall (517) and those trapped in the spring (1235). We must assume that the majority of the fish preferred to overwinter in the Snake River and then move into a tributary or hatchery to seek a spawning area. We did sample a higher percentage (34.4% vs. 17.2%) of wild fish in the fall trapped fish.

Estimating harvest of adult steelhead is the single most expensive and time consuming aspect of the evaluation program. Creel surveys were conducted on the entire Snake River system and estimates of effort and harvest made by section (Mendel et al, 1986). Estimates of harvest in the Snake R. were also obtained from statewide punchcard returns and found to be reasonably close to our statistical estimates. Sport and commercial harvest estimates were obtained where possible to provide the estimates of contribution of Lyon's Ferry reared and released fish. Scale samples of sport caught fish were taken, mounted, impressed on plastic and read with the aid of a scale projector. The scale age results were reported in the 1985-1986 Creel portion of our annual report.

Counting adults into tributary streams was difficult and probably unreliable. Rapidly changing stream flows and clarity made consistant adult observation impossible. Because of very high flows, the proposed Tucannon River counting station near Starbuck was not attempted and the Asotin Cr. station yielded results with a confidence limit of twice the observed and estimated number of escaping adults. The proposed Tucannon Hatchery Weir was not completed at this time and high flows precluded using the temporary weir.

Some attempts were made at spawning ground surveys in the area but high flows made observation and movement difficult. We will continue to attempt to obtain good escapement data through a number of different methods. This study year yielded few results for adult escapement except for the tag/brand data collected at Lower Granite Dam. This information continues to provide an excellent enumeration of escaping tagged fish into the project area. We will utilize this information as long as it is available and other data we collect, to assess the success of various release groups.

Objective 4: Electrofishing to determine increased abundance of steelhead in a stream is proving to be a questionable methodology for evaluating adult return performance. The electrofishing does provide valuable information on existing populations of juvenile salmonids, but we are unsure at present to what extent increased hatchery origin adult fish escapement will increase juvenile

populations. Gross increases in juvenile numbers would likely suggest increased spawning. Supporting redd count data would be necessary, however, to provide full usefullness of the data. We have unfortunately been unable to obtain that supporting data. What electrofishing has shown is the large numbers of residual hatchery steelhead smolts that have migrated throughout the tributary streams and are competing with existing populations. Large numbers of these fish contribute to the resident catchable trout fishery.

We were unable to accomplish any snorkeling this project year. We will attempt snorkeling in 1986 to determine if that technique would be effective in replacing some of the time consuming electrofishing.

Objective 5: We completed our creel surveys of catchable trout stocked waters with only minor problems. Opening day fishing effort was exceptionally high, as expected. We had difficulty in covering the fishing areas properly during this time because of the large number of people and the amount of time needed to collect creel information. This is a very important time because it accounts for a substantial percentage of total effort and harvest for the season on some smaller streams. Asotin Creek received over 50% of the seasons fishing pressure on opening weekend alone. Weekends in general acccount for 60-90% of the seasons total effort and harvest, depending on the water.

Angler utilization of catchable trout appears to be very good for the waters we surveyed. We had been concerned that catchable stocked fish were not contributing to the fishery at the rate they should, due to emigration from the stocking area. Our tagging study to measure trout movement, while not strongly conclusive, did not support our concerns. Movement within stream systems was not radical or unusual. Upstream movement distances nearly equaled downstream movements. Exploitation rates on stocked fish also seem to support that these catchable sized fish are heavily harvested by anglers. We also found very few holdover fish from the previous years stocking that might indicate under utilization. Based on these results, we believe that these fish were, at least in 1985, a cost effective part of the program and current levels of stocking for the impoundment should be continued. Stocking levels in the streams should, however, be scrutinized in light of possible conflicts between native trouts and stocked catchable trout. An adjustment of the stocking levels in some streams to remove some of the induced competition for space and food could be beneficial to the native trout and juvenile steelhead.

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APPENDIX A: WDG Compensation Program Goals

1. Establish an annual supply of steelhead brood fish capable of supplying eggs to meet compensation goals for Snake, Grande Ronde, Walla Walla and Tucannon Rivers and Asotin Creek.

Production will be based on two stocks of fish (Wallowa and Wells for 1983-85 and Wallowa and Lyons Ferry beyond 1986) until their performance is evaluated. A complete description of each stock and their characteristics was provided in the 1983 annual report (Schuck, 1985). A detailed description of the Lyons Ferry stock will be included in the 1986 report.

The Spokane rainbow stock cultured by WDG has been identified for use in the legal trout program (Schuck, 1985). These fish have been shown to perform well under various planting conditions and have a good disease history.

2. Maintain and enhance naturally spawning populations of steelhead and other native trouts which currently exist in southeast Washington streams.

All streams receiving plants of hatchery-produced steelhead and rainbow trout currently have indigenous populations. Protection of these populations is an integral part of WDG's management philosophy and must be considered when implementing a new mitigation program. The success of the program however, is not limited to simply reaching a number of adult fish escaping to their point of release. Success must include protection of the native fishes and proper integration of the compensation program into long term state management direction. Washington Ddpartment of Game will adopt special restrictive regulations to encourage catch of hatchery produced fish while affording protection to smaller or discreet populations of native fishes. Preserving the genetic integrity of these wild fish, by limiting outplanting to certain areas, is imperative to the continuation of the population.

3. Establish a return of adult steelhead into the Columbia, Snake, and tributary rivers which meets compensation plan goals.

Attainment of this goal is dependent to a large degree on goals 1 and 2 above. The State of Washington and WDG are committed to the success of the compensation program. Adult steelhead return goals from smolt releases for stream systems within Southeast Washington are:

Stream	Smolts released	Adults to return
Grand Ronde R.	310,000	1,550
Tucannon R.	175,000	875
Touchet R.	135,000	675
Walla Walla R.	175,000	875
Snake R.	100,000	500
Asotin Cr.	36,000	180
	931,000	4,655

4. Improve or reestablish sport fisheries for steelhead and resident trout in the Snake River and its' tributaries.

The Snake, Grande Ronde, Tucannon, Walla Walla and Touchet Rivers, and Asotin and Mill Creeks historically supported wild runs of steelhead and resident populations of trouts. Dramatic declines in steelhead runs in the Snake River system in the 1970's caused most of these systems to be closed to consumptive steelhead fishing.

A general decline in the health and size of resident trout populations caused WDG to propose broad based state wide regulation changes in 1984. These regulations are designed to insure most wild fish will have the chance to spawn naturally at least once.

Conditioning ponds (see "Facilities") are also an integral part of reestablishing returns of adult steelhead and thus consumptive fisheries. Rearing fish for the last two months before release in the watersheds or streams where they are destined to be released, should improve the return of adults to the area.

5. Coordinate compensation plan efforts and management directions with other agencies to comply with interagency guidelines and basin-wide goals for LSRCP hatchery operation.

The success or failure of the LSRCP for each state is not entirely independent of the activities and decisions of the other contiguous or down-river states. Changes in management direction or in regulations affecting harvest of compensation program fish can have serious impacts on percieved or actual attainment of an individual states' compensation goals. General guidelines for direction within the program and willingness to communicate and cooperate where possible will help assure the fullest program success and cost efficiency.

Appendix A. Evaluation Objectives and Approach.

Lyons Ferry Hatchery began operation in 1982 while still under construction. When complete, Lyons Ferry complex will consist of the main hatchery, Tucannon satellite hatchery, and three advanced rearing/conditioning ponds at remote locations. Washington's long-term objectives are:

1. Establish an annual supply of brood fish capable of supplying eggs to meet compensation goals for Snake, Grande Ronde, Walla Walla, Tucannon, and Asotin systems.

2. Maintain and enhance naturally spawning populations of steelhead which currently exist in southeast Washington streams.

3. Improve or reestablish sport fisheries for steelhead and resident trout in the Snake River and tributaries.

4. Establish a return of adult steelhead into the Columbia, Snake, and tributary rivers which meets compensation plan goals.

5. Coordinate compensation plan efforts and management directions with other agencies to comply with interagency guidelines and basin-wide goals for L.S.R.C.P. hatchery operation.

Operation of Lyons Ferry has changed significantly since it began operation, and will continue to do so until all facilities are complete. Operation in 1982-84 was dictated by need, emergency situation, and insufficient space. Evaluation was relegated to observation and data collection from non-typical years. Once construction is complete, evaluation will be essential. Providing constant monitoring of hatchery and field production and adult returns, will be the basis for determining the success of our program. Developing new production and management strategies will be done, if necessary, to meet our long-term goals.

Study Objectives and Approach

Long-term success of Washington's L.S.R.C.P. objectives will require continuing evaluation to assess their success or failure. Our evaluation objectives to accomplish this goal are:

1. Document juvenile growth and development and fish cultural procedures.

2. Document smolt and resident trout releases and evaluate smolt outmigration behavior. Provide management recommendations.

3. Estimate adult returns to down river and terminal areas as a measure of mitigation success.

4. Estimate juvenile age/class densities on selected streams as an indicator of any increased spawning escapement and success.

5. Document resident legal trout utilization in stocked compensation plan water.

6. Annually evaluate effectiveness of approach and tasks for obtaining necessary data. Provide written report.

Evaluation objectives address the two basic life periods available for study: juvenile growth and release, and adult returns. Hatchery design and programs were based on estimated growth potential for smolts and projected survival at release. Total juvenile performance and survival may be different for each stock of fish used, and will likely vary depending upon size at release. Tasks are designed to accurately document juvenile performance yearly so that optimum success from the program can be attained. Changes in hatchery procedures or fish stocks will be made, if necessary, to improve the program.

Adult returns are the sole purpose of L.S.R.C.P. hatcheries. Some direct effort at measuring adult returns to point of release and other intermediate or terminal areas is necessary. Marking of juveniles for positive identification has been, and will continue to be, an essential part of both juvenile and adult performance programs. Established monitoring systems at hydroelectric dams on the Snake and Columbia rivers supply needed juvenile out-migration data. Representative groups from each production or conditioning facility will be marked, tagged, and branded to allow easy identification. Adult returns from these releases will be monitored at the same sampling locations as well as in sport, commercial, and Treaty Indian harvests occurring throughout the Columbia Basin.

Electroshocking for juvenile age/class densities and adult trapping and enumeration in some areas will allow WDG to properly manage existing native stocks in concert with expected hatchery returns. Management recommendations from this data will allow protection for native stocks while encouraging harvest of appropriate numbers of hatchery stock. Use of indigenous steelhead stocks will hopefully increase spawning escapement. Juvenile densities will provide a measurement of this anticipated result.

Most legal trout production will be planted into 36 identified lakes, pond, and streams in southeast Washington. Selected sites will be surveyed to determine angler use, harvest, and annual carry-over.

OBJECTIVE 1: DOCUMENT JUVENILE GROWTH AND DEVELOPMENT AND FISH CULTURAL PROCEDURES.

SUB-OBJ. 1.1 Determine mean rearing time from egg to release for resident trout and for comparison of Wallowa (wild) and Wells (hatchery) steelhead stocks.

Task 1.11 Sample 0.005 to 0.01 percent of separately reared groups for mean fork length and weight, in millimeters and grams respectively.

Task 1.12 Document disease history to determine effects on growth. (Much of this information is available from hatchery records.)

Task 1.13 Estimate raceway, or pond mortality, based on estimates of numbers of fish stocked versus number of fish removed. Attempt to identify sources of mortality. Some possibilities are:

a. disease
b. avian predator
c. stocking estimate errors

Task 1.14 Calculate condition factors for all groups based on data from Task 1.11.

Task 1.15 Compare smolt and resident trout production (pounds and numbers) with hatchery mitigation goals.

Task 1.16 Document special fish cultural requirements (if any) of each release group and/or stock (eg. precocialism).

SUB-OBJ. 1.2 Determine condition of hatchery smolts (Wells and Wallowa) at time of release.

Task 1.21 See Task 1.14

Task 1.22 Sample for descaling and fin condition utilizing standard descaling report forms used by transporting agencies. (May be done in association with Task 1.11.)

OBJECTIVE 2: DOCUMENT SMOLT AND RESIDENT TROUT RELEASES AND EVALUATE SMOLT OUT-MIGRATION BEHAVIOR. PROVIDE MANAGEMENT RECOMMENDATIONS.

SUB-OBJ. 2.1 Document numbers, size, time of release, methods, and location of steelhead smolt and resident trout plants. Evaluate out-migration performance.

