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PROJECT TITLE: Evaluation of Lower Snake River Compensation Plan Facilities
in Oregon

PROJECT TITLE: Evaluation of the Benefits Provided by Releasing Spring
Chinook Salmon Presmolts in the Grande Ronde River and Its
Tributaries

PROJECT TITLE: Evaluation of the Benefits Provided by Reprogramming Spring
Chinook Salmon from Lower Columbia River Hatcheries

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SUMMARY

EVALUATION OF LOWER SNAKE RIVER COMPENSATION PLAN FACILITIES IN OREGON

Objectives for FY 1987

1. Document egg take, egg-to-smolt survival, growth, and disease profile of spring chinook salmon and summer steelhead reared and released at Lower Snake River Compensation Plan facilities.
2. Determine fin condition, degree of descaling, degree of smolting, and percent precocious males for Wallowa and Imnaha stock summer steelhead.
3. Document number, size, time, and location of releases for chinook salmon and summer steelhead produced at Lower Snake River Compensation Plan facilities.
4. Determine sex ratio, run timing, and spawning timing for chinook salmon that return to Lookingglass Hatchery and the Imnaha weir and for summer steelhead that return to Wallowa Hatchery and Little Sheep Creek weir.
5. Collect and analyze scales from chinook salmon and summer steelhead adults to determine age composition and length-age relationships.
6. Mark and cold brand the following groups of chinook salmon: Lookingglass stock for time-of-release comparisons and production survival estimates; Rapid River stock for zero-age smolt survival estimates and production survival estimates; and Imnaha stock for production survival estimates.
7. Mark and cold brand the following groups of summer steelhead: Wallowa stock for size at release comparisons, direct stream release survival estimates, and production survival estimates; and Imnaha stock for production survival estimates.
8. Mark all Rapid River stock chinook salmon smolts with right ventral clips to permit distinct broodstock identification.
9. Determine if virus free smolts can be produced from adult Wallowa stock steelhead with infectious hematopoietic necrosis virus (IHN) by incubating and rearing in virus free water. Mark Ad-LV+CWT 50,000 progeny from IHN positive parents to evaluate IHN carrier rate.
10. Collect and decode coded-wire tags from marked adults that return to adult collection facilities.
11. Summarize catch and escapement information for groups of coded-wire tagged summer steelhead and chinook salmon as information becomes available.

12. Summarize information from branded smolts recovered at Snake River collection sites.
13. Conduct chinook salmon spawning ground surveys in the Minam and Wenaha rivers in cooperation with Oregon Department of Fish and Wildlife (ODFW) management personnel to recover carcasses of marked hatchery strays.
14. Participate in planning activities associated with anadromous fish production and management in the Grande Ronde and Imnaha river basins.
15. Update five-year study plan.
16. Determine the number of summer steelhead caught, catch rates, and angling effort in recreational fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.
17. Estimate total number of summer steelhead in the 1985-86 and 86-87 run years and for chinook salmon adults in the 1986 run that resulted from smolts produced at Oregon's LSRCP hatcheries.

Accomplishments in FY 1987

We accomplished all of our original tasks except number 17. Too few marked chinook salmon adults were produced from LSRCP releases to allow for adequate estimates of catch in the ocean and Columbia River fisheries. No 1983 or 1984 brood summer steelhead were marked Ad+CWT, so we were unable to determine fishery contribution for these two brood years.

Findings in FY 1987

A total of 396 spring chinook salmon returned to Lookingglass Hatchery in 1986. We spawned 149 females and collected 635,927 eggs. We collected 340 chinook salmon at the Imnaha River weir of which 21 were hatchery fish. We spawned 59 females and collected 280,431 eggs from Imnaha chinook salmon. We received 897,745 Rapid River stock eggs from Pahsimeroi Hatchery in Idaho.

The age composition of chinook salmon that returned to Lookingglass Hatchery in 1986 was 21.5% age 3₂, 57.6% age 4₂, and 20.9% age 5₂. The age composition of wild chinook salmon trapped on the Imnaha River in 1986 was 7.0% age 3₂, 64.4% age 4₂, and 28.6% age 5₂. IHNV was detected in one family group each of Lookingglass and Imnaha chinook salmon adults. No IHNV was detected in Rapid River stock adults spawned at Pahsimeroi Hatchery. The blood cell virus called erythrocytic inclusion body syndrome (EIBS) was diagnosed in 1985 brood Rapid River and Imnaha stock chinook salmon. The 1985 brood Imnaha stock smolts were released at Lookingglass Hatchery instead of the Imnaha River because of presence of EIBS.

