WASHINGTON STATE GAME DEPARTMENT

FISHERIES MANAGEMENT DIVISION

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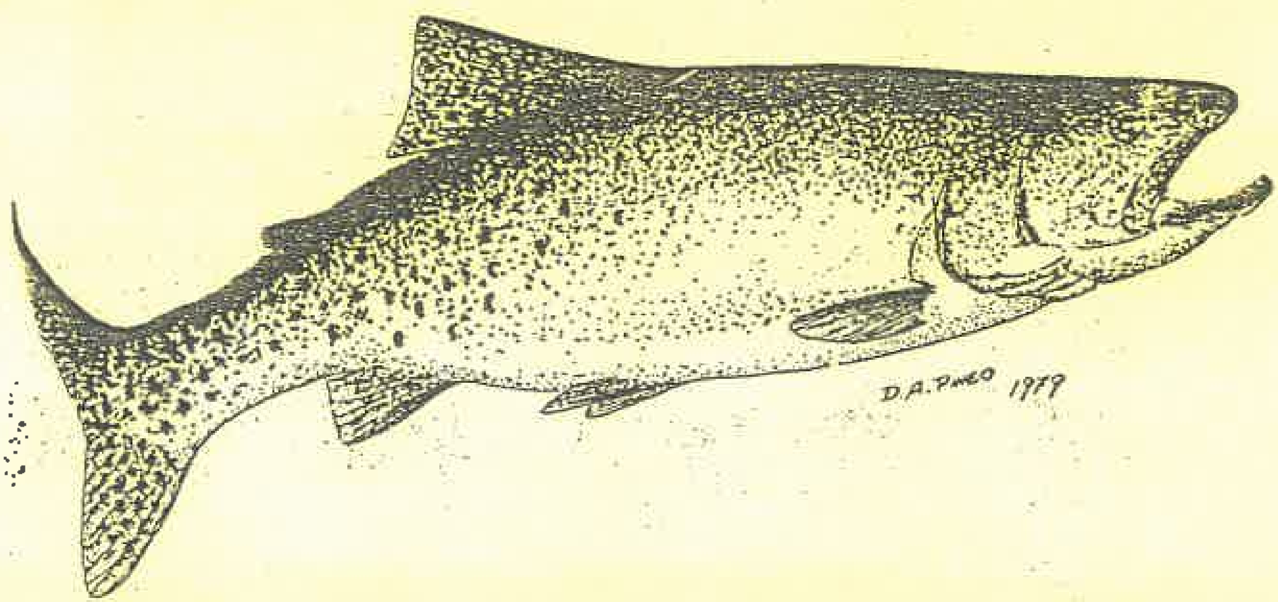

LYONS FERRY EVALUATION STUDY
Part II

Assessment of Production from Lyons Ferry/Tucannon Hatchery Complex; and Estimates of Return of Marked Fish to Compensation Plan Streams in Washington

Mark L. Schuck
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ABSTRACT

Lyons Ferry Hatchery operated in its second full year of production with two stocks of steelhead and one stock of rainbow trout from the 1983 brood year. A total of 1,176,560 steelhead smolts weighing 204,530 pounds were released during the spring of 1984 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 5.8 fish/pound for the entire release and ranged in size from 3.3-9.0 fish/pound. A total of 198,528 rainbow trout weighing 59,437 pounds were planted into 38 different lakes and streams in southeastern Washington during the summer. Trout averaged 3.3 fish/pound.

Five study groups of steelhead totalling 119,000 fish were coded-wire-tagged, fin clipped and branded as part of catch contribution and return rate studies for evaluating stock success. An additional 100,000 fish were branded for release at the hatchery to aide in identifying separate stocks for selective spawning. Tag loss for all groups was between 2.7-3.3%. Brand loss was very high this year with some groups averaging greater than 9%.

Smolt outmigration went very well this year. Estimates of smolt passage at Snake and Columbia River dams, however, are very suspect. Passage at McNary dam was estimated at between 18-61% of release from the hatchery. We suspect that there is some other reason for low estimates than massive mortality at the dams as survival between McNary and John Day dams was between 67-90% for the same groups.

Adult returns of steelhead were very encouraging this year. Escapement of adults from tagged groups to above Bonneville Dam was between 0.5 and 1.21% of release for a single return year. Escapement of individual groups into the project area and to fisheries within those areas was between 0.39 and 0.95 % of release.

Populations of juvenile salmonid fish in the compensation plan streams showed substantial 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. Further investigation and control vs. test area comparisons made.

Redd counts were attempted on the Tucannon and Touchet Rivers during the spring of 1984. High murky water prevented collection of reliable quantitative data on spawning escapement. Redd densities were between 1-3 redds/mile for areas walked. An attempt to count adults escaping above an abandoned water diversion dam on Asotin Creek was unsuccessful.

An intensive creel survey was conducted during the trout season on the Forks and parts of main Asotin Creek to determine percent utilization and user days provided by legal plants of trout from the Hatchery. Tagged fish were released to assess migration patterns of catchable trout after planting. Results showed that 46% of the effort and harvest occurred on opening weekend of the season. Tagging showed that there did not appear to be a substantial amount of out-migration of the catchable trout from the system as most tags were recovered within 5 miles from point of release. We were only able to account for 13.4% of the planted fish reaching the creel. Such a low exploitation rate is of great concern. We are unsure if low effort by fishermen is the cause or if harvest estimates are incorrect. Large number of hatchery rainbow and residual steelhead were observed in the catch on the South Fork of Asotin which does not receive plants of either fish. We propose to study this occurrence further in 1985 with an intensive creel survey on the Tucannon River. Preliminary data from the Tucannon River in 1984 indicate that residual steelhead may account for 82% of late summer trout harvest.

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1.0 INTRODUCTION

1.1 Evaluation Project Summary

This is the second report by the Washington Department of Game concerning activities at a new steelhead production facility on the Snake River. Lyons Ferry Hatchery 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). Three remote conditioning ponds are yet to be constructed and the Tucannon trout hatchery will be renovated and enlarged as part of this program. Some activities were still in the planning stage during the time period this report covers. Therefore, they will be described briefly here and researched more completely for future reports.

The contract period for this report is 1-April-1984 through 31-March-1985. There were, however, activities performed outside of these dates that are essentially part of the data that needs to be reported. There are also data collected in previous years that are germain to the 1984 year. Both of these types of cases have been included for sake of clarity within this report.

Project operation went much more smoothly this year with the addition of a second full time biologist to the project. This individual is stationed in Clarkston, Washington and coordinates all creel activities and those other activities within the project proposal that pertain to the Grande Ronde River or Asotin Creek. This individual was not available for the very busy April-May period however, so some spring tasks as outlined in the proposal were not completed. Most Tasks were addressed this year, however, in some form or level of completion which is an improvement over 1983.

Some refinements to the evaluation project have already begun. The 1983 proposal as submitted to the U.S. Fish and Wildlife Service (FWS) (Appendix 1) served as a guideline for our field activities. The list of objectives and tasks also served as a reference point for us to determine our progress in the evaluation project for the year. The 1984 proposal has been changed and portions removed or altered based on experience from the 1982 and 1983 field seasons. This type of refinement will occur each year to assure progress or to respond to new problems that have arisen with the facilities.

The year 1984 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 began collecting tags from our first tag releases to determine adult steelhead contribution to Compensation Plan and other harvest areas. The first years data is very encouraging and supports the premise that production and return goals as described in the LSRCP are achievable goals.

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 due to construction of hydroelectric dams built 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 of the state with 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, crappie and other species would be diminished by 67,500 angler days of recreation annually. These criteria were the basis for requesting 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.

Initially the Corps of Engineers recommended that "every practical effort should be made to replace that loss in the affected area before providing a substitute fishery off-project." To this end a study was contracted by the COE to investigate possible means to improve the resident warmwater fishery. Although this study was completed, the states' original request for 93,000 pounds of legal trout was finally accepted as an acceptable goal of the compensation program.

Washington Game Department did, however, negotiate an alternative method of producing the total amount of steelhead and resident trout needed for compensation. Inlieu of building one large production facility on the Snake River, Lyons Ferry hatchery would be constructed to produce 116,400 pounds of steelhead and 45,000 pounds of legal rainbow, and Tucannon hatchery would be repaired and updated to produce 41,000 pounds of legal rainbow and to aid in the propagation of Spring Chinook salmon for Washington Department of Fisheries. The remaining 7,000 pounds of rainbow would be produced by improving instream habitat in various streams in southeastern Washington.

Washington Game Department developed some program goals that will guide our efforts at achieving the compensation plan goals of replacing lost populations and angler opportunity, these goals and a summation of our approach to achieve the goal are:

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.

Washington had no hatchery stock of steelhead available for use in the Snake River system that had been developed from native or indigenous runs of fish. Disease problems throughout the Columbia River and tributaries and protective disease policies limited the availability of eggs for a new program. The state desired to utilize a stock or stocks that closely resembled native fish since extensive outplants could be expected within a few years. Unfortunately few fish were available for a brood stock development program and no trapping facilities for steelhead had been requested of the LSRCP. Washington Department of Game decided that the only available source of fish in 1982 was a Columbia River summer steelhead cultured at Wells Hatchery. These fish had been used sporadically in past years for small outplanting programs and had shown some measure of success. In addition, contacts with Oregon Department of Fish and Wildlife personnel involved with LSRCP proved beneficial. ODFW had been in the process of developing a "wild" stock of summer steelhead for several years. These fish were to be used at Wallowa Hatchery for the Grande Ronde River portion of their program. Agreement was reached to allow Washington to use "Wallowa stock" steelhead in their portion of the Grande Ronde, about 300,000 smolts annually, as well as other tributaries. In return for these fish, Washington would dedicate a large portion of production space at the Lyons Ferry facility to an egg bank building program for ODFW. Production would be based on these two stocks of fish until their performance is evaluated. A complete description of each stock and their characteristics was provided in the 1983 annual report (Schuck, 1985).

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. Significant time, expense and trouble have been saved for the program by utilizing this stock. There will, however, be an ongoing evaluation of stock performance and changes will be made, if necessary.

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. Habitat preservation and enhancement programs are under way in most streams to help rebuild depressed populations. WDG will adopt special restrictive regulations to encourage catch of hatchery produced fish while affording protection to smaller or discreet populations of native fishes. Research has shown that juvenile survival may be negatively affected by interbreeding of native/wild stocks of fish with some hatchery stocks (Leider, 1984). Preserving the genetic fitness 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 the WDG are committed to the success of the compensation 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. 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 it's 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.

Both of these existing conditions provide an excellent basis for the compensation program. By utilizing fin marked steelhead to plant streams, regulations can be adopted which protect wild fish and encourage harvest of hatchery produced LSRCP program fish. Wild spawners are thus protected while consumptive fisheries are allowed much sooner than would be possible with slowly rebuilding or static wild populations. Legal trout can be planted in specific "hatchery planted" waters to lessen fishing pressure on smaller, wild populations, which allows rebuilding to occur over a shorter period of time.

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 of release. This strategy will help meet the "in place" aspect of compensation with fish that are prone to straying.

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. 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.

1.3. Compensation Program Facilities

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

Lyons Ferry Hatchery

Production facilities include egg and starter troughs for 1.15 million 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 will undergo 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. One deep well 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 Hachery 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 C.P. 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 migrated.

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 2-6 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 C.P. 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 concrete 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.

2.0 METHODS

2.1 Hatchery Operation

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

Similar release strategies were used in 1984 as were used in the 1983 release (see Schuck, 1985). A majority of our fish this year were hauled by truck to another hatchery first then allowed to out-migrate into stream systems. This was because of the large number of Wallowa Stock steelhead reared for Oregon Department of Fish and Wildlife (ODFW) as part of their brood stock development program mentioned earlier. These fish were sampled for length, weight, condition factor (K), descaling and precocious males at the time they exited the rearing ponds or raceways. They were also sampled by ODFW personnel after transport to measure trucking mortality or descaling that might affect the success of the release. Their sampling efforts should be available in an ODFW evaluation annual report.

The complement of the releases were sampled just prior to their release into a stream system either while volitionally migrating from a structure or prior to pumping into trucks and direct release into the stream.

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. When groups of fish had been tagged and enumerated, this number minus any mortality since tagging was used and average weights from samples used to determine total pounds of fish planted. Un-tagged fish were volumetrically weighed by water displacement when trucked out of the hatchery. Average number of fish/pound from samples was then used to determine total numbers planted. This method does have some error associated with it because of the small sample sizes.

We attempted to assess residualism in the release streams by two separate methods. The proposal (task 2.6) stated that we would electroshock 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 census fishermen during the opening of the stream trout season and express results as percentage of catch over the first 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 residualism from year to year for different size or times of release. This might also help assess if conditioning ponds were effective in improving outmigration. Allowing fish to experience more normal temperature and water quality changes for the last two months of rearing should help, as compared to relatively constant conditions at the hatchery.

Assessment of smolt survival throughout their migration was obtained from samples taken 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. Survival and passage 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. Data is available from samples taken at Lower Granite, Little Goose, McNary and John Day Dams, and from a floating scoop trap operated at the confluence of the Snake and Clearwater Rivers at the town of Clarkston, Washington.

2.3 Fish Marking Program

Three types of marking were acomplished this year for separate purposes. Adipose clipping of one group released in the spring of 1984 and all the production fish for the 1985 release was done this year. These fish were marked to designate them as hatchery produced and available for harvest in selective fisheries upon return as adults. Coded-wire tagged fish were released for specific contribution and return rate studies pertinent to Lyons Ferry production and to help assess progress toward achieving mitigation goals. Group sizes were set in blocks of 20,000 fish to fully utilize raceway space the fish are held in after marking. Twenty thousand fish is considered a minimum group size because of low expected return rates and the difficulties of sampling sport fisheries for mark recoveries. A 40,000 fish group size is desirable. Tagged fish for the 1984 release year were left ventral clipped (LV) to indicate the presence of a cwt. This is a change over previous years because of the sequestering of the adipose clip for harvest management.

Tagging and branding were conducted during February, 1984 for the spring 1984 production release and during February, 1985 for the 1985 release. This time causes a conflict with budgets and reporting year since fish to be released in the spring are tagged with evaluation budget dollars from the previous contract period. We shall attempt to alleviate this confusion in future reports by including an entire production year and release into one report, which is the most logical time cutoff.

The WDG hired experienced personnel to operate equipment borrowed from NMFS for the marking program in 1984. Fish have to be removed from the large rearing ponds and moved into raceways so that they may be accessed easily. Retaining screens are removed from the lakes 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 1982-83 brand and cwt releases into various stream were provided to NMFS. Adults coming into their traps were mark sampled and the information along with sample rates was provided to us.