Task 2.11 Observe and record smolt migration behavior from rearing ponds, Wallowa hatchery and conditioning ponds. Document first day when screens are removed. Observe numbers migrating over period of time and estimate total numbers left in rearing pond.

Task 2.12 Observe and document smolt behavior from river release sites, according to river conditions and willingness to migrate.

Task 2.13 Document transfer of smolts from Lyons Ferry to Wallowa Hatchery and descaling caused by trucking. Determine by observation if transfer decreases willingness to migrate, or if trucking induces residualism. Observe if migration pattern from Wallowa differs from Lyons Ferry.

Task 2.14 Determine migration time and performance down river by information gathered at established smolt transport and sampling locations on the Snake and Columbia Rivers. Externally freeze branded fish will be indicators of group performance (see Task 2.16).

Task 2.15 Assess smolt residualism (failure to migrate) by censusing release sites and reasonably adjacent areas of streams through electroshocking and angler creel checks.

Task 2.16 Externally freeze brand representative groups of fish to allow evaluation of out-migration performance and residualism. (See Tasks 2.14 and 2.15). Approximately 260,000 marked releases for Lyons Ferry, Cottonwood C.P., Curl Lake C.P., and Wallowa Hatchery.

Task 2.17 Administer morphalene drip, if necessary, for imprinting Lyons Ferry broodstock smolt releases. (*Note: for 1986, 87, 88 - compare adult returns with and without morphalene.)

Task 2.18 Document number, size, time of release, and release locations for resident trout plants.

SUB-OBJ. 2.2 Attempt to determine out-migration timing and condition of wild steelhead smolts.

Task 2.21 Electroshock sections of streams on several occasions during the spring to determine relative abundance, condition and out-migration timing.

Task 2.22 Operate smolt trap to collect same information as in Task 2.21 (cooperatively with WDF).

OBJECTIVE 3: ESTIMATE ADULT RETURNS TO DOWN RIVER AND TERMINAL AREAS (STREAMS, OCEAN HARVEST, SPORT COMMERCIAL AND TREATY INDIAN HARVEST, HATCHERIES, ESCAPEMENT) AS A MEASURE OF MITIGATION SUCCESS.

SUB. OBJ. 3.1 Identify returning hatchery adults using coded wire tags, freeze brands or fin clips to estimate return rates.

Task 3.11 Coded wire tag, fin clip and brand 260,000 juveniles for out-planting from Lyons Ferry, Cottonwood C.P., and Curl Lake C.P.

Task 3.12 Adipose clip remaining steelhead production to comply with state management criteria and allow positive identification for wild/hatchery ratios (see Task 3.33 and 3.31).

Task 3.13 Compile sample data from Columbia River and Snake River adult sampling stations to determine regional return rates for marked groups (see also Sub-Obj. 3.3).

SUB OBJ. 3.2 Document hatchery rack returns of marked production and broodstock hatchery releases. Marked

(SUB. OBJ. 3.2 Con't)

returns will be used as part of totals for quantifying percent return from release.

Task 3.21 Use rack returns from hatchery records for Lyons Ferry, Tucannon, and Wallowa Hatchery to compute adult return rates.

Task 3.22 Compare adult returns to Lyons Ferry of Wells versus Wallowa broodstock releases made in 1982, 83, 84.

Task 3.23 Determine timing of returns from Lyons Ferry releases by examining returns of branded coded-wire tagged adults to adult collection facilities at McNary and Lower Granite Dams, and to Lyons Ferry and Wallowa hatcheries.

Task 3.24 Document lengths and sex of returning adults.

SUB OBJ. 3.3 Estimate sport and commercial harvest of returning adults.

Task 3.31 Design and conduct creel surveys for the Snake and Grande Ronde Rivers to estimate harvest of marked fish.

Task 3.32 Obtain sport harvest of returning adults in the Lower Snake River using punch card estimates from existing state program.
state program.

Task 3.33 Obtain sport harvest of adult steelhead on the Tucannon River using steelhead punch card estimates. Regular creel checks would be required to determine wild/hatchery ratios in the catch.

Task 3.34 Obtain estimates of down river sport and commercial harvest through existing sampling programs (BPA, ODFW).

Task 3.35 Obtain estimate of adult mortality rates through lower river hydroelectric projects.

Task 3.36 Collect and read scale samples to determine length/age relationships and duration of freshwater-ocean residence.

SUB OBJ. 3.4 Estimate spawning escapement.

Task 3.41 Construct counting station on Tucannon River near Starbuck (existing dam). Observe fish passage to determine timing and numbers escaping.

Task 3.42 Estimate mid-river escapement by subtracting harvest (Task 3.33) from estimated escapement at Starbuck and the Tucannon Hatchery weirs.

Task 3.43 Operate Tucannon Hatchery weir and trap to enumerate up-river escapement.

Task 3.44 Use coded wire tag return rates at Lower Granite Dam to estimate mean adult escapement for sample groups. Subtrac harvest estimates for the mid-Snake and Grande Ronde Rivers (Task 3.31) to obtain net adult escapement to point of release. (Note: estimates of escapement to Wallowa Hatchery through ODFW marking programs may be available as a check for this estimate.)

Task 3.45 Construct adult counting station on main Asotin Creek (at Headgate Park) to enumerate adult escapement.

Task 3.46 Establish two or three study sections one kilometer (1 km) in length on the Tucannon and Touchet Rivers, and Asotin Creek. These sections should be representative as far as possible within environmental constraints of spawning area in these systems. Walk each section once per week beginning in April to identify: (a) initial date of spawning; (b) density of spawners, expressed as mean Redds per mile from all areas; (c) differences in spawning areas; (d) completion of spawning.

OBJECTIVE 4: ESTIMATE JUVENILE AGE CLASS DENSITIES ON SELECTED STREAMS AS AN INDICATOR OF ANY INCREASED SPAWNING ESCAPEMENT AND SUCCESS.

Task 4.1 Locate representative juvenile rearing areas in several stream systems that will provide year-round habitat for steelhead. Mendel (1981) evaluated habitat on the Tucannon for all aspects of rearing capability.

Task 4.2 Establish three 30-40 meter sections to be electroshocked or snorkled in the fall for 0, 1, and 2+ steelhead on each river.

Task 4.3 Use standard backpack electroshocker and block nets at upper and lower end of section to prevent recruitment or escape. A three pass removal method for calculating population (Zippin, 1958) will be used. Fish would be kept live in buckets until shocking was complete, then weighed (gms) and measured (mm) respectively. Percentage age class would then be established by lengths.

Task 4.4 Compute population estimates and confidence intervals as described by Zippin (1958). This data will serve as a baseline when added to juvenile data collected by Mendel. Increases in juvenile age class abundance will be an indirect indicator of increased spawning escapement from smolt plants.

Task 4.5 Utilize snorkling procedures developed by Idaho and Washington to estimate juvenile population densities on large stream sections, if applicable.

OBJECTIVE 5: DOCUMENT RESIDENT LEGAL TROUT UTILIZATION IN STOCKED COMPENSATION PLAN WATERS. LAKES ARE STOCKED WITH KNOWN NUMBERS OF LEGAL SIZE RAINBOW AND BROWN TROUT. ESTIMATING TOTAL CATCH DURING THE SEASON WILL PROVIDE UTILIZATION AS A PERCENT OF FISH PLANTED.

Task 5.1 Creel census stocked lakes on a weighted random basis toward weekends, holidays, and high-use period directly following lake/stream plantings. Some of these times are:

a. opening day trout season
b. opening week trout season
c. weekends
d. July 4th
e. random week days

Task 5.2 Calculate man-days utilization of lakes based on catch and catch/effort.

Task 5.3 Compute cost benefit analysis figures for legal trout program costs versus estimated value of fishing man-days.

Task 5.4 After season closes, compute total man-days utilization, total catch, and percent of plant harvested. Results to be included in annual report.

Task 5.5 Document legal trout utilization in compensation plan streams through established creel census procedures. Attempt to determine:

1. Percent catch to release (exploitation).
2. Percent yearly hold-over to subsequent year catch.
3. Loss from the system due to migration of planted legals.
4. Percent wild production contributes to the catch.
5. Man-days use

Task 5.6 Mark, through fin clipping, legal trout releases into the Tucannon River. Assess migratory behavior within th system by checking for movement or removal of marked fish.

OBJECTIVE 6: WRITE ANNUAL REPORT OF ALL ACTIVITIES LISTED IN OBJECTION 1-5 AND EVALUATE EFFECTIVENESS OF APPROACH AND TASKS FOR OBTAINING NECESSARY DATA.

APPENDIX B: Compensation Program Facilities

Those facilities constructed or to be constructed within Washington for the Compensation plan are listed here with a brief description of the location and design criteria:

Lyons Ferry Hatchery

Production facilities include egg and starter troughs for 1,150,00 steelhead. One hundred thousand (100,000) rainbow eggs from outside sources will also be hatched annually. Nineteen intermediate concrete raceways and three rearing ponds (80'x 1150') with a surface area of 2.1 acres are used for advanced rearing. The hatchery and rearing ponds are designed for single pass water flow. Water is provided by eight deep wells capable of producing 103 cfs constant flow. Water temperature fluctuates between 48-53 degrees Fahrenheit. A fish ladder, enclosed spawning building and concrete release structure below the rearing ponds complete the WDG facility.

Design capacity was for 116,400 pounds of steelhead smolts at 8 fish/lb, and 45,000 pounds of legal rainbow trout at 3 fish/lb.

Tucannon Hatchery

The Tucannon Hatchery is undergoing complete renovation by the Corps of Engineers as part of Washingtons' LSRCP program. The hatchery will have an expanded spring collection network to provide sediment free, constant temperature water for egg hatching and raceway rearing. Six round ponds and three large raceways can be used for rearing, and adult steelhead and salmon holding. One large earthen pond will be used for advanced rainbow rearing. Two deep wells should provide warmer water for tempering very cold river water during winter.

The design capacity was for 41,000 pounds of legal rainbow annually, and for adult chinook holding and spawning. Spring chinook will be trapped, spawned and partially reared at Tucannon Hatchery as part of the WDF program.

Curl Lake Conditioning Pond

This earthen structure is for late season rearing/conditioning of steelhead smolts for the Tucannon River. Curl Lake is located five miles up river from Tucannon Hatchery and will be operated by Tucannon personnel. Design capacity is for 160,000 smolts, and water is supplied by a diversion pipeline from the Tucannon River. Curl Lake was first used in the spring of 1985 and is planted with legal rainbow trout after all smolts have emigrated.

Cottonwood Creek Conditioning Pond

This structure is located approximately eight miles north of the Oregon border on the Grande Ronde River. The facility consists of one large earthen-rock rearing pond, water diversion system, feed storage building, and temporary living quarters to be

occupied three months each year. Water is supplied by Cottonwood Creek, a tributary to the Grande Ronde River; flows range between 4-6 cfs. during the spring use period. The pond is dry the remainder of the year. Design capacity is for 250,000 steelhead smolts to be reared during March and April for release into the Grande Ronde in May. Temporary personnel oversee care and feeding. This facility was first used in spring, 1985.

Dayton Conditioning Pond

Dayton Conditioning Pond will be located on the Touchet River within the City of Dayton; construction will begin in 1986. The facility consists of one small earthen-rock rearing pond with asphalt bottom, feed storage building, and temporary living quarters. Water will be provided by a concrete diversion and pipeline from the Touchet River. Design capacity is for 150,000 steelhead smolts to be reared in March and April for release into the Touchet River in May. The first release is planned for 1987.

Appendix C. Electroshocking data form.

WDG-LF Eval.

ELECTROSHOCKING HABITAT DATA

SITE DESIGNATION_____

STREAM_____ DATE_____

SECTION_____ CREW_____

SITE LOCATION_____

_____

REFERENCE POINT LOCATION *_____

_____

* (note: Upper border of site is always set at 0+00 ft.)