A total of 1,960 summer steelhead returned to Wallowa Hatchery in 1986. We spawned 812 females and collected 4,083,274 eggs. In 1987, 3,855 steelhead returned to Wallowa Hatchery. We spawned 590 females and

collected 3,348,000 eggs. We trapped 49 wild fish and 23 hatchery fish at Little Sheep Creek in 1986. We spawned 32 wild and 10 hatchery females and collected 191,721 eggs. In 1987 we trapped 110 wild fish and 620 hatchery fish. We spawned 11 wild and 151 hatchery females and collected 695,000 eggs. The age composition for steelhead at Little Sheep in 1986 was 78.7% 1-salt and 21.3% 2-salt for wild fish, and 87.7% 1-salt and 12.5% 2-salt for hatchery fish. The age composition for steelhead that returned to Wallowa Hatchery in 1986 was 95.5% 1-salt and 4.5% 2-salt.

IHNV was detected in 21% of the family groups at Wallowa Hatchery and 1.5% of the family groups at Little Sheep Creek in 1986. We reared a majority of the Wallowa stock progeny from IHNV positive parents to the smolt stage and no virus was detected.

Smolt to adult return rate through age four fish for groups of Ad+CWT 1982 brood chinook salmon released from Lookingglass Hatchery was poor. Fish released in December 1983 during ice-up returned at 0.02%, and fish released in April 1984 returned at 0.07%. The return rate through age four returns for 1982 brood Imnaha chinook salmon was 0.14%. For Imnaha stock, the ratio of jacks to age four adults was unusually high at 0.6.

The passage index at Lower Granite Dam, which is a relative measure of outmigration performance, for chinook salmon released at Lookingglass in the spring 1986 was 13 times greater than the index for fish of the same brood released in fall 1985. The passage index for Wallowa stock steelhead released at an average weight of 124.5 g/fish was 2.3 times greater than the index for steelhead released at the same time and location at a size of 96.9 g/fish.

The first return of marked age four adult hatchery chinook salmon to the Grande Ronde occurred in 1986. We conducted carcass surveys, in cooperation with ODFW management personnel, from 28 to 30 August on the Minam River and on 1 September on the Wenaha River. Three marked adults were recovered on the Minam River and no marked fish were recovered on the Wenaha River. These fish were from smolts released at Lookingglass Hatchery in 1984. The findings that resulted from our planning activities are presented in Grande Ronde and Imnaha River Subbasin Production Reports (Carmichael et al. 1986a, 1986b; Carmichael et al. 1987a, 1987b).

We estimated for the catch and keep section (Section 1) of the Grande Ronde River (Wildcat Creek to Troy) that 904 anglers fished 2,631 hours during September through December and caught and released 294 unmarked steelhead and harvested 45 adipose-clipped steelhead. In the catch and release section (Troy to Oregon-Washington state line), 782 anglers fished 2,204 hours for the same period and caught and released 230 steelhead. On the Wallowa River, 6,376 anglers fished 27,223 hours from 1 February through 15 April. They caught and released 1,880 unmarked steelhead and kept 138 adipose-clipped and 503 short-dorsal-fin steelhead. The best catch rate occurred during October on the Grande Ronde River and during March and April on the Wallowa River. On the Imnaha River, 504 anglers fished 1,800 hours during October and November 1986 and March 1987. They caught and released 192 unmarked steelhead and 8 adipose-marked steelhead. Fishing was poor in the fall; 95% of the catch occurred in March.

Management Implications

1. If adequate eggs are obtained from Rapid River stock to meet smolt production goals for the Grande Ronde then there will be surplus Carson stock adults returning to Lookingglass Hatchery from 1987 to 1990.
2. Incubation and early rearing of the entire chinook salmon production in well water to reduce IHNV infection risk will cause smolts to be released at a larger size than the original program goal of 20 fish/lb. This will result in a corresponding decrease in the numbers of fish produced.
3. During 1986 and 1987 erythrocytic inclusion body syndrome became more prevalent and severe in chinook salmon at Lookingglass Hatchery. This disease may become the most important disease problem for chinook salmon at Lookingglass Hatchery.
4. Smolt-to-adult survival rate for hatchery-reared chinook salmon will have to improve dramatically if the present program is going to achieve the mitigation goal of 5,820 and 3,210 adults for the Grande Ronde and Imnaha basins respectively.
5. The substantial increase in effort and catch on the Wallowa River from 1986 to 1987 indicates that the LSRCP steelhead program is providing a great deal of recreational opportunity and that there is potential for extensive harvest of hatchery fish in this fishery.