Harvest of adults destined for compensation program 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 several sources such as WDG, ODFW, IDFG and the Indian tribes. Where this data is available, it is compiled and presented to reflect the total contribution of LSRCP fish within the basin.

Estimates of sport harvest of steelhead in the Snake River were accomplished through an intensive creel survey. The results from that survey have been published separately as part of the 1984 annual report (Mendel, 1985).

2.5 Juvenile Steelhead Populations in Project Rivers

We stratified streams into representative sections based on their general stream characteristics (eg. water temperatures, gradient, substrate type, discharge, etc.). Stream sections sampled by electrofishing for juvenile populations this year included: the Tucannon River between river mile (RM) 24.8 at Marengo and RM 45.6 near Panjab Creek ; one site on the South Fork of Asotin Cr. approximately 6 miles above the mouth; the lower 0.25 miles of Wenatchee Cr.(Grand Ronde R.); the middle section of Mill Cr.(Walla Walla R.); upper main Asotin Cr.; upper Touchet River; and lower North Fork Touchet River.

We selected sampling sites to either; 1) provide data for stream sections where no previous data existed, or; 2) provide more recent data for sites or stream sections electrofished in the past. Sites TU-3, MC-1, MC-2, and AS-1 were sites electrofished in 1981 by Mendel and Taylor (1981). (Note: site abbreviations are based on the first letters of specific rivers or streams; eg. TU = Tucannon River.) Sites TU-4, NT-1, NT-2, TR-1, and TR-2 were selected because electrofishing data was available from nearby sites in the same stream sections (Mendel and Taylor, 1981; Ransom et al, 1980).

We sampled during the late summer in a similar manner to that described in Hallock and Mendel (1985). The site was blocked off with 0.25 inch mesh nets at the upper and lower ends and then electrofished from the upper net to the lower net. Captured fish were placed in buckets and the process was repeated. When trout captures during the second "pass" exceeded 50-60% of those from the first pass, we repeated the procedure for a third pass. Habitat measurements were taken after all fish lengths and weights were recorded. Transects were established every 25ft for width and depth measurements. Depths were taken at 1ft intervals along each transect. Percent shade for the site was estimated between 1000 and 1500 hours. Pools and cover surface areas were measured for the entire site. Substrate types and embeddedness were generally described for the site. Numbers obtained from electrofishing were used in a Zippin (1958) or Seber and LeCren (1967) formula to estimate total population and 95% confidence interval for the site.

2.6 Redd Counts

We walked individual sections of the Tucannon and Touchet Rivers beginning the first week of April to determine the extent of spawning utilization. Very high murky runoff during most of the spring precluded walking in the stream and any good enumeration of actual numbers of redds. Notations were made about the location of some confirmed redds.

2.7 Legal Trout Program

A small intensive creel survey was accomplished on Asotin Creek to assess the affect of legal rainbow plants on sport fisheries and the amount of fishermen days recreation that they provide. A similar survey planned for the Tucannon River was not accomplished this year. Numbers of fish planted and some information on angler usage within a WDG management area are provided in summary.

3.0 RESULTS AND DISCUSSION

3.1 HATCHERY OPERATION

3.1.1 Juvenile Growth

Juvenile growth and development for all groups of steelhead and rainbow in 1984 were very similar to that observed in 1983. Total poundage produced in 1984 was considerably more than was produced in 1983 but this represents expansion of the program to levels that might be expected in future years. Even considering the expanded program and greater fish densities within the hatchery, all groups of fish responded well to rearing conditions and actually converted fish food fed to flesh produced better than in 1983. Table 3.1 summarizes production data for the groups of fish produced at Lyons Ferry in 1984.

Table 3.1 Trout Production at Lyons Ferry Hatchery, 1984.

Spec.	Stock	Fry	Food Fed(lbs)	Fish(lbs) Produced	Feed Conv.	Number Planted	% Survival
SSH	Wallowa	809,650	153,300	119,245	1.29	748,587	92.5@
SSH	Wells	425,963	110,250	82,511	1.34	388,913	91.3
RB	Tucannon	143,330	34,450	21,421	1.60	125,385	87.5
RB	L.Ferry*		29,990	24,891	1.21	73,143	
	Totals			261,213		1,336,028	

@ Survival figures are based on fry to smolt survival and do not include sub-smolt plants from the hatchery.
* Includes some trout production for Tucannon Hatchery.

Production of steelhead was up considerably from 1983 because of continued cooperation with Oregon Department of Fish and Wildlife. Over two-thirds of the production of Wallowa stock fish was transferred to the Wallowa Hatchery for release. This ongoing broodstock development program is essential to Oregon for a more rapid development of their steelhead program.

Most factors of fish rearing were similar to 1983 (see Schuck, 1983). Wells fish were spawned in February/March 1983 and Wallowa fish were spawned in April and May 1983. Both were released during April and May of 1984. Wells fish reared approximately 430 days from egg to smolt while Wallowa fish reared only about 350 days. Both were fed OMP diet and converted very well (Table 3.1). 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 fish were considerably larger than this because of delays in lake repair. Various groups of fish were ponded between October and early January. 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 ODFW.

There was no incidence of disease or secondary infections at the hatchery this year. 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. It is hoped that such efforts will retain the hatchery's clean status.

Survival from egg to fry for the steelhead was good for the groups (Table 3.2) in 1984. Survival from fry to smolt was very good and almost the same for the two stocks (table 3.1). Mortality for both groups averaged less than 1% per month for the entire rearing time. Unaccounted juvenile loss or extremely heavy predator mortality, have not been a problem.

Table 3.2 Juvenile mortality, Lyons Ferry Hatchery 1984

Stock	Brood year	Eggs In	Fry Out	% Mortality
Wallowa	1983	911,504	853,889	6.3
	1984	830,453	795,653	4.2
Wells	1983	474,390	454,913	4.1
	1984	373,648	340,339	8.9

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 considerable size variation between and among stocks at the time of release (Table 3.3). Fish were released that ranged from 3.3 - 9.0 fish/lb. The average size for the entire release of smolts for 1984 was 5.8 fish/lb. Total production was 1,176,560 fish totaling 204,530 pounds. Over 500,000 fish weighing almost 71,000 pounds were reared for Oregon. Table 3.4 summarizes the smolt samples taken at release from the lakes and raceways containing smolts. Fish sampled at Tucannon Hatchery were Lyons Ferry reared smolts transferred to the hatchery just prior to release. Groups of coded wire tags were mixed at the Tucannon hatchery so individual samples for the tag code are not available. There was very little size difference at time of marking so it is unlikely that major differences developed between December (when they were marked) and April, as the groups were treated identically.

Table 3.3 Smolt characteristics, Lyons Ferry Hatchery 1984.

Lake/RW	Stock	# fish Sampled	Sample Days	mean Length (mm)	mean Weight (gm)	(#/lb.)	K Factor	Prec.(%) Males	Mark
1	WA*	361	3	189.1	66.6	6.8	0.96	3.9	none
2	WE	310	3	213.3	94.2	4.8	0.96	10.0	none
3	WA	260	2	202.9	83.2	5.4	0.95	1.9	none
15	WE	68	1	228.3	130.2	3.5	1.07	16.2	RD-IT-2
16	WE	70	1	197.2	89.1	5.1	1.10	7.1	RD-IT-2
17	WA	82	1	228.1	126.1	3.6	1.10	7.3	RD-IT-1
18	WA	75	1	233.1	136.1	3.3	1.05	10.7	RD-IT-1
Tucan.	WA	55	1	197.3	82.2	5.5	0.93	9.1	CWT
Tucan.	WA	190	1	207.5	78.3	5.8	0.87	6.4	CWT
Tucan	WA	173	1	210.3	88.3	5.1	0.95	6.4	CWT
Tucan.	LF	121	1	177.5	47.7	9.5	0.85	1.6	AD

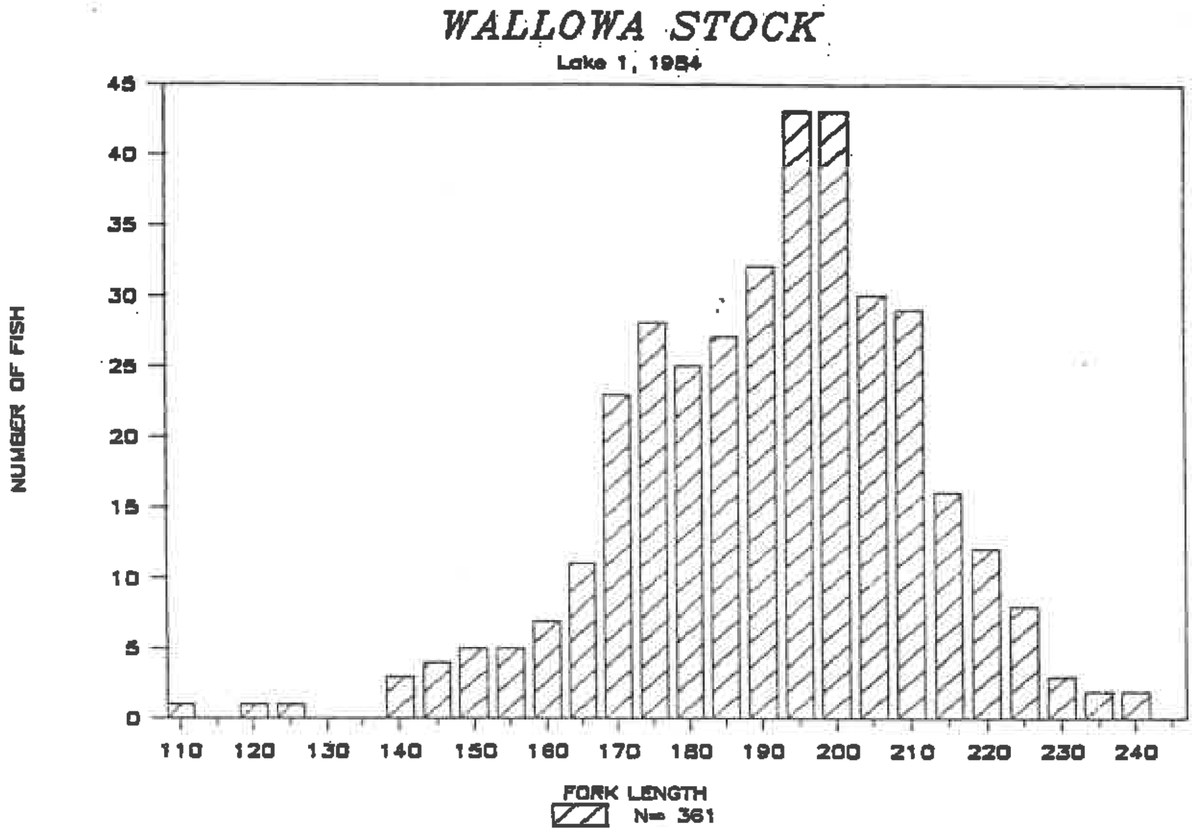
* WA= Wallowa; WE= Wells; LF= Lyons Ferry

Values in Table 3.3 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 - 3.3 depict the range and variation of samples of fish length and weight taken from the rearing lakes at Lyons Ferry in 1984.

3.1.3 Fish Marking

Fish marked for release in 1984 are listed with other releases in Table 3.4. National Marine Fisheries Service personnel were contracted to do the marking for us during February of 1984. Only Wallowa stock fish were tagged for this year. The fish ranged between 135-210mm fork length and between 7.5-14 fish/ pound at the time of marking. Because of the great variation in size approximately 20% of the fish handled were rejected because they were too small to accept a brand or were too large already and males were becoming heavily precocious. Although this may bias the tag groups and not truly represent hatchery production, we had to tag and brand within certain restraints to assure some reasonable amount of success for the money spent on marking. Approximately equal numbers of small and large fish were rejected.

We had great concern that the new Wallowa stock would not perform properly over time. Originally, half of the tagged fish were to be released from Wallowa Hatchery in Oregon to duplicate a release made in 1983. However, ODFW personnel objected to the marking and, therefore, a larger mark release was made into the