SITE LENGTH (ft)_____ GRADIENT (rise/run)_____

% OF SITE IN RIFFLE_____ % SITE IN POOL _____

% SHADE (1000-1400 HRS)_____ % ERODING BANKS_____

DISCHARGE(attach sheet)____ cfs DYE RATE (# ft/sec)_____

WATER QUALITY

HOH TEMP (time)_____ AIR TEMP (time)_____

ALKALINITY_____g/gal HARDNESS_____g/gal

pH_____ other?_____

TRANSECTS:(start at top net, 0+00, then every 25 ft:all values in ft)

LOC.	_____	_____	_____	_____	_____	_____
WIDTH	_____	_____	_____	_____	_____	_____
DEPTH(1/4)	____	_____	_____	_____	_____	_____
(1/2)	_____	_____	_____	_____	_____	_____
(3/4)	_____	_____	_____	_____	_____	_____
THALW.	_____	_____	_____	_____	_____	_____
SUBSTRATE (1/4)	_____	_____	_____	_____	_____	_____
(1/2)	_____	_____	_____	_____	_____	_____
(3/4)	_____	_____	_____	_____	_____	_____

(predom. size class, rel. embeddedness, type of fines)

1=(<0.5in), 2=(0.5-2.5"), 3=(2.5-5"), 4=(5-10"), 5=(>10")

1= (unembedded), 2=(partially; may affect incubation), 3=(completely embedded)

1=(silt), 2=(sand < 1/4 in), 3=(L.sand 1/4-1/2 in), 4= organic

MEASURE POOLS AND COVER & LIST RELATIVE DENSITY OF OTHER SPECIES

Appendix C. (cont.)

POOL DEFINITION: Reduced velocity, > ave. stream depth (must be at least 0.5ft deep), >= 1ft x 1ft. in area.

POOL MEASUREMENTS: Size, rating, and 3 - 5 max. depths (to be taken only for pools >= 2ft x 2ft.)

POOL RATING: Based on relationship to stream width, pool depth, amt. of cover. (see attached table for 20-60 ft wide streams and reduce all depth values by 1 ft for streams < 20 ft wide).

POOLS (Dimensions, rating, max. depths)	or	OTHER COVER (Dimensions, type)

PLATTS ET AL, 1983

Table 1.—Rating of pool quality; designed for streams between 20 and 60 ft in width[a]

Description	Pool rating
1A If the pool maximum diameter is within 10 percent of the average stream width of the study site	Go to 2A, 2B
1B If the maximum pool diameter exceeds the average stream width of the study site by 10 percent or more	Go to 3A, 3B
1C If the maximum pool diameter is less than the average stream width of the study site by 10 percent or more	Go to 4A, 4B.
2A If the pool is less than 2 ft in depth	Go to 5A, 5B
2B If the pool is more than 2 ft in depth	Go to 3A, 3B
3A If the pool is over 3 ft in depth or the pool is over 2 ft deep and has abundant fish cover[1]	Rate 5
3B If the pool is less than 2 ft in depth, or if the pool is between 2 and 3 ft and the pool lacks fish cover	Rate 4
4A If the pool is over 2 ft with intermediate[2] or better cover	Rate 3
4B If the pool is less than 2 ft in depth but pool cover for fish is intermediate or better	Rate 2
4C If the pool is less than 2 ft in depth and pool cover is classified as exposed[3]	Rate 1
5A If the pool has intermediate to abundant cover	Rate 3
5B If the pool had exposed cover conditions	Rate 2

[1] If cover is abundant, the pool has excellent instream cover and most of the perimeter of the pool has a fish cover.
If cover is intermediate, the pool has moderate instream cover and one-half of the pool perimeter has fish cover.
If cover is exposed, the pool has poor instream cover and less than one-fourth of the pool perimeter has any fish cover.

[a] For streams < 20 wide deduct 1ft from all values w/ but values (Platts et al 1983.

Appendix D. Creel survey data collection form for the Tucannon River, 1985.

DAYLIGHT ________
DARKNESS ________
SEASON (OPENING, JUNE JULY, AUG)
WE, WD AM, PM
DATE ____________

TUCANNON RIVER---CREEL SURVEY

*** LOWER RIVER ***

START TIME ________ STOP TIME ________

# ANGLERS		LOCATION
________	+	____________________
________	+	____________________
________	+	____________________
________	+	____________________
________	+	____________________
________	+	____________________
________	+	____________________
________	+	____________________
________	+	____________________

*** WOOTEN GAME RANGE ***

START TIME (circle)					
	AM (0530-1300)	600	700	800	900
	PM (1300-2030)	1400	1500	1600	1700

START LOC. ____________________

TIME	+	LOCATION	+	# ANGLERS
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
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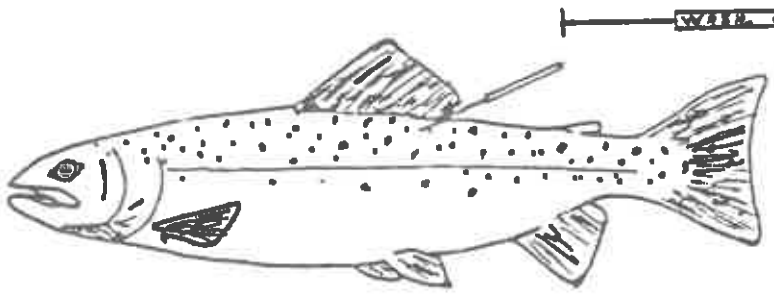
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________
________	+	____________	+	____________

Appendix E. Reward poster for the return of tags on Asotin Creek and the Tucannon River, 1985.

ANGLERS !

We would like to know if you caught a TAGGED trout (as shown below).



Tags are white or orange.

PLEASE return the tag with specific information concerning WHERE you caught the tagged fish and WHEN (the tag number and tag color are needed if the tag is not returned). Also include your name and telephone number and EXACTLY where in the river you caught the fish.

Information and tags may be left in the collection box at the Wooten WMA Headquarters, or mail to Dept of Game, 411 S. First, Dayton, WA 99328.

Your information is needed for a study of trout movements in the Tucannon River that may aid in trout management.

THANK YOU !

Dept. of Game

Appendix F:

1985 RAINBOW PLANTS

County	Water	# of Plants	Lbs.	# Fish Planted
Asotin	Golf Course Pd.	2	1,500	4,734
	Headgate Pd.	2	765	2,781
	Evans Pd.	2	840	3,120
	Silcott Pd.	2	520	1,840
	Asotin Cr.	2	1,710	5,685
	Alpowa	1	540	2,106
	Total		5,875	20,266
Garfield	Bakers Pd.	1	300	1,050
	Pataha Cr.	3	1,085	3,577
	Coles Pd.	2	400	1,260
	Casey Pd.	1	300	990
	Total		2,085	6,877
Whitman	Rock Lk.	2	2,115	8,459
	Garfield Pd.	1	460	1,518
	Gilchrest Pd.	1	460	1,518
	Total		3,035	11,495
Columbia	Rainbow Lk.	4	4,805	15,870
	Beaver Lk.	3	1,100	3,670
	Big Four Lk.	1	760	2,508
	Blue Lk.	5	3,810	12,597
	Spring Lk.	4	3,960	11,544
	Watson Lk.	4	3,635	12,012
	Deer Lk.	3	1,790	5,980
	Curl Lk.	2	1,670	5,211
	Dam Pd.	2	530	1,116
	Orchard Pd.	2	550	1,160
	Dayton Juv. Pd.	2	425	1,433
	Touchet R.	4	3,625	12,008
	Tucannon R.	9	10,400	34,411
	Total		37,060	119,520
Walla Walla	College Place Pd.	2	340	1,080
	Fishhook Pk. Pd.	2	1,745	4,982
	Jefferson Pk. Pd.	2	340	1,080
	Quarry Pd.	1	2,180	4,796
	Mill Cr. Res.	6	11,075	27,616
	Coppei Cr.	1	535	1,873
	Dry Cr.	1	530	1,855
	Total		16,745	43,282
	Grand Total 32 Waters		64,800	201,440

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	Coppei Cr.	1	535	1,873
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	Total		16,745	43,282
	Grand Total 32 Waters		64,800	201,440

Appendix G:

Tucannon Hatchery - IHN Epizootic, 1985
Steve Roberts, Fish Pathologist

Introduction

Infectious hematopoietic necrosis (IHN) is a very serious, contagious virus disease of salmonids. Prior to the summer of 1985, IHN epizootics in WDG hatcheries have been limited to Region 5 hatcheries: Beaver Creek, Cowlitz, Mossyrock, and Skamania. In June and July, 1985 IHN outbreaks were observed in rainbow yearlings at Chelan hatchery. A second IHN outbreak was noted at Tucannon hatchery in rainbow fingerlings during September and October, 1985. This report describes the Tucannon IHN epizootic and recommendations for preventing future occurrences.

Tucannon IHN Epizootic

Two ponds of Spokane stock rainbow fingerlings were diagnosed with IHN in September and October. The first outbreak occurred in round pond # 3 which contained 18,000 fish. The fish were confirmed to have IHN and were destroyed on October 1. The total mortality due to IHN was 2,208 fish or 12.3 % (Figure 1). The fish in pond # 2 died with IHN during October and the remaining fish were destroyed on October 14. Total mortality due to IHN was 468 fish or 2.6 % (Figure 1).

A grand total of 2676 fish were lost to IHN or 7.4 %. The remaining fish were destroyed.

Source of IHN

Broodstocks are often implicated in IHN epizootics; since IHN can be transmiited from the parent to progeny. However, at Tucannon hatchery the Spokane stock rainbow was used which has a long history of IHN free inspections (Table 1). The fish were first recieved as eyed-eggs at Lyons Ferry hatchery, a well water supplied hatchery. The fish were incubated and reared at Lyons Ferry till mid-April when they were transferred to Tucannon hatchery. The fish were initially reared in round ponds at Tucannon with 165,000 moved to the rearing pond in mid-July. The fish remaining in the round ponds succumbed to IHN; whereas to date the fish in the rearing ponds show no signs of the disease.

A more likely source of the IHN was carrier steelhead spawning in the Tucannon river in late spring. River water was inadvertently used from mid-April to mid-July in the round ponds.

Recommendations to Prevent Future IHN Epizootics

1. If possible, Do Not use Tucannon river water for any fish rearing from February through June.

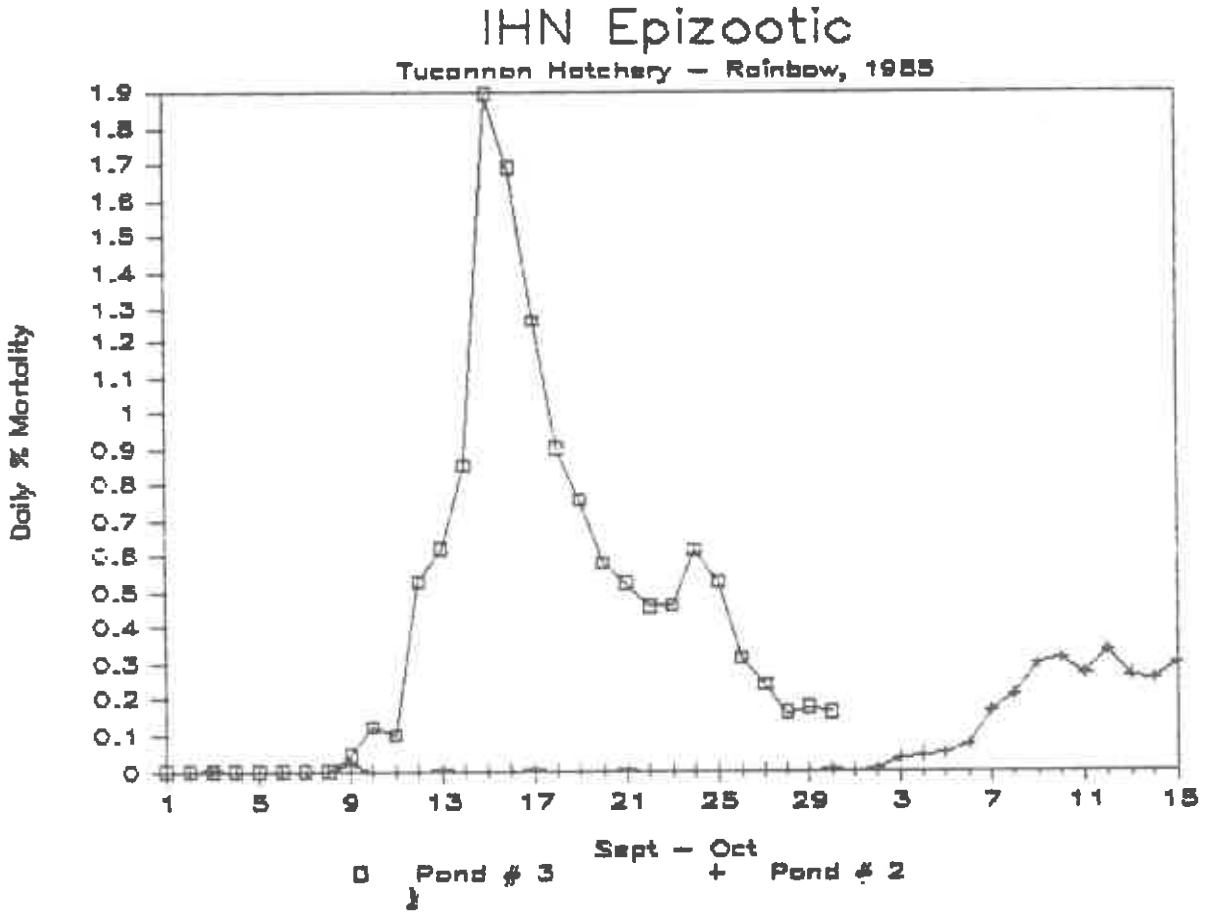
2. Continue to rear fish stock that are certified IHN free.