Recommendations

1. We should continue to develop and implement broodstock management guidelines and spawning strategies for summer steelhead at Little Sheep Creek and chinook salmon at the Imnaha River so that (1) adequate adults are passed above the weir sites to ensure persistence of the endemic wild populations, (2) life history characteristics and genotypic variation of the wild populations are maintained, and (3) life history characteristics and genotypic variation of the hatchery stock mimics that of the wild populations.
2. Surplus Carson stock adults that return to Lookingglass Hatchery should be outplanted into Catherine Creek and the upper Grande Ronde River because these areas have been planted with Carson stock presmolts and smolts in the past. Areas that have not been supplemented with Carson stock in the past should be supplemented with Rapid River stock when available.
3. Length-frequency distributions and scale analysis at time of spawning in 1989 should be used to discriminate age 4 Imnaha chinook salmon from age 5 Lookingglass chinook salmon, which are left-ventral fin marked. This will ensure that no crossbreeding between stocks occurs.
4. Multiple release strategies for chinook salmon at Lookingglass Hatchery and for steelhead at Wallowa Hatchery should be continued to further evaluate rearing and release strategies.

5. Some Rapid River stock adults should be allowed to pass above Lookingglass Hatchery to reestablish natural production in Lookingglass Creek. This will enhance natural production and provide naturally produced fish for broodstock at Lookingglass Hatchery.
6. Future possibilities and strategies for developing summer steelhead broodstock for the Grande Ronde basin from wild fish should be examined.

*EVALUATION OF BENEFITS PROVIDED BY RELEASING SPRING CHINOOK SALMON
PRESMOLTS IN THE GRANDE RONDE RIVER AND ITS TRIBUTARIES*

Objectives for FY 1987

Mark Ad+CWT 80,000 (replicate codes of 40,000) Lookingglass stock chinook salmon presmolts at Lookingglass Hatchery. Recover and decode tags from returning adults and release marked fish in Lookingglass Creek.

Accomplishments in FY 1987

The objective was accomplished.

*EVALUATION OF BENEFITS PROVIDED BY REPROGRAMMING SPRING CHINOOK SALMON
SMOLTS FROM LOWER COLUMBIA RIVER HATCHERIES*

Objective for FY 1987

Mark Ad+CWT 80,000 (replicate codes of 40,000) Carson stock chinook salmon at Bonneville and release fish at Lookingglass Hatchery in the spring.

Accomplishments in FY 1987

The objective was accomplished; however we released the fish at Big Canyon Creek facility instead of Lookingglass Hatchery.

General Introduction

The background of the Lower Snake River Compensation Plan (LSRCP) is given in Carmichael² et al. (1986). Oregon's mitigation goals for adult salmonids are 5,820 spring chinook salmon and 9,184 summer steelhead for the Grande Ronde basin and 3,210 spring chinook salmon and 2,000 summer steelhead for the Imnaha basin (United States Army Corps of Engineers, 1975).

The means of mitigation for Oregon's LSRCP is production and release of hatchery smolts. A complex of hatcheries and satellite facilities is being constructed to produce fish for release in the Grande Ronde and Imnaha basins (Figure 1). Lookingglass Hatchery was completed in 1982 and serves as the primary incubation and rearing facility for the entire chinook salmon production program. New facilities at Irrigon to hatch and rear summer steelhead and at Wallowa Hatchery to trap and spawn summer steelhead were completed in early 1986. An advanced rearing and adult recapture facility was completed at Big Canyon Creek in the spring of 1987. This facility was used for summer steelhead and spring chinook smolt acclimation and release, and adult trapping during spring of 1987. Construction of an advanced rearing and adult recapture facility for summer steelhead began at Little Sheep Creek during early summer of 1987. This facility was operational for smolt acclimation and adult trapping in March 1988. Work began on the chinook salmon facility on the mainstem Imnaha and it appears the facility will be operational by spring 1989.

Three projects were conducted under LSRCP-Oregon Evaluation Studies during this report period: (1) Evaluation of Lower Snake River Compensation Plan facilities in Oregon; (2) Evaluation of the benefits provided by releasing spring chinook salmon presmolts in the Grande Ronde River and its tributaries; and (3) Evaluation of benefits provided by reprogramming spring chinook salmon smolts from lower Columbia River hatcheries. The long term goals and objectives of these studies are outlined in a five-year study plan (Carmichael 1987). In this report we present a review of our activities under all projects for the period 1 April 1986 through 30 June 1987. Future annual progress reports will cover the period 1 July-30 June. Previous annual reports were prepared by Carmichael and Wagner (1983), Carmichael and Messmer (1985), and Carmichael₂ et al. (1986).