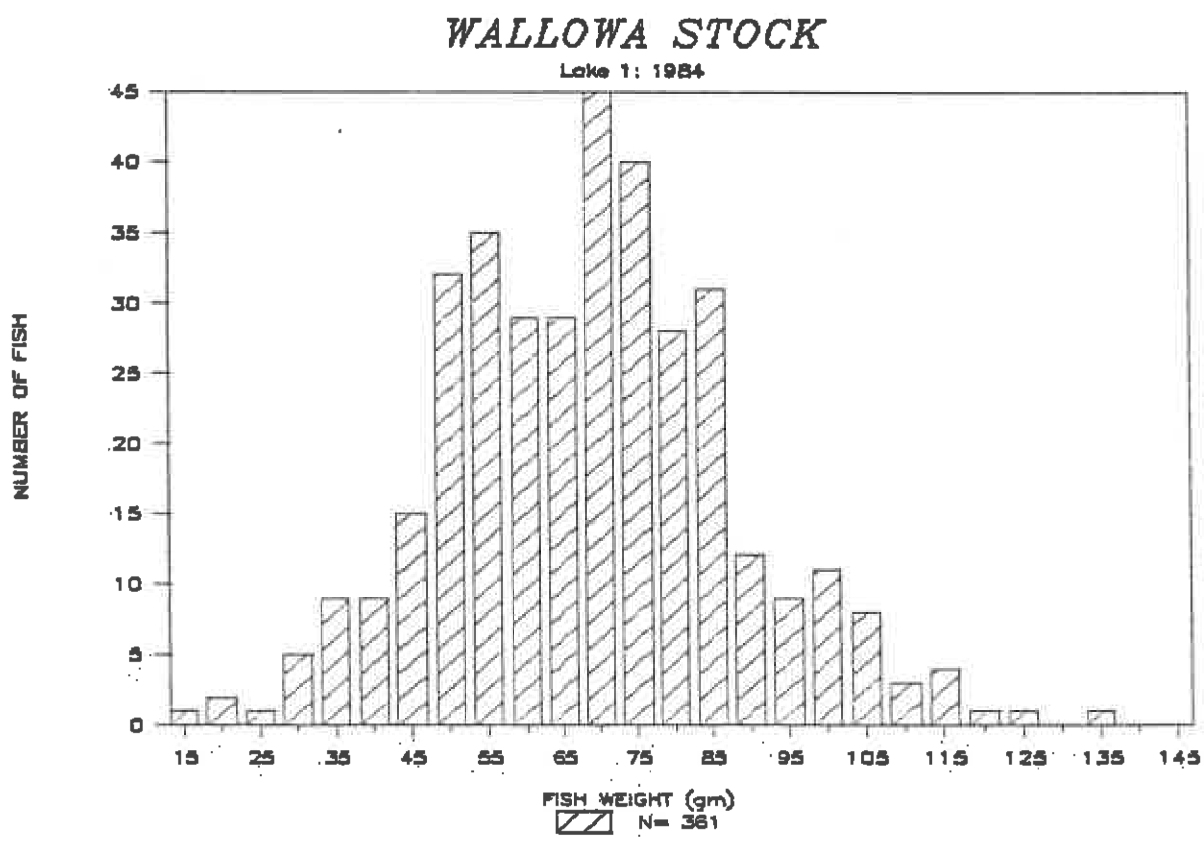
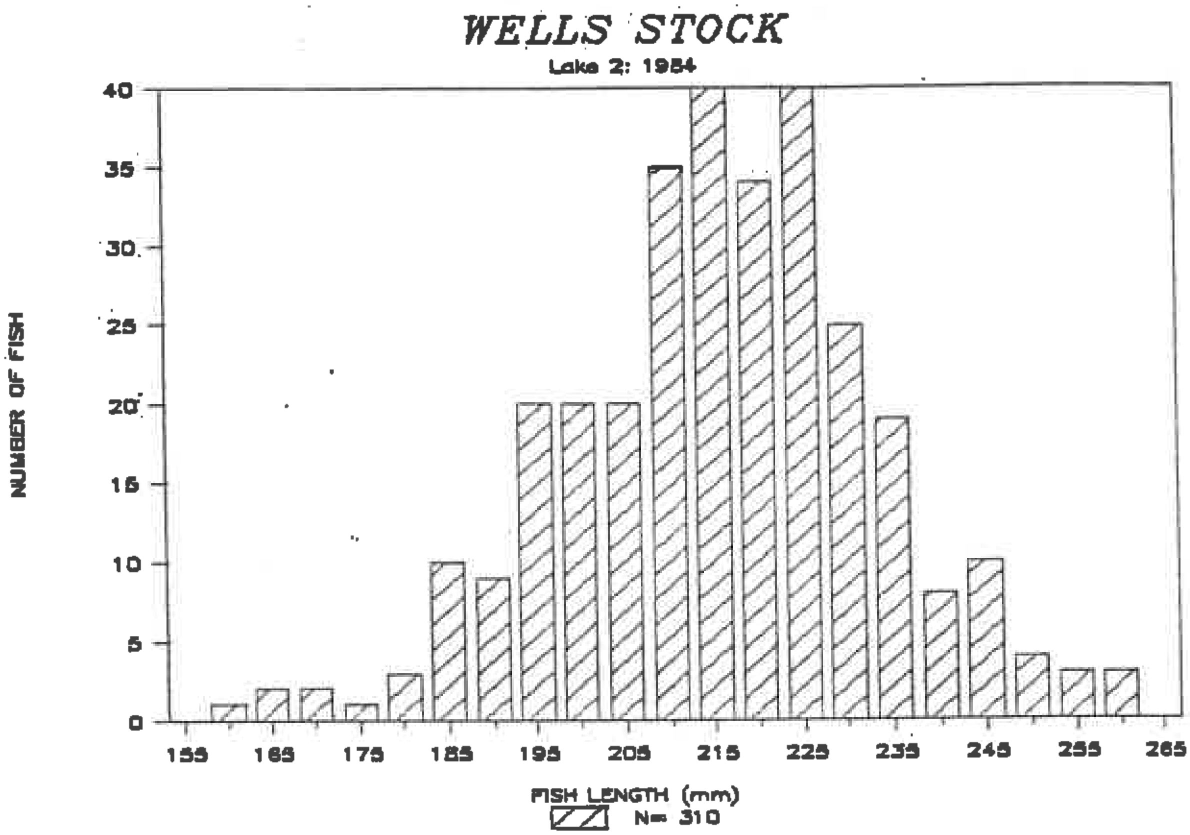


Fig. 3.1 Length and Weight histograms for Wallowa stock steelhead in Lake 1, 1984.



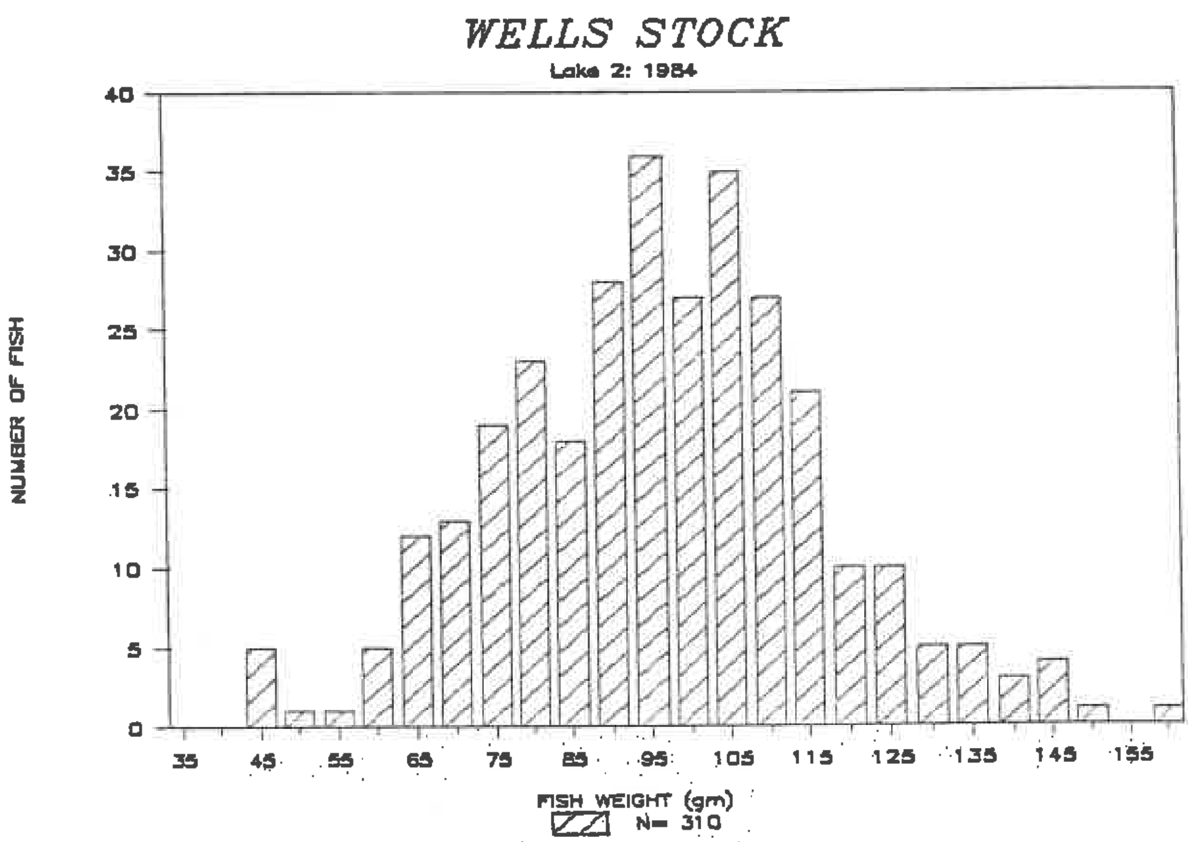
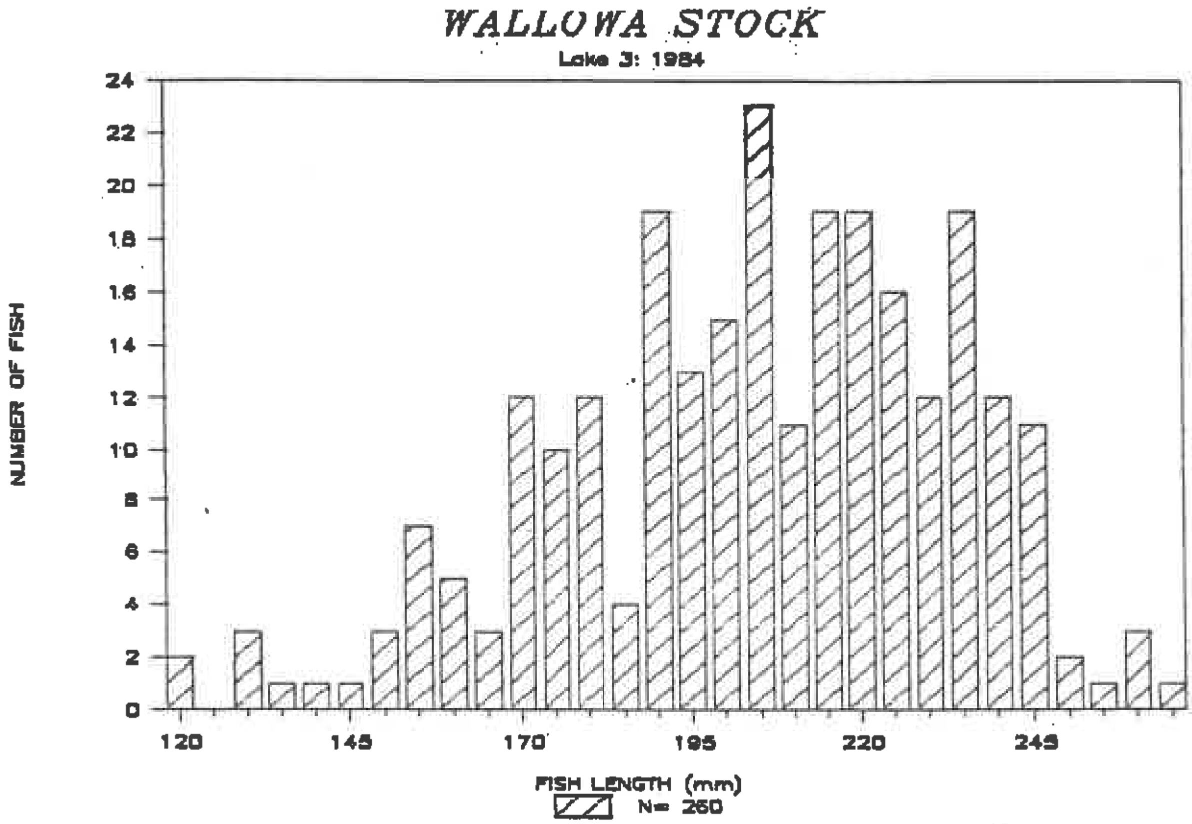


Fig. 3.2 Length and Weight histograms for Wells stock steelhead in Lake 2, 1984.



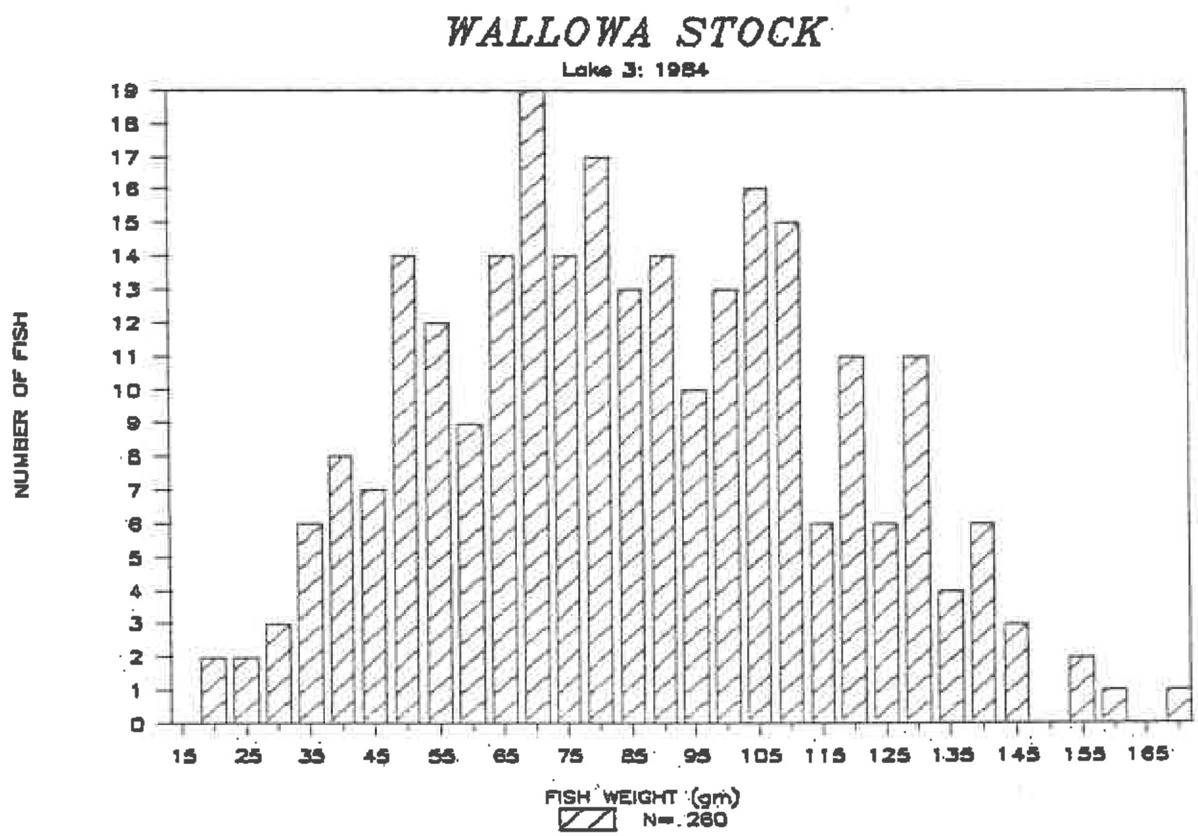


Fig. 3.3 Length and Weight histograms for Wallowa stock steelhead in Lake 3, 1984.

Table 3.4 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(%)
1982	G.RONDE @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.	30,930	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	

Tucannon River. The Tucannon was chosen because we anticipated being able to trap returning adults in 1985-87. The Tucannon had also received Wallowa stock fish in the past.

Tag loss from tagged groups was higher for the 1984 releases than in 1983 (Table 3.4). The reason for the increased tag loss may be the larger size of fish in 1984 during February versus the 1983 release tagged in December. Brand retention was much better for tagged fish this year with brand loss ranging between 0.8-4.8%. The brand-only fish lost their brands much more heavily with losses of 7.5% for RD-IT-1 Wallowa fish, and 9.6% for the RD-IT-2 Wells fish. Both these groups of fish were larger at the time of branding than the cwt/brand fish. Brand loss averaged 9.0% for all groups in 1983.