3. Inspect adult steelhead and possibly resident salmonids to determine if IHN is present.

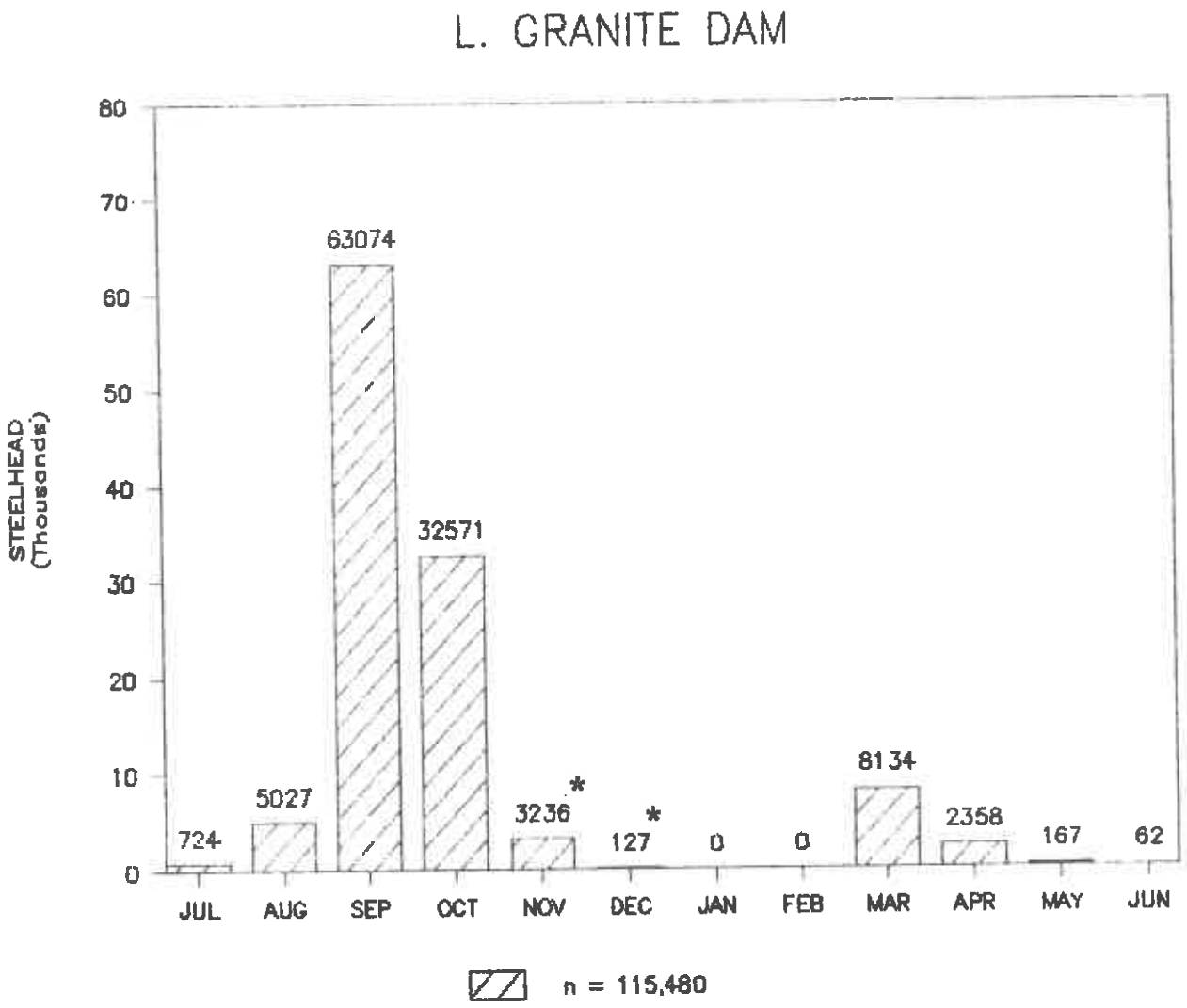
Table 1. Spokane rainbow broodstock - IHN & IPN Inspections

Hatchery	Date	Species	Stock	Stage	Sample	Result
Spokane	84/12	Rainbow	Spokane	Adult	60 OF & KS	Neg.
Spokane	84/1	Rainbow	Spokane	Adult	60 OF & KS	Neg.
Spokane	82/12	Rainbow	Spokane	Adult	60 OF & KS	Neg.
Spokane	81/12	Rainbow	Spokane	Adult	65 OF	Neg.
Spokane	80/12	Rainbow	Spokane	Adult	150 OF	Neg.
Spokane	79/12	Rainbow	Spokane	Adult	150 OF	Neg.
Spokane	78/12	Rainbow	Spokane	Adult	150 OF	Neg.
Spokane	77/12	Rainbow	Spokane	Adult	150 OF	Neg.
Spokane	77/1	Rainbow	Spokane	Adult	OF	Neg.
Spokane	74/12	Rainbow	Spokane	Adult	60 OF	Neg.
Spokane	70/12	Rainbow	Spokane	Adult	150 OF	Neg.

Figure 1. Tucannon Hachery IHN epizootic, 1985



Appendix H. Preliminary counts of adult steelhead crossing Lower Granite Dam, fall 1985 and spring 1986 (* partial counts on some days, counts stopped Dec. 15, no counts in Jan. & Feb.)



Appendix I. Description of sites electroshocked during fall 1985. (Listed in order from mouth upstream).

Site	Stream	Date Surveyed	Site Location	Reference Point Location
CH4	Charlie Ck.	9/10	0.6 miles above Blankenship's Gate near mouth	Orange nail in W. birch at 1+11 on L bank
CH3	Charlie Ck.	9/10	3.9 miles above Blankenship's & 0.2 miles above lower corrals	Orange nail in tree 24 ft above lower net loc.- R. bank
CH2	Charlie Ck.	9/06	5.7 miles above Blankenship's Gate 300 ft above upper corral	Nail in alder on R. bank 49 ft above above L. net
CH1	Charlie Ck.	9/05	8.9 miles above Blankenship's Gate on USFS	Nail in W. fir 32 ft above L. net
NA1	N. F. Asotin	9/11	about 0.5 miles above end of road on USFS	---
NA2	N. F. Asotin	9/24	1 - 1.5 miles above end of road	---
CO2 *	Cottonwood Ck	10/14	0.4 miles above Rd. at mouth	---
CO1	Cottonwood Ck	10/11	2.7 miles above Rd. at mouth	---
CU3	Cummings Ck.	10/02	about 200 ft above 1st creek crossing	---
CU2	Cummings Ck.	9/25	3.5 miles above mouth	---
CU1	Cummings Ck.	09/25	5.6 miles above mouth in small meadow	---
LT2	L. Tucannon	10/01	0.7 miles above Tuc. Rd.	---
LT1	L. Tucannon	10/01	1.9 miles above Tuc. Rd in campgrd.	---
ME1	Meadow Ck.	09/03	2.0 miles above mouth, 700 ft below campgrd.	orange nail in D. fir 0+14 R. bank
ME2	Meadow Ck.	09/04	2.3 miles above mouth in upper part of campgrd.	---
TU1	Tucannon R.	08/20	200 ft above 261 Bridge near mouth - RM 1.5	orange nail at 1+17 on L. bank ain alder
TU2	Tucannon R.	08/20	200 ft above Smith Hollow Br. RM 7.2	orange nail in R. bank alder
TU3	Tucannon R.	08/21	about 300 ft above Krouse Br. RM 13	orange paint on rock wall '16 ft above lower net
TU4	Tucannon R.	08/21	Field access road on Broughton Land - RM 22.6	nail 0+80 L. bank in alder
TU5	Tucannon R.	08/22	about 2 miles below Marengo on Hovrud's field access -RM 26.7	orange nail in L. bank alder 20 ft above L. net
TU6	Tucannon R.	08/27	300 ft above Br. 12 - RM 29.7	R. bank orange paint on riprap 32 ft above L. net
TU7	Tucannon R.	08/26	600 ft below Br. 13 - RM 31.1	orange nail 6.3 ft above lower net L. bank?
TU8	Tucannon R.	08/25	900 ft above Br. 14 - RM 32.8	orange nail in cottonw. 0+41 ft on L. Bank

* tributary to G. Ronde R.

Appendix J . Habitat Measurements For Sites Electrofished In 1985.

SITE	a SITE LENGTH (ft)	MEAN WIDTH (ft)	SURFACE AREA (sq.ft)	MEAN DEPTH (ft)	POOL AREA (sq.ft)	% SITE IN POOLS	MEAN POOL DEPTH (ft)	MEAN POOL RATING	COVER AREA (sq.ft)	% SITE IN POOLS + COVER	% GRADIENT	DYE RATES (ft/sec)	% SHADE	MEAN THALWEG DEPTH (ft)
CH4	102.0	11.03	1125.47	0.39	33.5	3.0	0.70	1.5	5.0	3.4	2.3	2.4	45	0.70
CH3	98.7	10.08	994.90	0.48	49.0	4.9	0.70	1.0	44.7	9.4	3.2	1.8	30	0.90
CH2	101.0	13.02	1315.02	0.43	100.8	7.7	0.70	1.4	15.2	8.8	2.6	2.0	80	0.86
CH1	120.0	15.31	1837.20	0.39	65.2	3.6	0.80	1.3	42.7	5.9	2.4	1.2	30	0.78
NA1	76.0	27.20	2607.77	----	------	----	----	---	-----	----	1.7	---	--	----
NA2	111.5	17.84	1988.60	0.68	364.5	18.3	1.33	3.0	5.5	18.6	1.6	2.0	50	1.33
CO2	85.0	9.55	811.75	0.56	------	----	----	---	-----	----	2.9	---	85	0.89
CO1	114.0	10.36	1181.27	0.44	------	----	----	---	-----	----	6.0	1.0	40	0.78
CU3	100.0	13.25	1325.00	0.32	------	----	----	---	-----	----	2.3	0.7	75	0.60
CU2	95.0	12.97	1232.15	0.36	------	----	----	---	-----	----	1.9	0.6	90	0.72
CU1	102.0	8.77	894.54	0.36	------	----	----	---	-----	----	4.0	1.1	75	0.68
LT2	104.0	10.19	1059.34	0.28	------	----	----	---	-----	----	4.5	1.6	85	0.52
LT1	122.0	7.07	862.54	0.28	------	----	----	---	-----	----	4.7	0.4	75	0.57
ME1	100.0	12.56	1255.80	0.38	106.8	8.5	0.75	1.4	70.0	14.1	2.1	0.8	85	0.72
ME2	103.0	17.58	1810.74	0.27	61.0	3.3	0.84	1.7	45.0	5.9	3.3	1.0	95	0.60
TU1	110.0	43.90	4820.00	0.69	26.0	0.5	----	---	8.0	0.7	---	3.2	10	1.45
TU2	185.0	33.02	6109.50	1.15	1485.9	24.3	----	5.0	0.0	24.3	0.5	2.1	5	2.87
TU3	180.0	27.15	4887.00	0.96	42.0	0.9	1.70	1.5	6.0	1.0	0.3	---	--	2.38
TU4	95.3	37.79	3599.50	0.77	20.5	0.6	2.60	2.0	92.0	3.1	0.4	2.1	5	1.53
TU5	100.0	40.62	4062.50	0.68	74.0	1.8	1.30	1.7	159.0	5.7	0.8	2.3	20	1.40
TU6	169.7	37.55	6371.50	0.96	193.0	0.3	1.80	1.8	220.0	6.5	0.4	1.9	0	1.68
TU7	95.3	31.82	3031.20	0.75	0.0	0.0	----	---	18.0	0.6	0.5	4.0	7	1.50
TU8	100.0	37.67	3766.80	0.76	0.0	0.0	----	---	32.0	0.8	0.7	3.0	0	1.30

a All Sites Listed In Order From Mouth-Upstream. Site Designations are: CH= Charlie Ck., NA=North Fork Asotin Ck., CO=Cottonwood Ck.(Above Conditioning Pond), CU=Cummings Ck., LT=Little Tucannon, ME=Meadow Ck.(Trib. Of Panjab Ck.), TU=Tucannon River.