EVALUATION OF LOWER SNAKE RIVER COMPENSATION PLAN FACILITIES IN OREGON

Introduction

The Evaluation of LSRCP Facilities in Oregon began in the fall of 1983. Work conducted during this report period encompassed six areas of study: fish culture monitoring; survival studies; natural escapement monitoring; planning; creel surveys; and disease investigation. The objectives and tasks for this report period are presented in the 1986-87 project proposal and in the summary section of this report. Work conducted under fish culture monitoring, survival studies, and creel surveys was a continuation of ongoing work. We began comprehensive spring chinook spawning ground surveys in 1986 because of the need for better escapement information for the Pacific Salmon Treaty. These surveys were funded in part with LSRCP and Pacific Salmon Commission funds. Results pertinent to straying of hatchery chinook salmon into the Minam and Wenaha rivers are presented in this report. Results of the comprehensive surveys will be presented in a separate report that is in preparation.

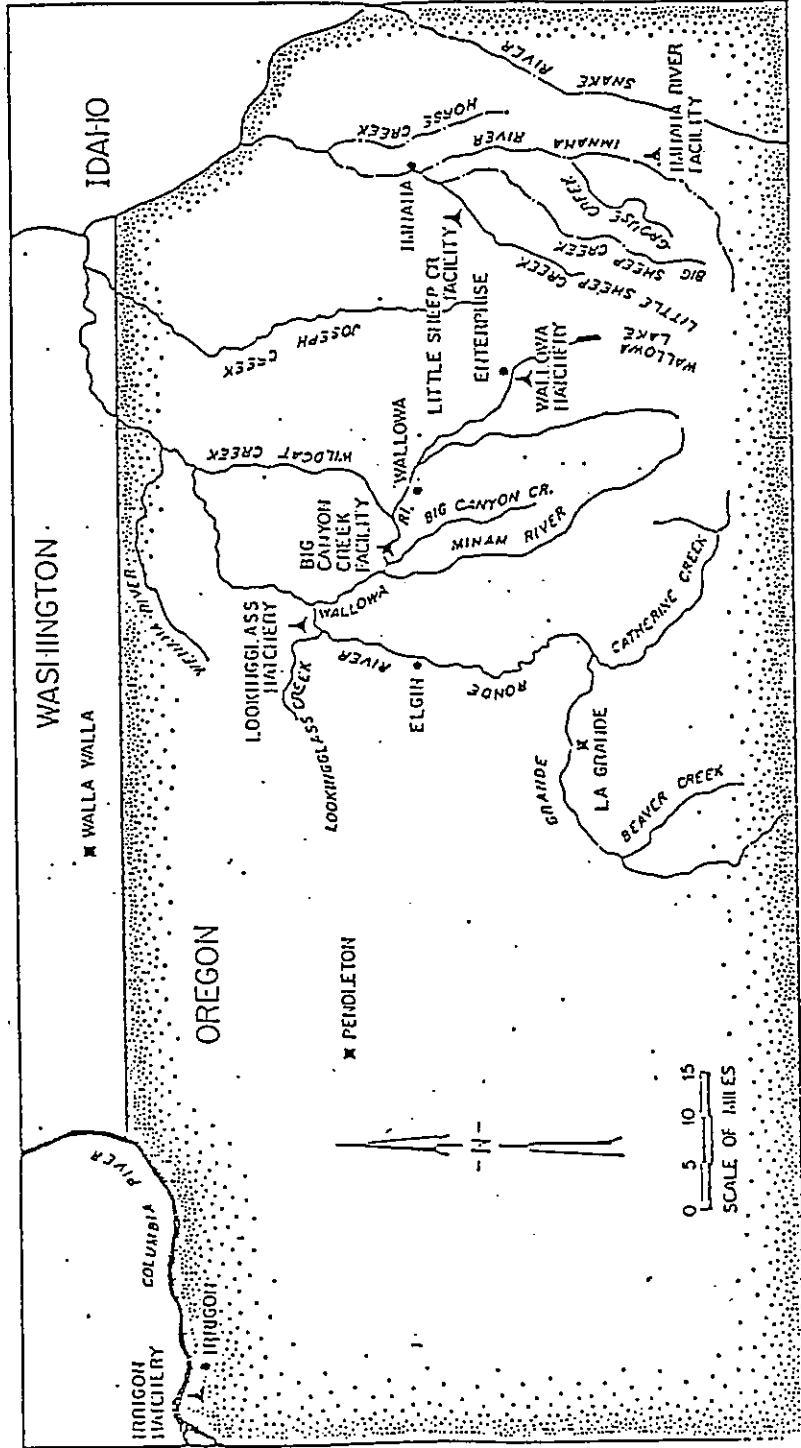


Figure 1. Map of northeastern Oregon showing the Grande Ronde and Imnaha river systems and the location of Lower Snake River Compensation Plan facilities.