Paired releases of 50,000 brand-only fish were made from Lyons Ferry Hatchery as part of the brood stock development and testing program (Table 3.4). We anticipate the ability to distinguish adult spawners returning to the hatchery ladder by the use of freeze brands. This will allow us to spawn each stock separately and also to compare return rates to the point of release. Fish that do not have a coded wire tag are branded in the dorsal position to facilitate easier identification.

One small group of Lyons Ferry stock fish were adipose clipped at Tucannon Hatchery prior to release. These were experimental Wells stock fish captured at Lower Granite Dam in 1982 and spawned in the spring of 1983. They were raised at Tucannon Hatchery and released in the river at 8.3 fish/lb. The marking was done to ensure they could be distinguished from wild fish that might be trapped at the Hatchery in the future. It is likely that many will rear another year in the Tucannon River before smolting because of their small size.

3.1.4 Discussion

The production year went very well despite structural complications with the rearing facilities. Rearing such a large number of smolts and legal size fish also created some space problems. While the densities of fish reared were not excessively above design capacity, certain critical times arise when more fish were almost unmanageable. Timing fry transfer in the spring from the hatchery to outside raceways is hampered by the catchable size rainbow program 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 more this year by having several raceways filled with smolts to be released from Lyons Ferry for brood stock returns.

Spring smolt release time can also be a critical time. The release structure below the three steelhead lakes is designed to hold a limited number of smolts. Heavier rearing pond stocking rates to accomodate ODFW made imminent overcrowding of the release structure, and possible stress mortalities, a daily concern for the manager.

Fish growth and performance during the year was excellent. Feed conversions were above expected values. Much of the performance is probably due to an excellent water supply and lack of any disease problems throughout the year. Smoltification at time of release appeared to be very good. Differences in stock performance are evident but there is no indication that either stock will be unsuitable for continued culture at this facility.

Raceway reared fish appear to have a much higher incidence of precocialism than do lake reared fish. This may be due to the increased average size of raceway fish. These 1984 fish were branded and released for brood stock returns to the hatchery. Because of the precocialism problem, this practice will not continue in the future unless necessary.

The smaller size group of Wallowa fish (lake 1) and the Wells fish (lake 2) show a much more even length and weight distribution than the larger more widely distributed Wallowa fish (lake 3). Lake 1 fish were the group nursed along to produce as many fish as possible but contained many fish which were less than optimum size (Figs.3.1-3.3). The even size distribution probably is due to grading that occurred later in the year than for lake 3. Wells fish are a more long term hatchery fish (Williams 1983) and tend to grow more evenly in a hatchery situation. Wells fish were also graded more strictly than the Wallowa fish since ample fish were available for the program and removal of small fish is an accepted hatchery practice. The lake 3 fish (Wallowa stock) probably exhibited a more normal "wild" growth pattern with some fish smolting earlier than others, similar to wild fish in a stream.

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 since it was common to have one machine "down" at any time of the day being fixed. Purchase of a new tagging trailer with WDF in 1985 may solve this problem and make scheduling of tagging, clipping, and branding easier.

Brand loss was excessively high this year in the later brand-only fish released from the hatchery. We are unsure of the exact reason for the high (>9%)loss in some groups. Such loss constitutes a substantial potential loss of migration data and is not cost efficient. We suspect that the losses were due primairly to improper branding procedure. We will try to stress greater branding quality in subsequent years or utilize different identification techniques if available.

3.2 SMOLT OUTMIGRATION

3.2.1 Hatchery Operations

All smolt plants for 1984 are summarized by release day in Table 3.3. Three types of release occurred this year. Brood stock smolt releases from Lyons Ferry were allowed to volitionally migrate for three to six days, then the remainder were forced from the raceways. The majority of fish this year were pumped from the release structure into tank trucks and hauled to either Tucannon Hatchery or Wallowa Hatchery in Oregon. The fish were then held in ponds or raceways for two to seven days then forced out over a two day period. The final release method was for fish to be pumped from the release structure into tank trucks then planted directly into various streams and rivers in Southeast Washington.

Fish released at the Tucannon Hatchery were released during two time periods because there was not sufficient space to hold the entire group at one time. The first group migrated out beginning April 26 and moved downstream well with only small concentrations of fish observed near the hatchery outlet after two days. The second group was released May 9. Two days after the last fish had been crowded out of the pond, a heavy rain/snow melt runoff occurred that flushed the fish from the river. This type of occurrence apparently caused some mortality as the fish did not appear to have survived as well to McNary Dam (see 3.2.2) as did the earlier release. This very high water precluded any electrofishing to assess smolt residualism. Based on creel checks from the stream trout season (see 3.6), residualism was not excessive or appear to be significantly different in Washington streams from 1983. There was a problem with residualism with the Wallowa River smolt releases (Ken Witty, ODFW, personal communication). Large numbers of small fish were caught in the stream trout season directly below the Wallowa Hatchery. No census was taken to quantify the number of fish caught however the problem had not been noticed in the past. This problem is likely the result of the 170,000 fish released that had not attained smolt size (8.5 fish/lb) attempting to rear another year.

Scales were taken from each of the groups to have for growth and aging reference as adults return. We observed a less than 1% scale loss on fish sampled during release. As noted in our 1983 report 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.

3.2.2 Migration Through Dams

All tagged and branded fish released in 1984 migrated from the mid-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.. Table 3.5 summarizes passage estimates for each brand group for 1984 and 1983. The second listing for some of the 1983 release groups is the 1984 passage estimate for that group. This number indicates the amount of second year outmigration for fish that reared an additional year in the Snake R. or some tributary.

Table 3.5 Estimated Passage of Branded Lyons Ferry Steelhead at McNary Dam in 1983 and 1984

Brand	Year	Number[1] Collected	Est. Passage	Number Released	% of Release	Size #/lb.	Stock
RA-S-1*	83	8,151	15,616	33,000	47.3	5.8	WA
RA-S-2*	83	6,557	13,230	32,000	41.3	5.0	WA
LA-S-1	83	6,128	31,192	50,597	61.6	4.3	WA
LD-S-2	83	4,432	22,433	52,253	42.9	4.3	WE
RA-IJ-1	84	1,081	3,669	30,473	12.0	4.9	WA
RA-IJ-2	84	983	3,264	27,122	12.0	5.4	WA
RD-IT-1	84	4,930	16,855	51,005	33.0	4.2	WA
RD-IT-2	84	3,530	12,008	50,450	23.8	3.3	WE
RA-IV-1	84	1,728	5,691	31,790	17.9	5.2	WA
RA-IV-3	84	1,715	5,771	30,930	18.7	4.9	WA
LA-S-1	83@	160	471	50,597	0.9	4.3	WA
RA-S-2	83	10	31	32,078	0.1	5.0	WA
LD-S-2	83	90	268	52,253	0.5	4.3	WE

1 This number would equal number of fish transported.
* Passage data estimated at Lower Granite Dam (for comparison).
@ 1983 releases collected in 1984. Smolt over-wintered one year.

Passage of fish was down significantly in 1984 compared to 1983. First arrivals of fish at McNary dam occurred eight days after release from Lyons Ferry hatchery and nine days after release from Tucannon Hatchery. Over half of the fish from all groups passed the dam within thirty (30) days but individuals from various groups continued to pass for approximately 75 days from release. 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 was also available at these same times.

3.2.3 Discussion

All preliminary indices for the 1984 outmigration were very good. Average fish size was up from the 1983 release which suffered considerable residualism from small fish (Schuck, 1983). There was some problem with large fish from the hatchery raceways however precocious males were not more than 10% of the fish sampled. This is a higher percentage than we would like, but not excessively high when compared to fish production at other hatcheries. All fish released appeared to migrate quickly from the site and to continue downstream without delay. This was evidenced by reports of brand passage at McNary dam within 7-9 days (McConnaha, 1985).

Total estimated passage at McNary dam however, would tend to indicate a tremendous amount of 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. Very high flows from the Snake and Columbia Rivers would be expected to encourage outmigration and assure strong currents through the pool areas and decrease migration time. All these factors should improve survival but the numbers indicate substantially poorer survival than in 1983, which had a more moderate spring runoff. There was no indication in the smolt samples for either length, weight, condition factor, or their apparent smoltification process, that the fish would not perform well during migration. Additional information from tag groups passing John Day Dam (first dam below McNary) indicate substantial mortality or residualism occurring in the Columbia R. between the two dams as well (Table 3.6). This portion of our study appears to have a substantial amount of error inherent in relying on passage estimates at the transport dams. If refinement of the estimating procedure is not possible we may drop the work. We will review this again in the 1985 report and determine whether to continue.

Table 3.6 Lyons Ferry steelhead performance between McNary and John Day Dams, 1984.

Brand	Release Site	McNary By-passed	John Day By-passed	Passage % Survival	Stock
RA-IJ-1	Tucannon	2,580	1,722	67%	WA*
RA-IJ-2	Tucannon	2,281	1,398	61%	WA
RD-IT-1	L.Ferry	11,925	8,793	74%	WA
RD-IT-2	L.Ferry	8,478	1,500	18%	WE
RA-IV-1	Tucannon	3,963	3,693	92%	WA
RA-IV-3	Tucannon	4,058	3,640	90%	WA

* WA= Wallowa; WE= Wells

Another trend appears when viewing the Snake and Columbia River passage data together. The early Tucannon River release

(RA-IV-1,3) migrated out in late April on moderate spring flows and consistantly performed better than the later releases from both Lyons Ferry and Tucannon hatcheries. While we believe there is some error in estimating passage at McNary Dam, the numbers should be at least relative to each other in analysing migration behavior. Therefore the early migrating fish appear to have survived, or migrated, in 50% greater numbers through both McNary and John Day facilities. Regardless of actual numbers successfully migrating to below these dams, it appears there was substantially greater success for the earlier released fish in 1984. We cannot, however, attribute this apparent success to any specific measurable difference in the smolts other than time at release and the moderate versus high flows occurring at that time.

Adult returns to the project area for each year class will have to be the final measure of whether smolt survival did decrease drastically in 1984 from 1983, and also, whether there was 50% better survival of early released fish within 1984.

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. Completion of the new Bonneville Power House and the increase in water flow along the Washington shore was expected to attract more steelhead to the Washington ladder and allow more fish to be sampled at the new adult sampling facility. Table 3.7 is a summary of Lyons Ferry tag releases passing this facility in 1984. Sample rates varied widely throughout the summer but this type of sampling gives excellent first results and timing information about returning adults.

Table 3.7 Adult returns of Lyons Ferry steelhead at Bonneville Dam in 1984. (Gilbreath, 1984)

Tag Code	62/16/50	63/28/38	63/28/39	63/28/40
# Sampled	65	134	59	40
Est. Passage	306	594	279	201
% of Release*	0.5	1.21	0.838	0.644

* Based on release numbers corrected for tag loss.

Passage of marked (cwt) groups of fish at Lower Granite Dam (LGR) have great significance since it is the upper most 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 3.8 lists estimated escapement of Lyons Ferry fish to above LGR and the percentage of release that these fish represent.

Table 3.8 Adult returns of Lyons Ferry steelhead to above Lower Granite Dam in 1984. (Harmon, 1984)

Tag Code	62/16/50	63/28/38	63/28/39	63/28/40
# Sampled	145	288	142	111
% of Release	0.237	0.588	0.426	0.356

,457

3.3.2 Returns to Other Locations

Many other fish bound for the Snake river were intercepted in consumptive fisheries or strayed into other stream systems where they were sampled. Table 3.9 summarizes this data and provides an idea of the migratory pattern and importance of these fish in other locations and fisheries.

Table 3.9 Adult returns of Lyons Ferry steelhead to locations and fisheries within the Columbia River Basin 1984. @

Tag Code	62/16/50	63/28/38	63/28/39	63/28/40
Location	Estimated Recovery or Harvest (% of release)			
L.Col. Sport		19(.039)		14(.045)
Zone 6 Net	90 (.143)	108(.220)	65(.195)	35(.112)
Deschutes R.				
caught	3(.005)	3(.006)	25(.075)	5(.016)
escaped	3(.005)		21(.063)	15(.048)
L.Ferry Ladder		46(.094)	6(.018)	
Upper Snake R.				
Sport	18(.037)	36(.073)		18(.057)
Wallowa Hatch.			88(.264)	66(.212)
Totals	114(.181)	212(.433)	205(.616)	153(.490)

@ tag recoveries are based on sample data collected by several agencies and forwarded to WDG through each states' tag coordinator.

Mendel and Aufforth (1985) estimated that Lyons Ferry produced fish made up approximately "9.39% of the 2,333 steelhead (222) caught in the mid-Snake River between 1 Sept and 30 Nov." and "an additional 2.1% of the remaining 5,306 steelhead caught in the lower and mid-Snake (111)" in fall and spring seasons, for a total of 333 fish or approximately 4.6% of the estimated catch for the entire season. (Note to the Reader: There is considerable uncertainty about how the sampling done by WDG and IDFG should be combined in estimating tag recoveries and overall sampling rates for the season. These decisions will likely change contribution rates for Lyons Ferry steelhead to the sport fishery as noted in Mendel and Aufforth (1985). These corrections will be reviewed and updated in the 1985 creel report. MS)

3.3.3 Discussion

Table 3.10 is a summation of tag recoveries for various locations and fisheries and is the essence of returns for 1984. The actual performance of the various groups is very encouraging and it appears that we are very close to meeting our mitigation/compensation goals. Results from the Snake river creel survey (Mendel & Aufforth 1985) are somewhat discouraging because of the lack of tag recovery data. It must be noted however that most of the Lyons Ferry fish return early in the season and most of the tags were recovered early. We will intensify sampling during this period in 1985.

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. Estimates of return performance for the LSRCP fish without this data, would be useless.

Table 3.10 Estimated returns to the Columbia River System by Tag Code in 1984.

Tag Code	62/16/50	63/28/38	63/28/39	63/28/40
% Return from Release	0.394	0.947	0.778	0.577

Actual numbers returning from the 1982 release (62/16/50) were even better for the total return period. Returns to LGR for 1983 and 1984 numbered 434 fish or 0.688 % of the released fish returning as adults. This return rate in the future, which has been surpassed already by two groups, will help assure the success of the program.