Appendix K. Population and density calculation information for sites electroshocked during fall 1985 in SE Washington.

Site	Fork Length of Rainbows (or species as defined)[a]	Pass 1	Pass 2	Pass 3	Estimated Population (N)	95 % CL	Capture Probability	Site Area (m2)
CH4	41-85	65	15		83	5.8	0.79	104.67
	86-165	15	4		19	2.3	0.83	
	TOTAL	80	19		104	7.4	0.77	
CH3	41-90	99	15		116	4.1	0.85	92.53
	91-175	22	8		33	7.6	0.68	
	TOTAL	121	23		148	6.2	0.82	
CH2	30-85	56	8		64	2.2	0.89	122.30
	86-210	36	4		40	1.4	0.91	
	TOTAL	92	12		105	3.1	0.88	
CH1	31-70	49	10		60	3.7	0.80	170.86
	71-230	100	9		109	1.8	0.92	
	TOTAL	149	19		170	3.9	0.88	
NA1	44-75	37	14		57	10.9	0.66	192.30
	76-140	11	3		14	2.1	0.82	
	TOTAL	48	17		72	11.3	0.67	
	CH	4	1		5	1.5	0.83	
	DV	1	0		1	0.0	?	
NA2	31-84	96	37		127	9.0	0.76	184.94
	85-260	24	11		51	6.6	0.74	
	TOTAL	120	48		197	27.8	0.61	
	CH	31	9		42	5.5	0.76	
CO2	44-70	8	3		11	2.8	0.79	75.49
	71-210	36	6		42	2.1	0.87	
	TOTAL	30	6		36	2.3	0.86	
CO1	44-70	14	1		15	0.6	0.94	109.86
	71-210	36	6		42	2.1	0.87	
	TOTAL	50	7		57	2.1	0.89	
CU3	31-65	33	20		77	42.3	0.44	123.23
	66-175	40	8		49	3.5	0.83	
	TOTAL	73	28		116	18.0	0.64	
CU2	31-65	33	6		39	2.2	0.87	114.59
	66-245	39	2		41	0.6	0.95	
	TOTAL	72	8		80	2.0	0.91	
CU1	41-65	59	9		69	4.1	0.86	83.19
	66-160	28	10		42	8.6	0.68	
	TOTAL	87	19		110	8.5	0.80	

Appendix K. (Cont).

Site	Fork Length of Rainbows (or species as defined)^	Pass 1	2	3	Estimated Population (N)	95 % CL	Capture Probability	Site Area (m2)
LT2	31-60	59	12		73	4.6	0.82	98.52
	61-160	12	2		14	1.3	0.88	
	TOTAL	81	14		97	4.3	0.84	
LT1	31-60	0	0		0	0	0.00	80.22
	62-190	24	3		27	1.3	0.90	
	TOTAL	24	3		27	1.3	0.90	
ME1	31-55	12	4		16	2.6	0.80	116.79
	56-205	35	7		43	3.4	0.82	
	TOTAL	47	11		60	4.9	0.80	
	BULL TR							
	46-65	4	1		5	1.5	0.83	
	66-156	2	1		3	3.2	0.75	
ME2	31-55	38	5		43	1.7	0.90	168.40
	56-220	36	3		39	1.0	0.93	
	TOTAL	74	8		82	1.9	0.91	
	BULL TR.							
	46-65	16	2		18	1.1	0.90	
	66-156	3	1		4	1.9	0.80	
TU1	SM BASS							
	55-56	1	1		2	--	--	449.10
TU2	60-72	2	0		2	0	1.00	568.18
TU3	46-100	14	2		16	1.2	0.89	454.49
	101-240	1	0		1	0	1.00	
	TOTAL	15	2		17	1.1	0.90	
	WF	1	0		1	?	?	
TU4	51-100	18	10	6	39	10.5	0.48	334.75
	101-180	3	1	0	4	0.7	0.80	
	TOTAL	21	11	6	43	9.7	0.50	
	WF	1	0	1	2	?	?	
TU5	54-95	15	5		21	4.4	0.74	377.81
	96-210	2	1		3	3.2	0.75	
	TOTAL	17	6		24	4.6	0.74	
TU6	41-100	33	20	10	74	15.6	0.46	592.55
	101-285	23	10	8	47	11.2	0.48	
	TOTAL	56	30	18	124	21.4	0.45	
	CH	8	5	3				
	WF	1	1	2	4	?	?	

Appendix K. (Cont).

Site	Fork Length of Rainbows (or species as defined)^	Pass 1	Pass 2	Pass 3	Estimated Population (N)	95 % CL	Capture Probability	Site Area (m2)
TU7	31-85	27	16	19	123	116.6	0.21	281.91
	86-155	2	0	1	3	3.0	0.60	
	TOTAL	29	16	20	124	106.3	0.22	
TU8	36-85	70	29	16	126	12.2	0.55	350.31
	86-165	1	0	1	2	13.2	0.50	
	TOTAL	71	29	17	129	13.0	0.54	
	CH	23	10	4	39	5.0	0.61	
	BT	1	0	0	1	?	?	

^ Age 0+ is first length group for rainbows. CH = Chinook, WF = white fish, BT = brown trout (see length freq. histograms).

Appendix L. Biomass estimates for salmonids captured by electrofishing at sites in Southeast Washington, Fall 1985.

Site [A]	Rainbow Trout Age 0+ Size Range (mm)	# Fish Measured	Mean Weight (g)	Estimated Total Weight [E] (g/100m2)	Age 1+ Size Range (mm)	# Fish Measured	Mean Weight (g)	Estimated Total Weight [E] (g/100m2)	Sum Total Biomass (g/100m2)
NA1 [B]	44-75	36	2.43	71.93	76-140	25	16.31	117.43	189.36
NA2	31-84	37	2.49	171.06	85-260	39	38.06	1050.46	1221.52
CU1	41-65	27	1.76	145.90	66-160	40	10.87	548.94	694.84
CU2	31-65	36	1.28	43.52	66-245	41	13.85	494.45	537.97
CU3	31-65	37 [C]	1.29	80.63	66-175	39	14.77	587.85	668.48
CO1	44-70	1	---- [D]	-------	71-210	29	33.37	1274.73	1274.73
CO2	44-70	1	---- [D]	-------	71-210	18	42.80 [F]	1416.68	1416.68
LT1	-----	0	----	0.00	62-190	27	11.96	403.05	403.05
LT2	31-60	20	0.91	67.43	61-160	21	13.10	186.02	253.45
ME1	31-55	16	0.74	10.21	56-205	41	20.72	768.71	778.92
ME2	31-55	39	1.17	29.84	56-220	43	21.14	490.45	520.29
TU1	-----	0 [G]	----	0.00	-------	0	------	0.00	0.00
TU2	60-72	2	4.30	1.72	-------	0	------	0.00	1.72
TU3	46-100	16	4.79	16.77	101-240	4 [H]	63.73	12.75	29.52
TU4	51-100	34	5.48	64.12	101-180	4 [H]	63.73	76.48	140.60
TU5	54-95	20	4.48	25.09	96-210	4 [H]	63.73	50.98	76.07
TU6	41-100	62	4.07	50.88	101-285	41	46.23	365.22	416.10
TU7	31-85	62	4.20	183.12	86-155	3	26.50	29.15	212.27
TU8	36-85	114	3.17	114.12	86-165	2	41.65	24.99	139.11
CH1	31-70	54	1.27	44.58	71-230	72	30.95	1974.61	2019.19
CH2	30-85	18	2.18	114.01	86-210	21	37.09	1212.84	1326.85
CH3	42-90	28	3.62	453.95	91-175	26	24.87	887.86	1341.81
CH4	44-85	24	2.35	186.36	86-165	7	30.25	547.53	733.89

Other Salmonids [I]

NA1	CH	73-75	4	4.92 [B]	10.33				
NA2	CH	64-91	36	5.36	121.67				
ME1	DV	48-63	5	1.24	5.33	DV 103-154	3	22.30	57.98
ME2	DV	48-63	19	2.03	21.72	DV 92-152	4	15.86	38.06
TU4	WF	105-106	2	11.50	6.90				
TU6	CH	62-95	15	7.79	23.37	WF 356-381	2	612.50	183.75
	WF	115-117	2	14.60	4.38				
TU8	CH	42-87	37	4.45	49.40	BT 78	1	5.20	1.56

A See Appendix I for site designations.
B No weights measured for NA1. Used NA2 weights for fish of same size category.
C No weights measured for 0+ age class. Used CU2 weights for fish of same size category.
D No weights available for 0+ age class.
E Mean weights x estimated densities.
F Mean weight is not representative of the group because the largest fish predominated in the weights.
G No 0+ age fish. A possible barrier may exist.
H Only four total fish of this age category were weighed for the three sites. Used a combined mean.
I Listed with site designations is species code: CH = chinook salmon, WF = white fish, DV = bull trout, BT = brown trout.

Appendix M. Relative abundance of non-salmonid fish species present at sites electrofished by WDG during fall 1985.

SITE	SCULPINS[A]	DACE[B]	LAMPREY[C]	SUCKERS[D]	RED-SIDED SHINERS	N. SQUAWFISH	PEAMOUTH/ CHISELMOUTH[E]
CH4	C [F]	N	N	N	N	N	N
CH3	C	N	N	N	N	N	N
CH2	C	N	N	N	N	N	N
CH1	C	N	N	N	N	N	N
NA1	Y	?	N	N	N	N	N
NA2	C	?-LN [G]	N	N	N	N	N
CO2	N	R	N	N	N	N	N
CO1	O	N	N	N	N	N	N
CU3	?	N	N	N	N	N	N
CU2	C	N	N	N	N	N	N
CU1	C	N	N	N	N	N	N
LT2	O	N	N	N	N	N	N
LT1	N	N	N	N	N	N	N
ME1	N	N	N	N	N	N	N
ME2	N	N	N	N	N	N	N
TU1	N	C-LN,S	R	N	R	C	C
TU2	N	C-LN,S	R	C-BL,LS	C	O	O
TU3	N	C-LN,S	R	O-BL,LS	C	R	O
TU4	C	C	R	N	O	R	N
TU5	C	C-LN,S	N	R	N	N	N
TU6	C	C-LN,S	N	O	N	N	N
TU7	C	C	N	N	N	N	N
TU8	C	C	N	N	N	N	N

[A] Sculpins may include Piute or Margined.
[B] Dace may include Long-nosed (LN) and speckled (S).
[C] Lamprey are River lamprey (Bugert WDF, pers. commun.).
[D] Suckers may include bridgelip (BL) and large scale (LS).
[E] some fish classified as peamouth at TU1 and TU3 may be chiselmouth.
[F] Relative abundance is:
N = none present
R = 0-4 fish captured
O = 5-10 " "
C >10 fish captured
[G] letters after the hyphen are the species identification (see footnotes above).

Appendix N. Electrofishing data for gamefish collected by WDF on the Tucannon River and Panjab Creek, 1985.

Table N-1. Gamefish population and density information from sites electroshocked by WDF personnel, summer and fall 1985 (pers. comm. with Bob Bugert, WDF).

SITE	TYPE	PASS 1	PASS 2	PASS 3	POPULATION (N)	95 % CL	AREA (m2)	DENSITY (FISH/100m2)	MEAN WT. (grams)
Wild	1 RUN	20	9		36.36	15.70	98.41	36.95	
	2 RUN	21	8		33.92	10.49	105.03	32.30	
	3 RUN	10	2		12.50	2.12	115.82	10.79	
	4 RUN	7	7	0	15.25	3.83	83.53	18.25	
	5 POOL	8	2		10.67	2.75	45.90	23.24	
	6 RUN	22	6		30.25	5.35	67.51	44.81	
	7 POOL	13	5		21.13	8.45	120.17	17.58	
	8 RUN	14	3		17.82	2.81	80.79	22.05	
	9 POOL	35	19		76.56	37.41	108.96	70.27	
	10 POOL	16	1		17.07	0.57	84.20	20.27	
	1.5 RUN	39	10		52.45	6.36	111.28	47.13	7.82
	2.1 POOL	24	6		32.00	4.77	138.09	23.17	
	2.2 RUN	12	5		20.57	9.90	85.33	24.11	
	2.3 RUN	38	9		49.79	5.46	208.40	23.89	
	2.4 RUN	34	3		37.29	1.27	76.26	48.90	
	2.5 RUN	29	9		42.05	7.88	116.12	36.21	19.29
	3.1 RIFFLE	15	4		20.45	4.24	135.73	15.07	
	3.2 RIFFLE	25	3		28.41	1.61	95.98	29.60	
	3.3 POOL	40	8		50.00	4.24	116.12	43.06	
	3.4 POOL	24	5		30.32	3.51	188.46	16.09	6.49
	4.1 RIFFLE	36	0		36.00	0.00	102.47	35.13	
	4.2 POOL	35	5		40.83	2.83	161.92	25.22	
	4.3 RUN	19	8	0	27.04	0.41	98.82	28.98	
	4.4 POOL	11	0		11.00	0.00	92.94	11.84	
SHEEP									
	1 RIFFLE	0	0		0	0	78.58	0.00	
	2 POOL	0	0		0	0	45.47	0.00	
	3 RIFFLE	1	3	*	4	?	55.54		
	4 POOL	0	0		0	0	16.34	0.00	
CUMMINGS									
	1 POOL	15	5		22.5	6.57	52.81	42.61	
	2 RUN	7	2		9.8	3.29	47.93	20.45	
	3 POCKET	30	1		31.03	0.39	58.25	53.28	
	5 RIFFLE	21	0		21	0	30.91	67.95	
	6 RIFFLE	10	3		14.29	4.33	50.25	28.41	
PANJAB									
	1 POOL	10	4		16.67	8.15	134.59	12.38	
	2 POOL	6	5		11	?	29.06		
	3 RUN	0	0		0	0	26.61	0.00	
	4 POOL	9	4	5	28.18	28.91	48.43	58.18	
	5 RUN	29	2		31.15	0.87	85.91	36.26	
	6 RUN	4	3		7	?	27.79		
	7 RUN	20	11	5	41.54	9.88	116.21	35.75	
	8 POOL	20	6		28.57	6.12	36.63	78.00	
	9 RUN	32	5		37.93	2.62	40.43	93.81	
	10 POOL	38	13		57.76	11.06	123.57	46.74	

Appendix N. (Cont).

Table N-1. (Cont).

SITE [a]	Species [b]	PASS 1	2	3	Lengths (mm)
OTHER GAME FISH					
WILD 1	WF	1	0		320
5	DV	1	1		93,98
6	BT	1	0		45
7	DV	4	0		103, 193,134,81
8	BT	2	0		46,44
2.4	WF	0	1		65
3.1	WF	1	0		35
3.1	DV	1	0		139
3.2	DV	1	0		189
3.3	DV	0	1		47
3.4	DV	1	1		122,190
4.1	DV	3	0		56,62,62
4.2	DV	2	0		58,62
8	DV	2	0		144,96
10	DV	5	0		103,143,92,122,139
PANJAB					
8	DV	1	0		205
10	DV	1	0		162

[a] Sites designated with whole numbers start about 100 ft downstream of the Panjab confluence and are then at 1000 ft intervals. Site 10 is about 300 m below Ruchert's Camp. Sites with a decimal are between the upper and lower whole numbers at no fixed distance. Panjab sites were at 240 ft intervals with the first site 150 ft upstream of the confluence. Sheep and Cumming Creeks are similar to Panjab. Sites not listed did not contain gamefish.

[b] DV = bull trout, WF = white fish, BT = brown trout.

* Fork lengths = 96, 144, 142, 80mm.

Appendix N. Electrofishing data for gamefish collected by WDF on the Tucannon River and Panjab Creek, 1985.

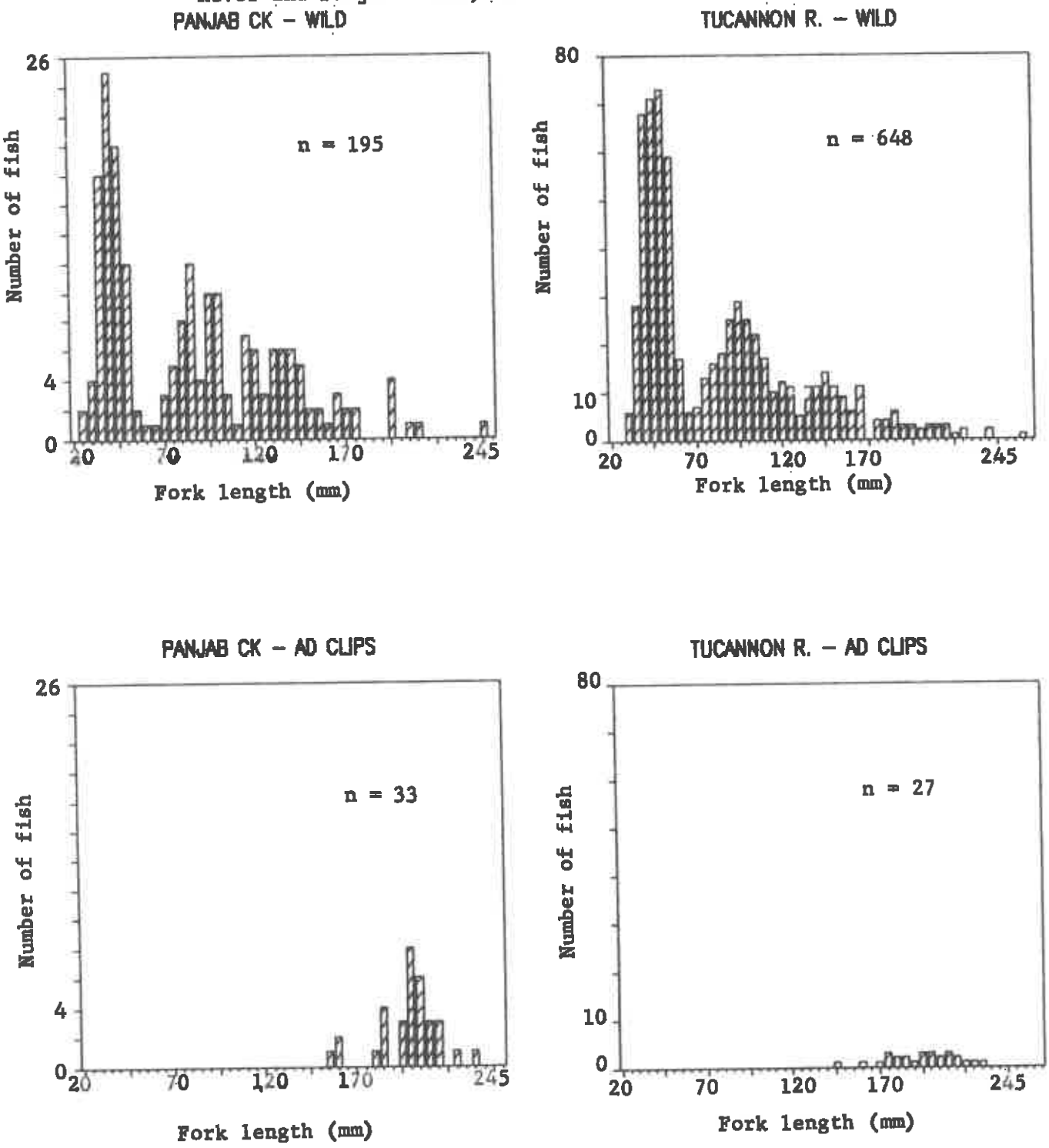


Figure N-1. Length-frequencies of rainbow trout captured by Dept. of Fisheries at sites electrofished in Panjab Creek and the wilderness portion of the Tucannon River, August - October 1985.

Appendix N. (Cont).

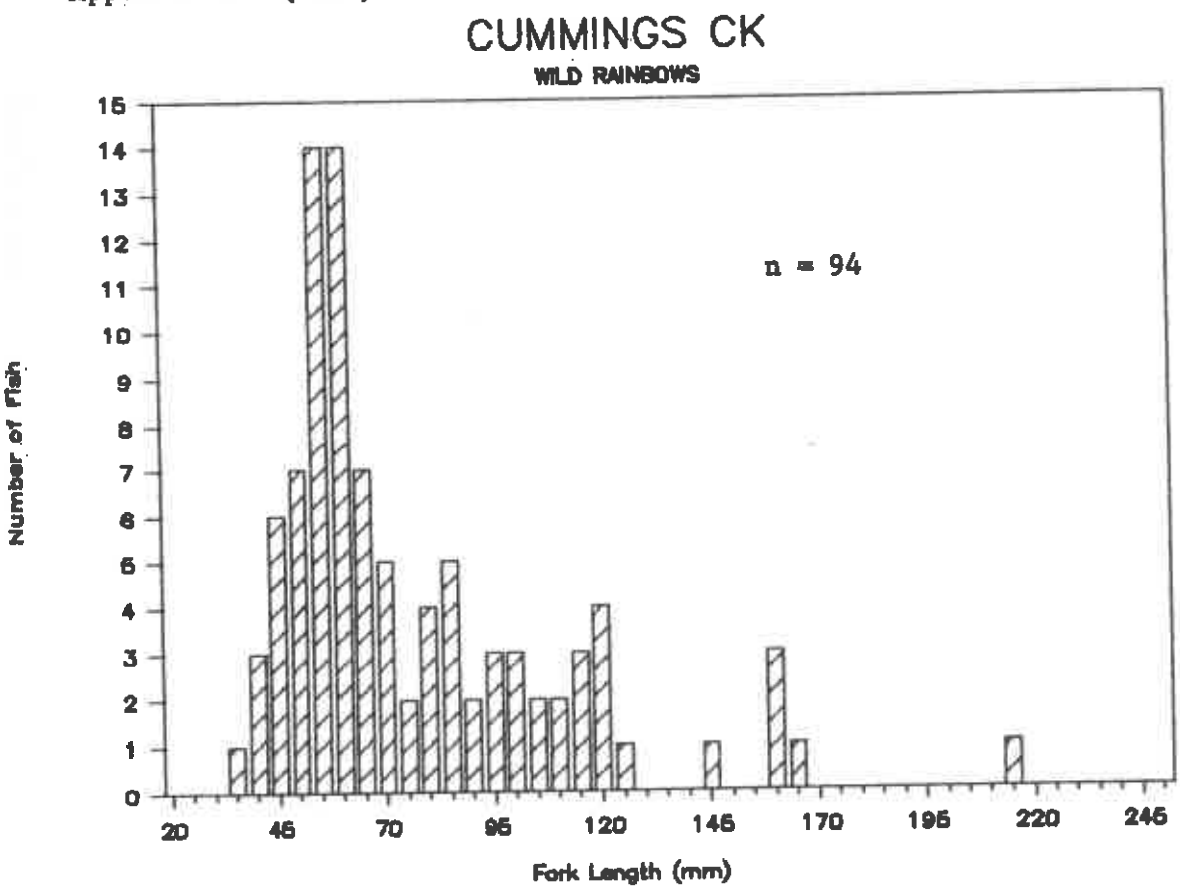


Figure N-2. Length-frequency for wild rainbow trout captured by WDF electrofishing at sites on lower Cummings Creek, September and October 1985.

Appendix O. Spring flow measurements for the N. and S. Fork of Asotin Creek 1985.

Stream	Date	discharge (cfs)	Previously measured summer flows (cfs) *
S. Fork	4/02	30.0	3 - 5
	4/12	64.0	
N. Fork	4/02	55.6	20 - 30
	4/12	? (too fast to wade)	
	5/01	98.8 (surface vel.up to 5.8 ft/sec)	

See Hallock and Mendel 1985 and other WDG reports.

Appendix P. Tucannon River creel survey data for summer 1985.

Table P-1. Angler effort and sampling data for Tucannon River creel survey, summer 1985.