3.4 JUVENILE STEELHEAD POPULATIONS IN PROJECT RIVERS

Electrofishing did not begin until late September 1984. By that time maximum water temperatures had cooled and an increase in stream discharges had occurred. Nets were difficult to maintain in the streams because leaf drop was occuring and nets became clogged with debris. One site on main Asotin Creek near RM-8 could not be sampled because high water flow and heavy debris load precluded our maintaining block nets. Site

Table 3.11Description of sites electroshocked during fall of 1984.

Site	Stream	Site Location	Reference Point Location	Site Area (m2)
TU1	Tucannon R.	300-500ft below Cow Camp Bridge in upper part of campgrd.	In base of small pine on left bank 55'5" above L. net	266.2
TU2	Tucannon R.	about .6 mile above Cow Camp Bridge	Base of alders on R. bank 9'9" above L. net	309.6
TU3	Tucannon R.	lower end is 6ft above Left bank abuttment of bridge #11	Base of alder on left bank 22' below top net	309.8
TU4	Tucannon R.	400 ft below first bridge above Marengo	Base of black locust on .r bank 31.5' above? top net	401.1
WE1	Wenatchee Ck	0.6 miles above mouth	Base of large alder 12' below l. net	193.7
WE2	Wenatchee Ck	98ft above cabled gate and 200-300 ft above bridge at mouth	Large boulder on L. bank 9' below L. net	195.8
MC1	Mill Ck	50ft below Kooskooskie Dam	At 1+00' mark in base of alder on L. bank	344.2
MC2	Mill Ck	155ft below Seven Mile Dam	At 1+26' mark in alder on R. bank	275.2
NT1	N.Touchet R	near Stanfield farm below Wolf Fork	Base of large fir 55' downstream from upper net.	332.4
NT2	N. Touchet R	300-400ft above South Fork, 25ft below S. Fork Rd. bridge	On rock on L. bank at 1+25' mark	417.4
TR1	Touchet R.	below bridge in Dayton near Golf Course	Base of small cottonwood at 0+00 ft mark on L. bank	346.0
TR2	Touchet R.	about 1/2mile below South Fork	At 4"x 4"fence post on dike road at 0+00 ft.	394.9
SA1	S.F. Asotin	100 yds above Alder Gulch	Base of water birch on R. bank 10 ft below lower net	124.7
AS1	Main Asotin	7.3 miles above Cloverland Rd. at 1981 Instream Flow Incremental Method. site.	None	—

locations and descriptions for 1984 are presented in Table 3.11.

Water quality was similar for all sites and the quantity and quality of pools and cover were generally low (Appendix A). Pool and cover measurements were made as they related to 1+ and older

trout. No attempt was made to measure habitat conditions for 0-age rainbow/steelhead trout.

Salmonid length frequencies were used to separate age groups for density estimates (Figs. 3.4-5). Population densities are reported in Table 3.12 and biomass estimates are presented in Appendix B. Data used in salmonid population and density estimates are listed in Appendix C.

Trout population densities in all streams tended continually decline from upper stream sections as we progressed downstream. On the Tucannon River, this held true for the section near Marengo (RM 25) for both steelhead and chinook, even though substrate and cover seemed about the same as for the upper river sites (TU-1 and TU-2). Maximum summer stream temperatures can be 10-15 degrees-F higher in the lower river which may explain the density differences.

Main Touchet River trout densities were extremely low when compared to trout densities just upstream in the lower North Fork (Table 3.12). A chemical spill in this area of the Touchet River during the Spring of 1984 or high summer stream temperatures may have caused the low trout densities observed.

Catchable sized brown trout are stocked into the Touchet River annually as part of a state program. It has been believed they did not reproduce successfully within the system, however, one 118mm brown trout was captured during electrofishing. This naturally produced fish indicates some degree of spawning success. Other fish species present at sites sampled are listed in Appendix D.

3.4.1 Comparison of 1981 and 1984 Data

Several sampling sections and/or sites had been sampled in 1981 (Mendel and Taylor, 1981) prior to any enhancement activities. Water quality data appear to be similar between 1981 and 1984 except for alkalinity levels in some streams. We doubt any significant changes have occurred in water chemistry.

Site TU-4 on the Tucannon R. was located about 50 ft below the location of site G in 1981. Site G was not used in 1984 because it was too deep to effectively electrofish. These sites, then, are not directly comparable. However, both sites TU-3 (Site F in 1981) and TU-4 had much higher densities (25.8 and 6.9

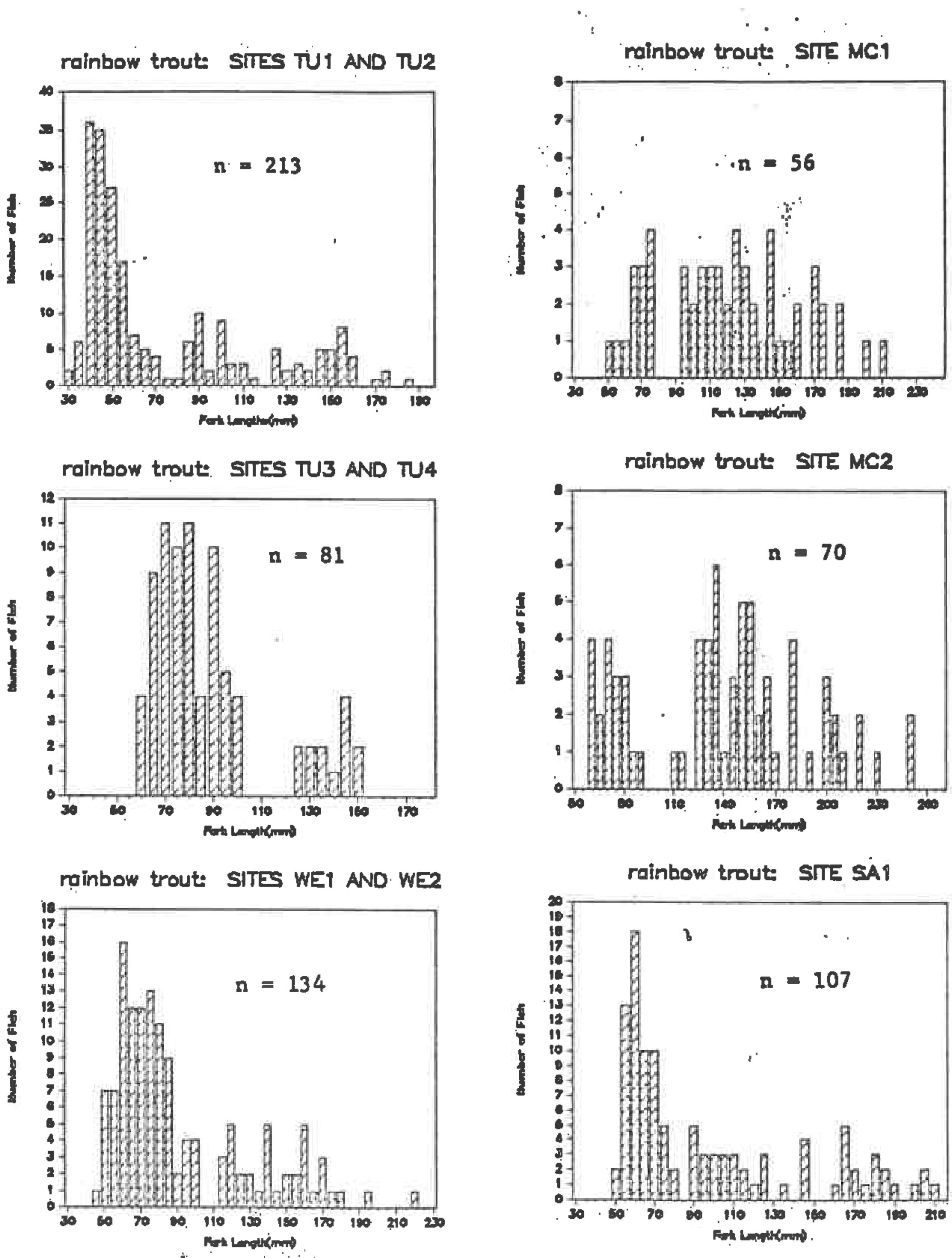


Figure 3.4Length-frequencies for rainbow trout captured by electroshocking at various sites in southeast Washington streams, 1984.

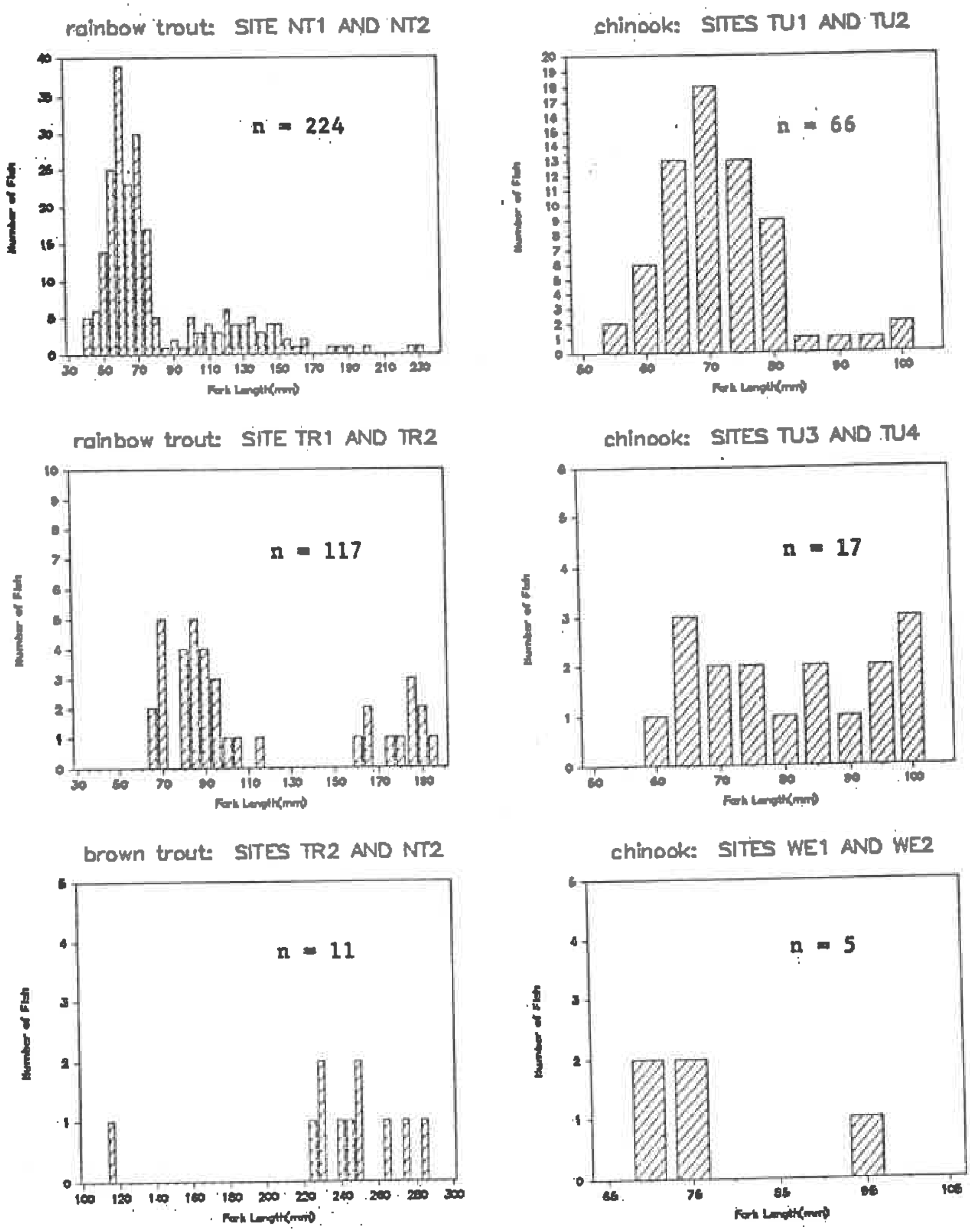


Figure 3.5 Length-frequencies for rainbow trout and other salmonids captured by electroshocking at various sites in southeast Washington streams, 1984.

Table 3.12 Salmonid density estimates (number of fish/100m² and 95% confidence intervals) for sites electroshocked in 1984.

		RAINBOW TROUT								OTHER SALMONIDS					
		Age 0+		Age 1+ to Legals[a]		Legals[a]		Total RBT		Chinook		Bull Trout	Whfish	Brown Trout	
Site	Date	#/100m²	CI	#/100m²	CI	#/100m²	CI	#/100m²	CI	#/100m²	CI	#/100m²	#/100m²	#/100m²	CI
TU1	09-21	23.0	0.5	11.2[b]	1.3	0.0	–	34.2	1.0	13.5	0.3	0.75	–	–	–
TU2	09-22	28.3	4.5	17.4[b]	8.7	0.0	–	46.6	7.7	10.7[e]	1.4	–	–	–	–
TU3	09-28	19.2	3.1	5.9	0.9	0.6	0.0	25.8	2.9	4.2[c]	–	0.3[c]	0.3[c]	–	–
TU4	10-08	3.3	1.1	2.7[c]	–	1.0[c]	–	6.9	4.5	1.0[c]	–	–	0.2[c]	–	–
WE1	09-26	19.6	6.8	9.8	1.5	0.0	–	29.4	6.9	0.0	–	–	–	–	–
WE2	09-27	31.1	2.3	11.7	0.0	1.0	0.0	44.9	3.2	3.1	2.2	0.5[c]	–	–	–
MC1	10-01	3.8	0.0	12.5	1.2	0.6[c]	–	16.9	1.2	0.0	–	0.3[c]	1.7[c]	–	–
MC2	10-04	6.5[c]	–	17.4	7.5	4.4	0.9	30.9	9.5	0.0	–	–	–	–	–
NT1	10-03	50.2	1.0	17.5	1.7	0.9[c]	–	68.6	1.8	0.0	–	–	–	–	–
NT2	10-05	20.1	3.7	9.1[c]	–	1.0[c]	–	34.0	7.5	0.0	–	–	–	1.4[c,f]	–
TR1	10-09	2.6	0.0	1.1[c]	–	0.3	–	4.5	1.1	0.0	–	–	–	–	–
TR2	10-12	3.5	1.0	2.3[c]	–	0.0	0.0	5.8[c]	–	0.0	–	–	0.3[c]	1.3	0.5
SA1	10-22	53.7	8.0	20.8	3.7	19.2[d]	2.3	94.6	11.5	0.0	–	–	–	–	–
AS1[g]	09-24	–	–	–	–	–	–	–	–	–	–	–	–	–	–

[a] Legal-sized trout are >=195mm, except on S.Fork and Asotin Creeks where legals were >=145mm.
[b] Contains identifiable age 1+ and 2+ fish (see length-freq. and population calc.info.).
[c] Poor reduction between passes (<=50%) and/or validity test indicates poor estimate, therefore sum is generally used and estimate is considered a miminum value only. Confidence Intervals (CI) are not calculated for these estimates.
[d] Legal-sized fish on the S.F. Asotin Creek were >=145mm.
[e] Two large (100-110mm) milting male chinook with worn caudal fins and two typically sized juvenile chinook were sacrificed for aging, etc.
[f] One brown trout was 118mm, all others were legal size.
[g] No estimate was possible because fish escaped from buckets and were recaptured during later passes.

rainbow/100m² respectively in 1984; and 7.5 and 3.7 rainbow/100m² respectively in 1981) of rainbow/steelhead than were captured in the same area in 1981. Also, no chinook were present at these two sites in 1981 but they were found in each of the 1984 sites. Habitat conditions at site TU-3 did not change between 1981 and 1984.