Month	Day-Type	n,N[A]	Time of Day	Hrs. avail. per 1/2 day	Mean # Anglers	Std. Dev.	Correct. Factor	Estimated Trout Angler hrs. Per AM/PM
WOOTEN HMA								
June	WE	5,13	600-1330	7.5	44.00	41.731	1.357	447.81
		4,13	1330-2100	7.5	39.75	38.038	1.896	565.24
	WD	5,24	600-1330	7.5	8.00	4.301	1.141	68.46
		5,24	1330-2100	7.5	9.00	4.743	1.222	82.48
July	WE	3,9	600-1330	7.5	23.67	11.590	1.357	240.87
		3,9	1330-2100	7.0	31.67	24.007	1.890	420.28
	WD	5,22	600-1330	7.5	10.40	5.941	1.141	88.99
		5,22	1330-2100	7.0	21.20	22.186	1.222	181.34
Aug.	WE	3,9	700-1330	6.5	20.00	13.856	1.357	176.41
		4,9	1330-1930	6.0	14.00	5.831	1.890	159.26
	WD	4,22	700-1330	6.5	5.50	3.109	1.141	40.79
		4,22	1330-1930	6.0	11.00	9.018	1.222	80.65
MID TUCANNON R.								
June	WE	4,13	600-1330	7.5	5.64	3.665	----- [B]	42.30
		4,13	1330-2100	7.5	5.02	3.220	-----	37.62
	WD	5,24	600-1330	7.5	1.01	1.509	-----	7.59
		5,24	1330-2100	7.5	2.00	2.345	-----	15.00
July	WE	3,9	600-1330	7.5	1.33	1.155	-----	10.00
		3,9	1330-2030	7.0	3.19	3.726	-----	22.33
	WD	5,22	600-1330	7.5	1.40	2.608	-----	10.50
		5,22	1330-2030	7.0	0.46	1.022	-----	3.20
Aug.	WE	2,9	700-1330	6.5	4.50	6.364	-----	29.25
		5,9	1330-2030	7.0	1.00	1.000	-----	7.00
	WD	3,22	700-1330	6.5	0.00	0.000	-----	0.00
		5,22	1330-2030	7.0	2.00	2.121	-----	14.00

[A] n = AM or PM's sampled, N = AM or PM's available per period. WE = weekends and major holidays, WD = weekends.

[B] no correction factor for poor access areas, instead these data are from vehicle counts and do not include anglers that may have walked into this portion of the stream. Therefore, these data underestimate the actual angler effort for all anglers.

Appendix P. (Cont).

Table P-2. Catch rate data and sampling information for the Tucannon River creel survey, summer 1985.

Month	Day-Type	Time of Day *	# Parties Interviewed	# Anglers Interviewed	Total Angling Hrs	# Fish Kept	# Fish Rel.	fish/angler	Mean Hrs/angler
WOOTEN HMA									
June	WE	AM	121	241	301.3	550	85	---	---
		PM	78	147	282.5	258	238	---	---
	WD	AM	30	56	56.9	84	49	---	---
		PM	39	76	88.8	136	7	---	---
	Complete trip		48	98	209.3	284	156	2.9	2.14
July	WE	AM	47	91	102.2	117	81	---	---
		PM	120	237	348.4	442	207	---	---
	WD	AM	25	49	42.5	60	54	---	---
		PM	54	103	187.6	213	132	---	---
	Complete trip		37	80	140.6	191	42	2.4	1.76
Aug.	WE	AM	35	59	90.7	77	121	---	---
		PM	25	47	60.6	52	58	---	---
	WD	AM	12	25	22.5	37	68	---	---
		PM	28	61	123.5	58	187	---	---
	Complete trip		36	64	121.6	91	208	1.4	1.90
Season	Complete trip		121	242	471.6	566	406	2.3	1.95
MID TUCANNON RIVER									
Season	Complete trip		6	14	24.4	46	34	3.3	1.74

* See Table P-1 footnote A for time of day and daytype information.

Appendix Q. Tucannon Impoundments creel form for 1985.

TUCANNON LAKES

DATE_____

WE, WD AM, PM

START TIMES_____ DAYLIGHT _____

START LOC. _____ DARKNESS _____

	EFFORT (# ANGLERS)	C/E INTERVIEWS # ANGLERS	# HRS	# FISH	FISH/HR
COUNT TIMES	_____+_____+_____				
SPRING	_____+_____+_____	_____+_____+		_____+_____	
BLUE	_____+_____+_____	_____+_____+		_____+_____	
RAINBOW	_____+_____+_____	_____+_____+		_____+_____	
DEER	_____+_____+_____	_____+_____+		_____+_____	
WATSON	_____+_____+_____	_____+_____+		_____+_____	
BEAVER	_____+_____+_____	_____+_____+		_____+_____	
BIG 4	_____+_____+_____	_____+_____+		_____+_____	
CURL	_____+_____+_____	_____+_____+		_____+_____	

WEATHER: _____

LAKE TEMPS: _____

COMMENTS: _____

_____

Appendix R. Creel survey data from the Tucannon Lakes, spring and summer 1985.

Table R-1. Spring Lake creel survey data, angler effort, catch rates and harvest effort estimates.

	ANGLER EFFORT				CPE DATA						
PERIOD	n,	MEAN # ANGLERS N* (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
OPENING AM +	2	8 99.0 (8.49)	792	94							
PM	2	7.5 28.0 (25.5)	210	264							
TOTAL			**1002**	**280**	18 (51)	105.3	89 (7)**	0.8456	0.5612	847	617
MAY WE AM	3	8 11.9 (4.82)	572	211							
PM	3	8 9.4 (3.62)	639	225							
TOTAL			1212	308							
WD AM	5	25 2.1 (1.89)	315	228							
PM	5	25 4.2 (2.00)	900	341							
TOTAL			1215	410							
MONTH TOTAL			**2427**	**513**	98 (188)	247.0	410 (23)	1.6599	0.3511	4,028	1,208
JUNE WE AM	4	13 5.4 (4.33)	422	280							
PM	5	13 5.3 (6.89)	581	535							
TOTAL			1003	604							
WD AM	5	24 1.4 (1.55)	202	178							
PM	5	24 0.8 (0.56)	163	90							
TOTAL			365	200							
MONTH TOTAL			**1368**	**636**	72 (150)	124.4	211 (5)	1.6968	0.5109	2,321	1,296
JULY WE AM	4	9 0.2 (0.32)	15	14							
PM	4	9 0.0 (0.00)	0	0							
TOTAL			15	14							
WD AM	3	22 0.0 (0.00)	0	0							
PM	3	22 0.0 (0.00)	0	0							
TOTAL			0	0							
MONTH TOTAL			**15**	**14**	0	0	0	0.0000	0.0000	0	0
AUG WE	7	9	48	32							
WD	4	22	34	62							
MONTH TOTAL			**83**	**70**	3 (7)	24.5	14 (3)	0.5773	0.2359	48	45
GRAND TOTAL			**4895**	**867**	199 @ (418)	527.4	758 (31)	1.4372	0.2663	7,035++	1,807

Appendix R. (Continued).

Table R-2. Blue Lake creel survey data, angler effort, catch rates and harvest effort estimates.

		ANGLER EFFORT				CPE DATA						
PERIOD	n,	N*	MEAN # ANGLERS (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
OPENING AM +	2	8	72 (1.41)	576	16							
PM	2	7.5	33 (26.9)	247	279							
TOTAL				823	279	22 (55)	94.5	115 (?)**	1.2169	0.6272	1002	624
MAY WE AM	3	8	9.6 (2.80)	459	123							
PM	3	8	7.5 (2.78)	510	172							
TOTAL				969	211							
WD AM	5	25	1.4 (1.22)	210	146							
PM	5	25	3.7 (2.13)	779	362							
TOTAL				989	391							
MONTH TOTAL				1958	444	77 (147)	209.6	249 (50)	1.1883	0.2697	2,327	749
JUNE WE AM	4	13	4.7 (2.13)	370	139							
PM	5	13	5.4 (4.95)	597	384							
TOTAL				967	408							
WD AM	5	24	0.6 (0.59)	86	68							
PM	5	24	1.1 (0.73)	63	65							
TOTAL				231	75							
MONTH TOTAL				1285	430	58 (137)	151.9	285 (4)	1.8762	0.5216	2,411	1,055
JULY WE AM	4	9	2.9 (0.85)	168	37							
PM	4	9	0.9 (1.21)	63	65							
TOTAL				231	75							
WD AM	3	22	0.0 (0.00)	0	0							
PM	3	22	0.6 (0.51)	80	78							
TOTAL				80	78							
MONTH TOTAL				311	109	13 (25)	34.5	54 (6)	1.5652	0.6501	486	266
AUG WE	7	9	1.4 (2.75)	112	77							
WD	4	22		378	684							
MONTH TOTAL				490	688	5 (12)	5.9	6 (0)	1.0256	0.7483	503	836
GRAND TOTAL				4867	1107	176 @ (382)	508.3	712 (60)	1.4007	0.2345	6,817++	1,930

Appendix R. (Continued).

Table R-3. Rainbow Lake creel survey data, angler effort, catch rates and harvest effort estimates.

	ANGLER EFFORT				CPE DATA						
PERIOD	n,	MEAN # ANGLERS N* (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL.)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
RAINBOW LAKE											
OPENING AM +	2	8 101 (16.97)	808	188							
PM	2	7.5 48 (48.08)	360	498							
TOTAL			1168	533	13 (33)	60.0	112 (?)**	1.8667	0.6646	2,180	1,274
MAY WE AM	3	8 18.4 (8.07)	883	354							
PM	3	8 25.8 (10.75)	1757	667							
TOTAL			2639	755							
WD AM	5	25 2.0 (2.06)	295	248							
PM	5	25 4.6 (5.40)	985	918							
TOTAL			1280	951							
MONTH TOTAL			3919	1214	74 (166)	265.6	290 (53)	1.4307	0.4046	5,607	2,365
JUNE WE AM	4	13 7.0 (5.29)	546	343							
PM	5	13 11.9 (11.54)	1319	895							
TOTAL			1865	958							
WD AM	5	24 2.2 (2.04)	317	234							
PM	5	24 1.7 (1.72)	354	280							
TOTAL			671	365							
MONTH TOTAL			2535	1025	94 (209)	219.25	302 (33)	1.3774	0.4497	3,492	1,830
JULY WE AM	4	9 5.8 (5.68)	341	248							
PM	4	9 5.7 (5.20)	409	279							
TOTAL			750	373							
WD AM	3	22 2.2 (1.68)	318	257							
PM	3	22 2.3 (1.20)	410	227							
TOTAL			728	343							
MONTH TOTAL			1478	507	55 (147)	157.2	142 (0)	0.9033	0.3237	1,335	667
AUG WE	7	9	201	99							
WD	4	22	137	176							
MONTH TOTAL			338	202	9 (15)	14.6	0 (0)	0.0000	0.0000	0	0
GRAND TOTAL			9438	1763	245 @ (570)	716.6	936 (86)	1.3061	0.2240	12,327++	3,132

Appendix R. (Continued).

Table R-4. Deer Lake creel survey data, angler effort, catch rates and harvest effort estimates.

		ANGLER EFFORT					CPE DATA						
PERIOD		n,	N*	MEAN # ANGLERS (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
OPENING	AM +	2	8	27.0 (4.24)	216	47							
	PM	2	7.5	10.0 (9.90)	75	103							
	TOTAL				291	113	15 (33)	51.2	91 (?)**	1.7773	0.8560	517	323
MAY WE	AM	3	8	11.6 (10.50)	555	460							
	PM	3	8	3.8 (1.07)	257	67							
	TOTAL				812	465							
WD	AM	5	25	0.6 (0.59)	90	71							
	PM	5	25	3.2 (2.53)	680	396							
	TOTAL				770	402							
MONTH TOTAL					1582	615	57 (111)	136.75	280 (1)	2.0475	0.3741	3,238	1,395
JUNE WE	AM	4	13	3.2 (2.73)	253	177							
	PM	5	13	6.2 (5.91)	685	459							
	TOTAL				939	491							
WD	AM	5	24	0.8 (0.69)	115	79							
	PM	5	24	0.1 (0.30)	27	49							
	TOTAL				142	93							
MONTH TOTAL					1081	500	56 (111)	104.25	87 (3)	0.8345	0.3253	902	552
JULY WE	AM	4	9	0.1 (0.16)	5	7							
	PM	4	9	0.7 (0.69)	54	37							
	TOTAL				59	38							
WD	AM	3	22	0.1 (0.19)	16	29							
	PM	3	22	0.2 (0.39)	39	73							
	TOTAL				55	79							
MONTH TOTAL					114	87	5	1.9	0	0.0000	0.0000	0	0
AUG WE		7	9		0	0							
WD		4	22		0	0							
MONTH TOTAL					0	0	0 (0)	0	0 (0)	0.0000	0.0000	0	0
GRAND TOTAL					3068	823	136 (271)	314.1	506 (4)	1.6109	0.2975	4,942++	1,614

Appendix R. (Continued).

Table R-5. Watson Lake creel survey data, angler effort, catch rates and harvest estimates.

		ANGLER EFFORT				CPE DATA						
PERIOD		n,	N*	MEAN # ANGLERS (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
OPENING	AM +	2	8	114 (33.23)	916	368							
	PM	2	7.5	55.0 (31.11)	412	322							
	TOTAL				1328	489	32 (80)	156.0	260 (?)**	1.6672	0.5131	2,215	1,071
MAY WE	AM	3	8	20.4 (16.88)	981	740							
	PM	3	8	18.9 (8.37)	1285	519							
	TOTAL				2266	904							
WD	AM	5	25	3.5 (3.06)	530	367							
	PM	5	25	5.8 (2.75)	1225	468							
	TOTAL				1755	297							
MONTH TOTAL					4021	1081	93 (221)	312.2	459 (35)	1.4702	0.3538	5,912	2,143
JUNE WE	AM	4	13	9.4 (9.44)	734	612							
	PM	5	13	9.7 (12.01)	1068	931							
	TOTAL				1803	1114							
WD	AM	5	24	1.7 (1.51)	240	173							
	PM	5	24	1.9 (1.66)	395	269							
	TOTAL				635	320							
MONTH TOTAL					2438	1160	66 (164)	210.3	298 (11)	1.4167	0.4219	3,453	1,953
JULY WE	AM	4	9	5.0 (2.37)	295	104							
	PM	4	9	1.9 (1.50)	140	81							
	TOTAL				435	131							
WD	AM	3	22	1.0 (0.88)	143	135							
	PM	3	22	0.2 (0.39)	39	73							
	TOTAL				182	154							
MONTH TOTAL					617	202	35 (97)	123.7	200 (10)	1.6168	0.4529	998	433
AUG WE		7	9	1.1 (1.68)	129	67							
WD		4	22	0.4 (0.75)	103	187							
MONTH TOTAL					231	198	4 (11)	13.3	2 (14)	0.1504	0.2312	35	65
GRAND TOTAL					8635	1,684	232 @ (579)	825.5	1225 (70)	1.4839	0.2105	12,814++	3,095

Appendix R. (Continued).

Table R-6. Beaver Lake creel survey data, angler effort, catch rates and harvest estimates.

	ANGLER EFFORT				CPE DATA						
PERIOD	n,	N*	MEAN # ANGLERS (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
OPENING AM +	2	8	16.0 (0.00)	128	0							
PM	2	7.5	11.0 (2.83)	82	29							
TOTAL				210	29	11 (28)	45.5	79 1 (7)**	1.7363	0.6101	365	138
MAY WE AM	3	8	4.3 (3.46)	211	151							
PM	3	8	3.8 (0.73)	261	45							
TOTAL				471	158							
WD AM	5	25	0.7 (0.77)	105	92							
PM	5	25	2.4 (0.93)	503	158							
TOTAL				608	183							
MONTH TOTAL				1079	242	49 (96)	94.55	157 (9)	1.6605	0.5016	1,793	677
JUNE WE AM	4	13	1.5 (1.52)	123	99							
PM	5	13	2.0 (2.04)	221	158							
TOTAL				344	186							
WD AM	5	24	0.5 (0.74)	67	84							
PM	5	24	0.5 (0.73)	95	128							
TOTAL				163	153							
MONTH TOTAL				507	241	29 (70)	77.65	75 (2)	0.9659	0.2803	490	275
JULY WE AM	4	9	0.8 (0.16)	5	7							
PM	4	9	1.0 (1.02)	75	55							
TOTAL				80	55							
WD AM	3	22	0.1 (0.19)	16	29							
PM	3	22	0.4 (0.51)	78	96							
TOTAL				94	101							
MONTH TOTAL				173	115	10 (21)	15.35	19 (0)	1.2378	0.9214	215	220
AUG WE	7	9	1.7 (2.21)	193	89							
WD	4	22		137	144							
MONTH TOTAL				330	169	5 (13)	9.15	11 (2)	1.2022	0.6143	397	292
GRAND TOTAL				2299	399	105 @ (231)	243.70	344 (13)	1.4116	0.2638	3,245++	830

Appendix R. (Continued)

Table R-7 . Big Four creel survey data, angler effort, catch rates, and harvest estimates.

	ANGLER EFFORT					CPE DATA						
PERIOD	n,	N*	MEAN # ANGLERS (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
OPENING AM +	2	8	71.0 (15.56)	568	172							
PM	2	7.5	28.0 (5.66)	210	59							
TOTAL				778	182	25 (47)	122.7	30 (?)**	0.2444	0.1451	190	122
MAY WE AM	3	8	6.0 (2.00)	228	88							
PM	3	8	4.0 (2.65)	272	164							
TOTAL				560	186							
WD AM	5	25	3.0 (5.06)	450	606							
PM	5	25	1.4 (1.13	305	192							
TOTAL				755	636							
MONTH TOTAL				1315	663	58 (90)	148.9	64 (100)	0.4300	0.1717	565	368
JUNE WE AM	4	13	6.5 (1.85)	501	188							
PM	5	13	4.9 (3.70)	545	287							
TOTAL				1046	343							
WD AM	5	24	0.8 (0.96)	115	110							
PM	5	24	0.6 (0.89)	122	145							
TOTAL				238	182							
MONTH TOTAL				1283	388	71 (116)	185.9	77 (97)	0.4142	0.1618	532	264
JULY WE AM	4	9	1.1 (1.31)	66	57							
PM	4	9	2.3 (1.82)	168	98							
TOTAL				234	113							
WD AM	3	22	0.3 (0.58)	47	89							
PM	3	22	0.9 (1.02)	157	192							
TOTAL				204	212							
MONTH TOTAL				438	240	22 (41)	45.0	13 (10)	0.2892	0.2892	127	421
AUG WE	5	9		112	95							
WD	4	22		0	0							
MONTH TOTAL				112	95	7 (12)	23.3	8 (5)	0.3441	0.4416	39	63
GRAND TOTAL				3926	831	183 @ (306)	525.7	192 (212)	0.3652	0.0882	1,434++	462

Appendix R. (Continued).

Table R-8. Curl Lake creel survey data, angler effort, catch rates, and havest estimates.

	ANGLER EFFORT					CPE DATA						
PERIOD	n,	N*	MEAN # ANGLERS (Std. Dev.)	angler hrs	95 % CL	# PARTIES (ANGLERS)	TOTAL HRS	# KEPT (REL)	CATCH RATE (fish/hr)	95 % CL	HARVEST (# fish)	95 % CL
JUNE WE AM	5 ?	13	21.7 (18.06)	1690	988							
PM	5	13	21.4 (27.35)	2365	2120							
TOTAL				4055	2339							
WD AM	5	24	2.4 (3.05)	346	350							
PM	5	24	4.1 (4.07)	830	661							
TOTAL				1176	747							
MONTH TOTAL				5231	2456	123 (328)	373.9	650 (104)	1.7382	0.3224	8,064	4,343
JULY WE AM	4	9	5.6 (4.17)	328	182							
PM	4	9	10.7 (4.65)	770	249							
TOTAL				1098	309							
WD AM	3	22	4.0 (1.33)	572	204							
PM	3	22	4.6 (5.32)	802	1004							
TOTAL				1374	1025							
MONTH TOTAL				2472	1070	76 (207)	227.0	395 (44)	1.7397	0.3680	4,301	2,082
AUG WE	7	9	9.6 (6.21)	1085	249							
WD	4	22		1237	650							
MONTH TOTAL				2322	696	35 (89)	122.8	140 (80)	1.1401	0.4881	2,648	1,394
GRAND TOTAL				10025	2768	239 @ (646)	751.2	1302 (228)	1.7332	0.2217	17,376++	5,431

* N = available hours on opening day, otherwise available days per strata.
n = # of hours or days sampled.

+ Opening WE, AM = 0530-1329, PM = 1330-2100. May and June, AM = 0600-1200, PM = 1201-2030
July AM = 0600-1229, PM = 1230-2030. Aug 0700-1930. Opening day = 4/21/85, May = 4/22-5/24,
June = 5/25-6/30, July = 7/1- 7/31, Aug. = 8/1-8/31.

** released fish not recorded.

@ not additive - includes data from interviews with no time of day recorded.

++ not additive - used weighted mean seasonal catch rate.

? includes 1 count only for opening day (5/25) AM period.

Appendix S. Tucannon Impoundments Limnological Data.

Spring Lake — 8-17-53 area = 4.55 acres
11-81 drained

9-8-85 mean depth = 2.2m (range = 1.2 - 3.0)

Temp.	D.O.	pH
0907 am air = 58° F	surf. 13mg/l	10.0
HOH surface = 62°	1.5m 13mg/l	10.0
1m = 62°	bottom 12mg/l	9.75
1.5m = 62.5°		
2.0m = 62.0°		
2.5m = 62°		
bottom 2.7m = 62°		

Blue Lake — 8-17-53 area = 2.82 acres

9-8-85 mean depth = 2.1m (range = 1.1 - 2.6)

Temp.	D.O.	pH
air = 60° F		
surf = 58.5°	13mg/l	9.0
1m = 58°		
1.5m = 57.5°	12mg/l	9.0
2m = 56.0°		
bottom 2.4m = 56.0°	10mg/l	8.5

Rainbow Lake — 8-17-53 area = 2.48 acres

9-8-85 mean depth = 1.9 (range = 0.9 - 3.0)

Temp.	D.O.	pH
air = 60° F		
surf = 58°	10mg/l	7.75
1m = 57°		
1.5m = 55°	12mg/l	7.75
2.0m = 53.5°		
bottom 2.2m = 53.5°	12mg/l	7.5

Appendix S. (cont.)

Deer Lake 8-17-53 area = 2.09 acres

9-8-85 mean depth = 1.2 (range = 0.5 - 1.95)

	Temp.	D.O.	pH
1110	air = 59° F		
	surf = 60°	14mg/l	9.5
	1m = 59.5°		
	1.5m = 58°	14mg/l	9.7
bottom	2.0m = 56°	9mg/l	8.5

Watson Lake 7-10-53 area = 6.05 acres, 22.98 acre ft.

9-8-85 mean depth = 1.6m (range = 0.7 - 3.1)

	Temp.	D.O.	pH
1503	air = 63° F		
	surf = 59°	13mg/l	9.5
	1m = 58°		
	1.5m = 56.5°	13mg/l	9.5
	2.0m = 55.0°		
	2.5m = 54.0°		
	3.0m = 54.0°		
bottom	3.1m = 54.0°	7mg/l	7.0

Beaver Lake 7-10-53 area = 2.06 acres, 4.85 acre ft.

9-8-85 mean depth = 1.0 (range 0.6 - 1.4)

	Temp.	D.O.	pH
	air = 60° F		
	surf = 55°	12mg/l	7.5
	1m = 53°	1.5m 10mg/l	7.0
bottom	1.4m = 52.5°	>1.5m 8mg/l	6.75

Appendix T. Number of fish, percent of known origin, and mean fork length (Std. dev.) from fish captured during qualitative electrofishing efforts on the N. and S. Forks of Asotin Creeks, spring 1985.

Date	Hatchery Rainbows [A]			Wild Rainbows			Unk. Origin
	#	%	X Length(cm)	#	%	X length(cm)	
SOUTH FORK							
4/23 [B]	8	36.4	19.5 (1.0)	14	63.6	14.8 (2.2)	1
5/01 [C]	31	100.0	15.7 (1.7)	0	0.0		0
5/07 [D]	9	52.9	15.5 (2.2)	7	41.2	16.1 (5.6)	1
NORTH FORK							
4/23	2			0			0
5/01	2			3		15.9 (1.7)	0
5/07 *	0			1			0

[A] Steelhead smolts planted in 1984 were unclipped. Planted catchable-sized rainbows were ventral clipped.

[B] All of these hatchery rainbows were unclipped and most were milting males.

[C] All but 1 fish captured was an adipose clipped steelhead smolt released at the Forks Bridge on 4/24/85. Mean length for ad. clipped fish only.

[D] Plus a 33.5 cm bull trout, and 1 hatchery rainbow without an adipose clip.

* Plus 1 chinook fry just after button up.

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