Mill Cr. habitat conditons and trout densities at MC-1 (site C in 1981) were very similar between 1981 and 1984 (densities of 20.2 trout/100m² and 16.9 trout /100m², respectively). Site MC-2 (site E in 1981), however, changed substantially, becoming deeper and narrower. Trout densities increased from 0.8 trout/100m² in 1981 to 30.9 trout/100m² in 1984 and many more suckers were electrofished in 1984 as well.

The South Fork of Asotin Cr. also had increased densities of trout from 1981 (Mendel and Taylor 1981) to 1984 (Hallock and Mendel 1985). The average density of all size classes of trout from four sites in 1981 was 28.7 trout/100m². In 1984, trout densities averaged approximately 60-70 trout/100m² in five control sites. The major differences in trout densities occurred in the Age-0 group. In 1981 this segment of the population was extremely low.

3.4.2 Discussion

Electrofishing activities should be conducted in July, August and early September before leaf drop, to reduce problems caused by clogged nets, cold water, and increased stream discharge. More than two sites per stream section would be preferrable to better monitor density changes but this may not be possible.

Reduced trout densities in lower stream sections appear to reflect warm summer water temperatures that are marginal for trout. Available physical habitat in upper and lower sections does not appear to be substantially different. Average fish weights were greater, however, on the Tucannon near Marengo then fish found upstream. This is likely a beneficial effect of higher average stream temperatures and increased growth rate.

The increase of trout densities at sites in Mill Cr., Tucannon R. and the South Fork of Asotin since 1981 may be a benefit from stocking hatchery steelhead smolts. The increase in Age-0 fish could have resulted from increased adult escapement of 1-Ocean returns from the 1983 Lyons Ferry release. However, the increased densities of chinook salmon at TU-3 and TU-4 and the dramatic habitat changes at MC-2 could indicate that the increased rainbow/steelhead densities observed in 1984 reflect lower stream temperatures and habitat improvement since the 1974 flood or year to year variability. We also do not know if densities measured in 1981 are abnormally low because of a hot dry summer. Further samples from identical or similar sites in future years should allow us to conclude more.

3.5 Redd Counts

Eldred (1960,1964) discussed steelhead spawning in Southeast Washington streams as beginning in March and extending into May. Again this year we were unable to obtain good redd/mile data because of high murky flows during the spring run-off. Weather patterns during the spring can cause catastrophic flow conditions such as the floods of 1964 and 1974 that devastated sections of most streams in this area. The more normal occurrance is elevated early spring flows during March and April, sometimes caused by rain on snow creating very high murky flows for a few days to a few weeks. Later in the spring or early summer, high temperatures (>100°F) will melt high snow pack in the Blue Mountains and high turbid flows are again the result.

The spring of 1984 (the beginning of this contract period) experienced these normal runoff situations and made it very difficult to walk streams and view with any certainty the presense of redds. We did walk stream sections on the Tucannon and Touchet Rivers. The data, however, is useful only for some indication of the extent of habitat being accessed by fish and not for estimating actual spawning density, as we had hoped.

Table 3.13 presents a summary of redd observations for each stream for the time period 1-April to 21-May-1984. Observations are given by river mile but extended from Coppei Cr. in the Town of Waitsburg to the Wolf Fork on the Touchet River; and from Starbuck to immediately above Panjab Cr. on the Tucannon River.

Table 3.13 Redd Observations in Southeastern Washington, 1984.

Stream	Section(RM)	Reach Length (miles)	Date	Obsereved Redds	Obsereved Adults
Tucannon R.	4.5-5.5	1.0	4/11	3(2)@	5-10
" "	42.4-43	0.6	4/11	0	0*
" "	35.9-36.5	0.6	4/27	4(2)	2
" "	45.6-46.8	1.2	5/21	5(4)	0
Touchet R.	43.0-44.4	1.4	4/16	0	0*
" "	53.2-54.8	1.6	4/16	4(3)	3
" "	unknown[1]	~1.0	5/25	3(4)	0
" "	53.2-54.8	1.6	5/25	1[2]	3

@ Numbers in ( ) are suspected/false redds, not confirmed.
* Water was not clear enough to confirm any sightings.
1 no river mile map available- this section from mouth of Wolf Fk. upstream ~1.0 mile.
2 an additional sighting not including those from 4/16/84

We also attempted counting adult steelhead crossing Headgate dam on Asotin Cr. in March of 1985, at the very end of the budget year. We wanted to estimate total numbers of adults migrating into the upper Asotin watershed and to compare 1985 with trapping records from the 1950's and early 1960's. We considered this as an additional check for future reference to help us assess our efficiency at redd counts and also to determine total redds per escaping adult. If counting were simple and accurate it might also be an economical alternative to mass redd counts at some future date. The results from this work will be covered in the 1985 annual report.

3.5.1 Discussion

Redd counting has, in general, been a frustrating and less than reliable means of collecting data on adult escapement into project streams. High and murky flows often severely limit visibility to see redds or spawning adults and frequently keep us completely out of the water for concern of safety about wading fast streams. Unless there is a weather pattern change that would allow us to wade streams and have clear visibility, all we can conclude is that fish are escaping into these two rivers to spawn. Total escapement and what percent of the fish are hatchery fish released from Lyons Ferry cannot yet be answered. Counting fish into the system by trapping would be a much more exact means to assess adult escapement and determine the percent of the fish returning from hatchery releases. This is, however, a difficult, time consuming and expensive operation that current budgets would not allow. Some trapping opportunity may occur on the Tucannon R. near the Tucannon Hatchery in future years and we will trap fish if possible.

3.6 CATCHABLE TROUT PROGRAM

3.6.1 Production

Production of legal or catchable size rainbow trout at the Lyons Ferry/Tucannon complex totaled 198,528 fish weighing 59,437 pounds. Fish planted directly from Lyons Ferry averaged 1.9 fish per pound and fish planted from Tucannon Hatchery averaged 3.8 fish per pound. The cumulative average weight for catchable trout was 3.3 fish/lb for 1984. Appendix E gives a listing of streams and lakes in Southeast Washington which received compensation plan plantings. Total compensation plan production would be 84,000 pounds of fish total, with 6,200 pounds provided to Idaho. The program this year accounted for about 71% of that goal and no fish were raised for Idaho. We expect to rear fish for Idaho beginning in 1985.

3.6.2 Creel Survey

A creel survey was jointly conducted on both Forks of Asotin Creek in Asotin County. The North Fork receives annual plants of catchable size trout while the South Fork receives no plants of fish. All steelhead plants are made below the confluence of the two forks. We believed that this would provide some useful information on the migration of steelhead smolts as well as the response of catchable fish planted into a stream environment. All 4,000 spring planted fish were right ventral fin clipped to positively identify that plant, additionally, fifty-one trout were tagged with anchor tags to help assess any movement of trout after planting (such as spatial distribution or "flushing out" from the system). The survey began on the opening of trout season in late May and continued through June and July. The results of this survey were reported in detail by Hallock & Mendel (1985) as part of the "Instream Habitat Improvement Project Annual Report". They are summarized here.

An estimated 1,399 fish were caught from the North Fork and 523 fish from the South Fork during the survey period. Total estimated angler effort during the period was 848 $\pm$ 270 hours and average catch per hour was 1.65$\pm$ 0.45 fish per hour. Twenty one point two (21.2) percent of the effort and 21.5% of the catch occurred on opening weekend. Opening weekend on the South Fork accounted for 46% of the total effort and 46.2% of the total estimated catch. This intensive angler effort appears to be characteristic of stream fishing as this same effort response in other streams has been observed. The effort and catch of opening weekend were even more unusual since the weather was cold and rainy and stream flows were high and murky. Effort dropped off significantly after this first weekend and centered around weekends the rest of the summer.

A total of 332 fish were examined on the North Fork. Only 6% of the sample were wild fish and only 36% of the remainder of hatchery origin fish were RV clipped, the 1984 released, catchable fish. An additional 30 RV clipped rainbows were estimated, from electrofishing surveys, to remain in late summer in the five miles of the North Fork Asotin Cr. within Asotin HMA (Hallock and Mendel, 1985). Therefore, only an estimated 534 RV clipped rainbows were caught or remained in the stocked portion of the North Fork Asotin Cr. This represents only 13.4% of the 4000 hatchery fish released in the North Fork and a less than 13% exploitation rate. These data suggest that many of the stocked catchable trout either moved out of the stocking area, or that the percentage of RV clips observed in the 1984 creel and electrofishing surveys are underestimates of the actual numbers of fish present. We believe that the exploitation rate of 13%, on fish stocked, may be accurate for this area of the North Fork Asotin Cr., but it may not be indicative of the true exploitation rate on fish remaining in this area.

We were unable to quantify actual numbers of steelhead versus rainbow accurately but there appeared to be large numbers of fish available to the fishermen miles above where they had been released. There were also several larger rainbow taken in the fishery that were apparently holdover fish from a catchable plant made the previous fall. The average wild fish taken in the

North Fork was 215mm versus 225mm for hatchery fish and 55% of the all fish checked were either ripe or spent males.

Although no hatchery fish were planted on the South Fork, 70% of all fish obseerved in the creel were of hatchery origin, and limits of hatchery trout were caught as far as six miles up stream from the mouth. These fish were evidently residual steelhead that had moved up from the confluence to rear an additional year or take up permanent residence. Only one RV clipped hatchery trout was observed in the creel, but other RV clipped fish were captured during electrofishing.

RV clipped trout were observed in the creel on main Asotin Cr. as far as six miles below the Forks. Checks of 70 fish after opening weekend showed all to be of hatchery origin but only 4 were RV clipped (5.7%). Therefore, it is obvious that hatchery steelhead smolts contributed significantly to the harvest on both forks and the main Asotin Cr. in 1984. The average size of hatchery fish in the creel (Table 3.14) continued to decline during the season

Table 3.14 Average lengths of rainbow trout observed in the creel on the North and South Forks of Asotin Cr. during spring and early summer, 1984.

		{ South Fork			}	{ North Fork			}
Period	Type fish	Mean length	SD	Range	Sample size	Mean length	SD	Range	Sample size
Opening	Wild	210mm	14.6	190-234	13	214	54.4	175-252	2
	Hatch	219	22.6	189-264	35	236	20.8	175-279	57
June	Wild	212	25.4	190-254	5	230	44.9	182-289	9
	Hatch	207	16.5	170-226	11	225	20.4	154-305	136
July	Wild	169	24.1	144-200	9	195	31.6	152-248	7
	Hatch	197	32.0	144-244	17	220	27.6	165-296	106
G.Total	Wild	197				215			
	Hatch	211				225			

Only five of the 51 anchor tags released were recovered during the creel survey. Three tags were caught within the first week from stocking less than 0.2 miles downstream from their release location. The other two tags were caught 6 and 39 days after release 9 and 5 miles downstream respectively. Both of these fish had moved out of the forks and down into the main Asotin Cr..

3.6.3 Tucannon R./Wooten W.A.

A significant portion of catchable trout production, 74,000 fish or over 37%, is planted into waters located on or near the

W.T.Wooten Wildlife Area. This wildlife recreation area surrounds about 15 miles of the upper Tucannon River and contains eight very popular small lakes.

Records from the headquarters checkout area are used to estimate the number of annual fishermen days expended within the area. Estimates are based on voluntary checkout sheets departing fishermen are requested to fill out. An expansion factor is used from a study on the Wooten W.A. that indicated only one in 10 fishermen stopped to check out after fishing. Using this information, the estimated total number of anglers fishing the river or one of the lakes during the 1984 fishing season was 42,770, and they fished a total of 61,274 fishermen days from early April through August. This number was up from 51,331 days spent fishing in 1983. The lakes are utilized heavily and fish are rarely left to over-winter. There are some larger trout which overwinter in the river, however it is heavily fished also. Estimates of harvest, again based on the checkout system, place harvest between 150,000-200,000 fish for 1984 (only 35,000 were planted). Even considering that residual steelhead (see 3.6.4) may add substantially to this number of "hatchery fish", this is the same overestimating problem noticed in 1983 and casts serious doubt on the accuracy of the data. An intensive creel survey similar to the Asotin creek survey is planned for the Tucannon area in 1985. This will provide more valid data on actual harvest and angler effort.

3.6.4 Residual Steelhead

Residual steelhead consistently contribute to the sport trout harvest in all rivers receiving smolt plants. It was very difficult to distinguish hatchery reared smolts from hatchery rainbow after a few weeks. There was a substantial group of under size fish on both the Tucannon and Touchet Rivers that contributed to the catch for at least the first month of the stream season.

The Touchet river fish were in a well defined area approximately 5 miles below the lowest smolt planting site. They apparently migrated downstream a short distance and then residualized. We were unable to gather sufficient data to estimate total contribution of these residual fish to the fishery but spot checks showed they comprised 100% of the catch in some river areas. These fish averaged 182mm in length but ranged from 140-234mm. There were very few of these fish in the upper stream section where hatchery rainbow were predominant.

Hallock (unpublished data) estimated from electrofishing surveys in 1984 that 89% of all legal-sized fish in the Tucannon R. within the Wooten W.A. during mid-to-late summer were of hatchery origin , and that 82.2% of these fish were adipose and/or LV clipped. This indicates that they were residual steelhead.

Tucannon River checks showed some apparent mixing of fish with some smolts migrating upstream from the release site and others migrating down as in the Touchet. Some carryover or subsequent year smolting of these fish likely occurs.

Approximately 41% of all legal-sized trout captured during electrofishing in the South Fork Asotin Cr. in 1984 (Mendel, 1984 Instream Project file data) were of hatchery origin. The South Fork is not stocked with either catchable rainbow or steelhead smolts, however, many hatchery trout of both types have been observed to migrate upstream into the South Fork shortly after planting. We are currently unsure if subsequent year smolting is occurring from undersize residual steelhead.

3.6.5 Discussion

The legal/catchable trout program is a very successful and increasingly popular part of the compensation program. Trout waters, especially lakes, are not numerous in the area and therefore receive heavy fishing pressure. Catchable trout are much larger than those planted in past years and are well received by local anglers.

Given the difficulties with hatchery construction and repair problems, total production for the year was very good and will not likely improve for 1985. The Tucannon Hatchery will be under construction all of next year and any trout produced will be primarily from Lyons Ferry. Full production levels can be expected for the 1986 fishing year, when construction is finished.

We will be conducting a creel survey in 1985 on the Tucannon area and may be able to correct the voluntary data, collected in 1983 and 1984, that was discussed here. That information alone is insufficient to accurately estimate the man days of recreation attributable to compensation program catchable plants.

Data from creel and electrofishing surveys in 1984 indicate that residualism of hatchery steelhead smolts is common on most of the streams planted. Also, these residual steelhead contribute substantially to the resident trout fishery. The Tucannon creel survey and release of marked steelhead in 1985 will allow us to accurately assess the level of smolt residualism occurring in the Tucannon.

4.0 SUMMARY

The 1984 evaluation year was much more productive than 1983 with most objectives being addressed to some degree. There are still areas where, for one reason or another, individual tasks were not completed and this may have affected whether the overall objective was satisfactorily determined. Comments concerning each objective, as listed in Appendix F, are given here.

OBJ. 1 Cultural procedures at the hatchery have begun to settle into a more realistic regimen. Where 1983 was characterized by constant problems and stresses to the fish, 1984 was less stressful and more indicative of the type and quality of smolts we hope to release yearly. We continue to notice some measurable differences in the two stocks of steelhead being cultured but it is too early to conclude whether these differences will affect the adult return rates to the project area. The large difference in rearing time for the stocks requires greater effort and care with the more wild Wallowa stock fish to assure these fish reach an acceptable size at release. Condition factors, fry to smolt mortality rates, disease history and apparent smolt hardiness and degree of smoltification were all determined prior to release. General smolt condition was excellent. Some small Wallowa stock releases were less than desired size at release but this was a result of the late spawning time.

Continuation of this objective is of primary importance to the evaluation of hatchery performance. Future years will allow us to look at some size and time of release experiments to see if we can optimize juvenile survival during the critical downstream migration time.

OBJ. 2 A large proportion of the hatchery production was released from Wallowa Hatchery in Oregon this year as part of a brood stock building program. Outmigration appeared good from the holding ponds and fish arrived at Lower Granite Dam within two weeks of release indicating that many of the fish were actively migrating. ODFW personnel noted, however, that there was a substantial trout fishery during the summer comprised mostly of residual steelhead. Considering the large number of fish released (>500,000), even a minor amount of residualism would provide large numbers of "trout" to a fishery that is supported by wild fish and some catchable size fish plants.

We observed similar behavior in most of our streams but it became increasingly difficult to segregate residual smolts from legal plant trout as the season progressed as body confirmation and coloration became very similar. An intensive creel survey and adipose marking planned for all steelhead plants in 1985 should help answer the question of what percent of the smolts planted residualize and what do they contribute to the resident trout fishery.

Estimation of juvenile passage at the Snake and Columbia River dams by freeze branding was a source of serious concern for our releases this year. Estimated passage (or survival) beyond McNary Dam on the Columbia R. would indicate that only 20% of some hatchery released groups survived. The quality of our smolts, and above average flow and passage conditions at the dams this year do not logically bear out these poor survival estimates. Water Budget Center studies done this year also were suspect in their results and seem to indicate that estimating procedures may need to be altered or adjusted to properly represent true downstream survival. We shall remain involved with the juvenile branding program for at least two more years.

OBJ. 3 Adult escapement into the hatchery this year caused increasing concern that there is a significant straying problem for fish released from Lyons Ferry hatchery. Although large numbers of adult steelhead migrated past the hatchery in the late summer and fall, very few escaped into the hatchery collection facility. Passage of these fish to above Lower Granite Dam is further evidence that straying of both stocks of fish released is occurring at a significant level. We are yet to determine whether this straying is an intentional behavioral bypass of lower river areas in late summer in preference to more rapidly flowing up-river areas, or, failure of the fish to "home" back to their parent water supply. This area needs much additional review. We will likely divert more of the tagging budget to this problem in 1985-87 to resolve this problem.

OBJ. 4 Coded-wire-tagging will continue to be a crucial part of the evaluation process. More of the tagging emphasis will be placed on the suspected straying problem occurring at the hatchery for at least the next three years. Because of hatchery design the maximum annual tagging level will be between 240-300,000 fish. Difficulty in obtaining sufficient tag recoveries for estimates to be statistically sound requires such a large percentage of tags.

OBJ. 5 Estimating escapement of adults, the basic measure of program success, into tributary streams is one of the most difficult aspect of the hatchery evaluation. We proposed to measure increases in spawning escapement and the expected resultant increases in juvenile populations to help us answer these questions. Spawning ground surveys have, unfortunately, been fairly unproductive. High, murky flows during the spawning period have precluded good quantitative counts in sample areas. Counting adults past an old structure that required the fish to jump was frought with similar problems. Measuring juvenile populations in streams has been the most productive effort so far and has also allowed us to work in conjunction with the instream habitat improvement project of the Mitigation program as well. We will continue to review streams for the next two years at which time we will likely restrict our sampling to specified sections where trends can be observed. We shall continue to attempt spawning ground surveys and hope to be able to trap adults on the Tucannon River in 1985-86.

OBJ. 6 This was the first year of a two year program to estimate harvest of catchable size trout in some of the waters planted from the Lyons Ferry/Tucannon complex. Our effort on Asotin Cr. helped us realize the extent of work necessary to cover a trout fishery. Much of the information collected is somewhat inconclusive because of the small sample size. We plan to finish this project in 1985 with a larger program in the Tucannon River/Lakes area. We do not appear to be losing our catchable trout through outmigration as we had feared and in 1985 we should be able to accurately assess the amount of residualism from our smolt plants and what they contribute the the sport fishery. Our basic approach will be unchanged for 1985.

Utilizing the available voluntary check-out data from the Tucannon River area to estimate angler use as we did last year has some problems. We doubt that the total harvest of fish from the area based on these estimates is four times the annual catchable trout plant made from the hatchery. We hope to correlate this data with our actual creel estimates in 1985 and make the data more usable for the future. If a relationship can be established, it would be a much more cost effective means of tracking the catchable trout program and determining the man-days of use attributable to an increment of fish planted.

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Appendix A.

Water chemistry information for sites electroshocked during 1984 (Hach kits used for water chemistry analysis).

SITE	DATE SURVEYED	WATER TEMP (F)	TIME	FREE ACIDITY (mg/L)	TOTAL ACIDITY (mg/L)	ALKALINITY (mg/L)	TOTAL HARDNESS (mg/L)	DO (mg/L)	CO2 (mg/L)	pH
TU1	09-21	--	--	--	--	--	--	--	--	--
TU2	09-22	50	1520	0.0	--	0.18	0.18	11.5	5.0	7.8
TU3	09-28	--	--	0.0	--	0.18	0.18	12.0	10.0	7.0
TU4	10-08	--	--	--	--	--	--	--	--	--
WE1	09-26	52	1530	0.0	0.00	0.16	0.18	12.0	5.0	7.5
WE2	09-27	53	1500	--	--	--	--	--	--	--
MC1	10-01	50	1600	0.0	0.03	0.18	0.18	10.0	10.0	7.5
MC2	10-04	58	1600	0.0	0.12	0.18	0.18	11.0	10.0	8.0
NT1	10-03	56	1400	0.0	0.02	0.18	0.18	10.5	5.0	8.0
NT2	10-05	58	1615	0.0	0.03	0.18	0.18	11.5	10.0	8.0
TR1	10-09	60	1300	--	--	--	--	--	--	--
TR2	10-12	--	--	0.0	0.12	0.18	0.18	11.0	5.0	7.5
SF1	10-22	44	1615	--	--	--	--	--	--	--
AS1	09-24	--	--	--	--	--	--	--	--	--

Habitat measurements from 1984 electroshocking sites.[a]

SITE	SITE LENGTH (ft)	MEAN WIDTH (ft)	SURFACE AREA (ft2)	MEAN DEPTH (ft)	POOL AREA (ft2)	% AREA IN POOLS	MEAN POOL DEPTH (ft)	MEAN POOL RATING	COVER AREA (ft2)	% AREA IN POOL & COVER	% GRADIENT	% SHADE
TU1	94.0	30.45	2862.3	0.93	19.25	0.67	0.87	1.29	2.5	0.76	?	5.0
TU2	105.0	31.71	3329.6	0.88	100.50	3.00	0.96	1.30	0.00	3.02	0.96	12.5
TU3	105.0	31.73	3331.7	0.90	97.00	2.91	1.00	1.57	10.00	3.21	0.90	15.0
TU4	119.0	36.33	4323.3	1.00	297.50	6.88	1.12	2.23	27.00	7.50	0.50	12.5
WE1	102.0	20.42	2082.8	0.56	271.00	3.97	1.03	1.56	17.25	14.80	2.84	75.0
WE2	94.0	22.40	2105.6	0.69	462.75	1.98	0.88	1.63	2.50	2.10	2.92	5.0
MC1	106.0	34.92	3701.5	0.62	621.00	6.78	1.14	1.38	0.00	16.78	2.90	75.0
MC2	134.0	22.08	2958.7	1.27	404.00	3.65	1.26	1.17	127.00	17.95	0.40	50.0
NT1	117.5	30.41	3573.2	0.52	89.50	2.50	0.69	1.50	0.00	2.50	1.70	20.0
NT2	141.0	31.83	4498.0	0.82	165.00	3.70	1.12	2.20	6.50	3.80	1.38	5.0
TR1	100.0	37.20	3720.0	1.07	274.50	6.30	1.00	1.20	0.00	6.30	0.28	5.0
TR2	112.0	37.90	4244.8	1.05	316.50	7.45	1.07	1.60	14.00	7.78	?	15.0
SA1	109.0	12.30	1340.7	0.41	98.75	7.36	0.85	2.00	1.00	7.44	2.71	10.0
AS1[b]	--	--	--	--	--	--	--	--	--	--	--	--

[a] Substrate types are available in the original field data books.

[b] No habitat data collected.

Appendix B.

Rainbow Trout/steelhead biomass estimates based on results of electroshocking of sites during the summer of 1984.

Site	Age 0+ Size Range (mm)	Age 0+ # Fish Weighed	Age 0+ Mean Weight (g)	Age 0+ Estim. Total Weight g/100m²	Age 1+ To Legals Size Range (mm)	Age 1+ To Legals # Fish Weighed	Age 1+ To Legals Mean Weight (g)	Age 1+ To Legals Estim. Total Weight g/100m²	Legals Size Range (mm)[b]	Legals # Fish Weighed	Legals Mean Weight (g)	Legals Estim. Total Weight g/100m²	Estim. Grand Total g/100m²
TU1	30-79	29	1.45	33.4	80-194	16	28.08	314.6	>=195	0	0.0	0.0	347.9
TU2	30-79	26	1.81	52.1	80-194	37	27.15	473.5	>=195	0	0.0	0.0	525.6
TU3	60-104	50	6.57	129.0	105-194	22	34.31	207.7	>=195	2	110.0	71.0	407.6
TU4	60-104	13	5.10	181.2	105-194	11	43.11	175.1	>=195	4	93.8	93.3	286.5
WE1	45-94	30	3.38	66.3	95-194	18	27.33	268.0	>=195	0	0.0	0.0	334.3
WE2	45-94	59	4.94	153.9	95-194	23	34.73	407.9	>=195	2	109.7	112.2	673.9
MC1	45-79	10	4.45	16.8	80-194	41	30.90	385.9	>=195	2	115.7	67.2	469.9
MC2	60-99	18	5.11	37.4	100-194	41	41.18	718.4	>=195	11	141.3	616.1	1371.9
NT1	40-89	80	3.97	199.5	90-194	50	30.56	533.2	>=195	3	136.9	123.5	856.3
NT2	60-109	65	9.08	182.7	110-194	40	42.54	408.8	>=195	4	102.3	98.0	688.5
TR1	65-99	9	7.89	20.5	100-194	4	65.58	75.8	>=195	1	76.2	22.0	118.4
TR2	65-99	14	7.44	26.4	100-194	9	52.24	119.1	>=195	0	0.0	0.0	145.4
SA1	50-89	0[a]	0.00	--	90-144	0[a]	--	--	>=145	0[a]	--	--	--
AS1	50-84	40	4.03	[c]	85-144	33	15.40	[c]	>=145	4	45.1	[c]	c

[a] No weights taken. See Hallock and Mendel 1985, for weights of trout on S.F. Asotin Creek in 1984.

[b] See length-frequency histograms.

[c] Fish escaped from buckets and were subsequently recaptured during later passes, so population estimate could not be made.

Salmonid biomass estimates, excluding Rainbow Trout/Steelhead, from various sites electroshocked during 1984.[a]

Site	Chinook Size Range (mm)	Chinook # Fish Weighed	Chinook Mean Weight (g)	Chinook Estim. Total Weight g/100m²	Bull Trout Size Range (mm)	Bull Trout # Fish Weighed	Bull Trout Mean Weight (g)	Bull Trout Estim. Total Weight g/100m²	Whitefish Size Range (mm)	Whitefish # Fish Weighed	Whitefish Mean Weight (g)	Whitefish Estim. Total Weight g/100m²	Brown Trout Size Range (mm)	Brown Trout # Fish Weighed	Brown Trout Mean Weight (g)	Brown Trout Estim. Total Weight g/100m²
TU1	60-95	22	5.34	72.2	222-235	0										
TU2	55-105	14	5.82	62.0												
TU3	60-105	13	8.32	34.9	455	1	900	209.5	345	1	700.0	225.9				
TU4	70-105	4	8.98	8.9					131	1	21.4	5.3				
WE2	70-100	5	6.50	19.9	260	1	247	126.1								
MC1					279	1	455	132.2	229-340	6	403.8	703.8				
NT2													230-293	5	241.98	289.9
NT2													118	1	20.7	5.0
TR2									144	1	30.2	7.7	229-266	5	202.78	256.8

[a] Sites not listed either did not contain salmonids other than rainbow/steelhead or none of the other salmonids were weighed (See density estimates for salmonids present).

Appendix C: Population and density calculation information for sites in Southeast Washington electroshocked during Fall 1984.

Site	Fork Lengths of Rainbows (or species names for other salmonids)*	PASS 1	PASS 2	PASS 3	Estimated Pop (N1)	95% CI	Bias	Corrected Pop. Estim. (N)	Validity Test	Density (N/m2)
TU1	30-79	57	4		61.30	1.268	0.093	61	ok	0.230
	80-120	12	1		13.09	0.715	0.117	13	ok	0.049
	120-194	12	4		18.00	6.000	1.500	17	ok	0.062
	80-194	24	5		30.32	3.580	0.500	30	ok	0.112
	>=195	0	0		0.00			0	ok	0.000
	total	81	9		91.13	2.670	0.176	91	ok	0.342
	CH	34	2		36.13	0.797	0.075	36	ok	0.135
	DV	2	0		2.00	0.000	0.000	2	ok	0.008
TU2	30-79	59	20		89.26	13.790	1.571	88	ok	0.283
	80-120	15	7		28.13	15.390	4.512	24	no	0.076
	120-194	15	8		32.14	23.490	8.050	24	no	0.078
	80-194	30	15		60.00	26.830	6.000	54	ok	0.174
	>=195	0	0		0.00			0	ok	0.000
	total	89	35		146.69	23.790	2.450	144	ok	0.466
	CH	26	6		33.80	4.412	0.620	33	ok	0.107
TU3	60-100	42	13		60.83	9.630	1.230	60	ok	0.192
	100-195	15	3		18.75	2.650	0.470	18	ok	0.059
	>=195	2	0		2.00	0.000	0.000	2	ok	0.006
	total	59	16		80.95	8.840	0.890	80	ok	0.258
	CH	8	5					13	no	0.042
	DV	1	0		1.00			1	no	0.003
	WF	1	0		1.00			1	ok	0.003
TU4	60-100	10	3		14.29	4.410	1.140	13	ok	0.033
	100-195	7	4		16.33	20.640	11.400	11	no	0.027
	>=195	2	2		4.00			4	no	0.010
	total	19	9		36.10	18.100	4.790	28	no	0.070
	CH	2	2					4	no	0.010
	WF	1	0		1.00			1	ok	0.003
WE1	45-94	18	6	7	37.80	13.106		38	ok	0.196
	95-194	12	6	1	20.00	2.949		20	ok	0.098
	>=195	0	0	0	0.00			0	ok	0.000
	total	30	12	8	56.82	13.381		57	ok	0.294
WE2	0-94	41	14	4	61.46	4.585		61	ok	0.311
	95-194	18	5	0	23.35	0.000		23	ok	0.117
	>=195	1	0	1	2.00			2	no	0.010
	total	60	19	5	87.50	6.220		88	ok	0.449
	CH	3	1	1	5.88	4.211		6	ok	0.031
	DV	0	1	0	1.00			1	no	0.005
MC1	45-80	12	1	0	13.00	0.000		13	ok	0.038
	94-194	27	11	3	43.20	4.259		43	ok	0.125
	>=195	1	1	0	2.00	0.000		2	no	0.006
	total	40	13	3	58.70	3.529		59	ok	0.169
	DV	1	0	0	1.00	0.000		1	no	0.003
	WF	3	2	1	6.00			6	no	0.017

Appendix C: (cont')

Site	Fork Lengths of Rainbows (or species names for other salmonids)*	PASS 1	PASS 2	PASS 3	Estimated Pop (N1)	95% CI	Bias	Corrected Pop. Estim. (N)	Validity Test	Density (N/m2)
MC2	60-100	11	7		30.00	40.830	22.000	8	no	0.029
	100-195	28	13		52.00	20.710	4.420	48	ok	0.174
	>=195	9	2		12.00	2.440	0.390	12	ok	0.044
	total	48	22		88.60	26.100	4.200	85	ok	0.309
NT1	0-90	133	24	8	167.00	3.353		167	ok	0.502
	90-195	43	10	3	58.33	5.631		58	ok	0.175
	>=195	0	3	0	3.00			3	no	0.009
	total	176	37	11	228.57	6.132		229	ok	0.686
NT2	60-110	55	20		86.00	15.550	1.920	84	ok	0.201
	115-195	23	15		66.00	66.000	25.550	40	no	0.091
	>=195	3	1		4.50	3.000	1.500	4	no	0.010
	total	81	36		146.00	31.200	3.700	142	ok	0.340
	BRTR	4	2		6.00			6	no	0.014
TR1	0-100	9	0		9.00	0.000	0.000	9	ok	0.026
	100-195	2	2					4	no	0.011
	>=195	0	1					1	no	0.003
	total	11	3		15.00	3.850	0.900	14	ok	0.045
TR2	0-100	11	3		15.00	3.860	0.960	14	ok	0.035
	100-195	4	5					9	no	0.023
	>=195	0	0					0	ok	0.000
	total	15	8		32.10	23.490	8.050	23	no	0.060
	BRTR	4	1		5.30	1.990	0.740	5	ok	0.013
	WF	1	0		1.00			1	no	0.003
SA1	55-84	34	20	6	67.00	10.017		10	ok	0.537
	90-140	15	6	3	26.00	4.640		5	ok	0.208
	>=145	16	5	2	24.00	2.899		3	ok	0.192
	total	65	31	11	118.00	14.260		14	ok	0.946

* species include: WF = Whitefish (Prosopium Williamsoni), DV = Bull Trout (Dolly Varden) (Salvelinus malma), CH = Chinook salmon (Onchorhynchus tshawytsha), BRTR = Brown Trout (Salmo Trutta).

Appendix D. Non-salmonid fish species present at sites electroshocked in 1984.

SITE	SCULPINS[a]	DACE[b]	LAMPREY[c]	SUCKERS[d]	RED-SIDED SHINERS	SQUAWFISH
TU1	Y[e]	?	PA	N	N	N
TU2	Y	?	?	N	N	N
TU3	Y	?	?	BL	N	N
TU4	Y	Y	N	N	Y	Y
WE1	?	?	N	N	N	N
WE2	Y	?	?	N	?	N
MC1	Y	NL	BR	N	N	N
MC2	Y	Y	BR	BL	Y	N
NT1	Y	Y	Y	N	N	N
NT2	TO	?	N	N	N	N
TR1	TO	Y	N	N	Y	N
TR2	TO	Y	N	Y	Y	N
SA1	Y	?	N	N	N	N
AS1	Y	?	?	?	?	N

[a] Sculpins may include Piute, Margined, and/or Torrent sculpins (TO).
[b] Dace may include Long-Nosed (LN) and speckled dace.
[c] Lamprey may include Pacific (PA) or Brook (BR) lamprey.
[d] Suckers may include large-scale or Bridge-lip (BL) suckers.
[e] N = none, Y = yes, fish of this group present but exact species not recorded.
? = May have been present but not recorded.

Appendix E.

1984 LEGAL TROUT PLANT ALLOTMENTS

County	Water	Species	#of Plants	Total Numbers
Asotin	Golf Course Pond	Rb	3	5,000
	Headgate Pond	Rb	3	4,000
	Evans Pond	Rb	2	2,000
	Alpowa Creek	Rb	1	2,000
	Asotin Creek	Rb	1	6,000
	Silcott Pond	Rb		1,000
Garfield	Baker's Pond	Rb	1	1,000
	Pataha Creek	Rb	2	3,000
	Cole's Pond	Rb	3	2,500
	Casey Pond	Rb	2	1,000
Columbia	Beaver Lake	Rb	4	4,000
	Big Four Lake	Rb	1	2,500
	Blue Lake	Rb	4	10,000
	Dayton Pond	Rb	2	1,000
	Deer Lake	Rb	4	6,000
	Watson Lake	Rb	4	11,500
	Dam Pond	Rb	2	1,000
	Spring Lake	Rb	4	8,000
	S. Touchet River	Rb	1	2,000
	Tucannon River	Rb	3	30,000
	Touchet River	Rb	-	4,000
	Orchard Pond (L.F. Marina)	Rb	-	500
Walla Walla	College Place Pond	Rb	2	1,000
	Fishhook Park Pond	Rb	2	6,000
	Jefferson Pond	Rb	2	1,000
	Mill Creek Res.	Rb	1	17,000
	Quarry Pond	Rb	2	10,000
	Coppei Creek	Rb	1	2,500
	Dry Creek	Rb	1	2,500
	Mill Creek	Rb	2	6,000
	Blue Creek	Rb	1	500
Franklin	Dalton Lake	Rb	1	5,000
Whitman	Garfield Pond	Rb	1	1,500
	Gilchrist Pond	Rb	1	1,500
	Rock Lake	Rb	1	15,000
	Union Flat Creek	Rb	1	1,000
				Total: 178,500

Appendix F.

Study Plan:

Objective 1: Document juvenile growth and development.

Task 1.1 Document mean rearing time from egg take to smolt release for distinct egg take groups. Include disease history to determine effects on growth. Much of this information available from hatchery records.

Task 1.2 Sample 0.005 to 0.01 percent of separately reared groups for mean fork length and weight in millimeters and grams respectively.

Task 1.3 Calculate condition factors for all groups based on data from Task 1.2. Compare wild stock growth and condition to hatchery stock currently being used to supplement production. Radical differences in condition factors between hatchery and wild parent smolts may provide an indication of expected smolt performance and survival.

Task 1.4 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 estimates error

Task 1.5 Determine smolt hardiness by analyzing condition factors and percent descaling of smolts prior to release. Descaling has a direct effect on survival and will be evaluated utilizing standard descaling report forms used by transporting agencies. This data will also be submitted to Idaho as part of their smolt descaling research.

Objective 2: Document smolt outmigration behavior.

Smolts will be released under three differend circumstances during 1983. Directly from Lyons Ferry into the Snake River. Trucked from Lyons Ferry to Enterprise, Oregon; held for one to five days, then allowed to volitionally migrate. Trucked from Lyons Ferry to river release sites and dumped directly in the river at several sites.

Task 2.1 Observe and record migration behavior from rearing ponds through the release structure. Document first day where screens are removed. Observe numbers migrating over a period of time and total number left in rearing pond.

Task 2.2 Document transfer of smolts from Lyons Ferry to Wallowa Hatchery and document 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 2.3 Observe and document smolt behavior from river release sites, according to river conditions and willingness to migrate.

Task 2.4 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 Objective 5).

Task 2.5 Assess smolt residualism (failure to migrate) by censusing release sites and reasonably adjacent areas of streams through electroshocking and angler creel checks.

Task 2.6 Electroshock 100 meter lengths of streams at or below smolt release sites and quantify by real numbers and by percent of one pass captive the relative abundance of residual smolts.

Task 2.7 Creel check areas at or below smolt release sites intensively for first two weeks of open trout season to quantify as percent of fishermen harvest, residual smolts (see Objective 6 Task 6.1).

Objective 3: Document hatchery rack returns of marked production and brood-stock hatchery releases.
Marked returns will be used as part of totals for quantifying percent return from release.

Task 3.1 Determine timing of returns from Lyons Ferry releases by examing returns of branded-coded wire tagged adults to adult collection facilities at McNary and Lower Granite Dams. (see Objective 5). Direct collection at Lyons Ferry will be possible after Fall 1984.

Task 3.2 Examine adult returns to Wallowa Hatchery to determine percent return marked Lyons Ferry reared fish for brood year 1985-86

Objective 4: Mark representative groups from Objectives 2, 3, to allow accurate statistically sound analysis of those objectives and to establish the basis for adult return evaluation to tributary rives in future years.

Task 4.1 Determine planting allotment for each compensation plan river to be planted based on available 1982 brood production.

Task 4.2 Establish coded-wire tagging levels based upon data from Task 4.1; guidelines set forth in the P.M.F.C. according to standard reporting procedures adapted by Pacific Coast States.

Objective 5: Attempt to establish come reliable indicator, other than sport harvest, to evaluate increased spawning escapement or success in target rivers. Juvenile age class population estimates for selected study sections and a Redd per mile index are two possibilities.

Task 5.1 Locate representative juvenile rearing areas in the Tucannon and Touchet River systems that will provide year around habitat for steelhead. Mendel (1981) evaluated habitat on the Tucannon for all aspects of rearing capability.

Task 5.2 Establish two or three 100 meter sections to be electroshocked in the fall for age 0 and age 1 steelhead on each river.

Task 5.3 Use standard backpack electroshocker and block nets at upper and lower end of section to prevent recruitment or escape. A two pass removal method for calculating population (Zippin, 1958) would 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 5.4 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 (ibid). Increases in juvenile age class abundance will be an indirect indicator of increased spawning escapement from a specific smolt plant.

Task 5.5 Establish two or three study sections one kilometer (1 km) in length on both the Tucannon and Touchet Rivers. These sections should be representative as far as possible within environmental constraints of spawning area in these systems.

Task 5.6 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 figure from all areas; (c) differences in spawning areas; (d) completion of spawning; (e) possible siltation or high water effects on Redd integrity.

Task 5.7 Determine if any other possible indicator of escapement or success is feasible and initiate, if possible.

Objective 6: 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 6.1 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 6.2 Take early morning and mid-day counts of fishermen on these lakes to be used in a lake harvest model described by Brown (1976).

Task 6.3 Calculate man-days utilization of lakes based on catch and c/e derived from model and creek data collected.

Task 6.4 Compute cost benefit analysis figures for legal trout program costs versus estimated value of fishing man-days.

Task 6.5 After season closes, compute total man-days utilization, total catch, and % of plant harvested. Results to be included in annual report.

Task 6.6 Document legal trout utilization in compensation plan streams through established creel census procedures. Attempt to determine:

1. percent catch to release
2. percent yearly holdown to subsequent year catch
3. Loss from the system due to migration of planted legals
4. Percent wild production contributes to the catch

Task 6.7 Mark through fin clipping, legal releases into Asotin Creek and utilize winter steelhead creel checker to cover summer trout season. Assess migratory behavior within the system by checking for movement or removal of marked fish.

Task 6.8 Estimate effort and catch through daily random angler or car counts and compute percentages in Task 6.6 based on these figures.

Task 6.9 Attempt to determine if habitat structures emplaced on Asotin Creek and Tucannon River effectively increase catchability of legal plants by encouraging residency of fish.

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