Methods

Fish Culture Monitoring

Methods are described in the 1985 and 1986 annual reports (Carmichael and Messmer 1985; Carmichael₂ et al. 1986) and in the five-year study plan (Carmichael 1987). Pathological examinations were conducted by ODFW Pathology staff.

Survival Studies

We marked and released chinook salmon (Ad+CWT) and summer steelhead (Ad-LV+CWT) to determine catch contribution and smolt-to-adult survival rates. Smolts were cold branded to evaluate outmigration performance. Tags were recovered and decoded from all marked adults that returned to broodstock collection sites. We obtained catch information from agencies monitoring ocean and Columbia River fisheries.

Natural Escapement Monitoring

We conducted spawning ground surveys cooperatively with ODFW management biologists on the Minam River from 28 to 30 August 1986 and on the Wenaha River on 1 September 1986. We examined all carcasses for fin marks and collected snouts from all marked fish.

Planning

Work on planning consisted of editing, rewriting, and completing the summer steelhead and spring chinook salmon production reports for the Grande Ronde and Imnaha river basins prepared for the Columbia River Management Plan under U.S. v. Oregon negotiations.

Creel Surveys

Methods are described in the 1986 annual report (Carmichael₂ et al. 1986).

Disease Investigation

All steelhead adults that were spawned at Wallowa Hatchery in 1986 were sampled for presence of IHNV and Infectious Pancreatic Necrosis Virus (IPNV). Generally, fish were spawned in family groups of three females with two males. Fry from parents that were diagnosed as positive for the presence of IHNV were reared separate from fry of parents diagnosed negative. Juveniles were sampled for presence of IHNV periodically throughout rearing and we marked Ad-LV+CWT replicate groups of 25,000 which were acclimated and released at Wallowa Hatchery. Each marked adult that returns to Wallowa Hatchery and is spawned will be individually sampled to assess presence and level of IHNV.

Results

Results for fish culture monitoring of chinook salmon are presented in Tables 1-9 and in Figure 2 and for summer steelhead in Tables 10-21. Results of pathology exams are presented in Table 22.

Table 1. Egg take and survival of spring chinook salmon at Lookingglass and Irrigon hatcheries, 1985-86 brood years.

Stock, brood year	Number of eggs taken or received	Egg loss (%)	Egg-to-fry survival (%)	Egg-to-smolt survival (%)
Imnaha:				
1985	162,481	22.0	76.0	76.0
1986	280,431	25.7	72.4	(a)
Lookingglass:				
1985	981,684	7.9 ^b	91.7	88.9
1986	635,927	5.5 ^c	94.5	(a)
Rapid River:				
1985	497,520	14.3 ^d	85.1	79.1
1986	179,768 ^e	10.4	60.6	23.8
1986	717,977 ^f	0.8	94.8	(a)

- ^a Most 1986 brood smolts will be released in the spring of 1988.
- ^b Estimate does not include the loss of 160,000 eggs that were destroyed because of the presence of IHNV in the parents.
- ^c Estimate does not include the loss of 12,000 eggs that were destroyed because of the presence of IHNV in the parents.
- ^d Estimate does not include the loss of 33,480 eggs that were destroyed because of the presence of IHNV in the parents.
- ^e Received as green eggs and incubated at 15°C for experimental production 0+ smolts.
- ^f We received 601,665 of these as eyed eggs.

Data related to survival studies of spring chinook salmon and summer steelhead appear in Tables 23-29.

Results of comprehensive chinook salmon spawning ground surveys conducted in the Grande Ronde and Imnaha river basins will be presented in a progress report that is in preparation. Results of monitoring chinook salmon staying in the Minam and Wenaha rivers are presented in this report. Three marked hatchery chinook salmon adults were recovered on the Minam River. These fish were released as smolts from Lookingglass Hatchery during spring of 1984. No marked fish were recovered on the Wenaha River in 1986.

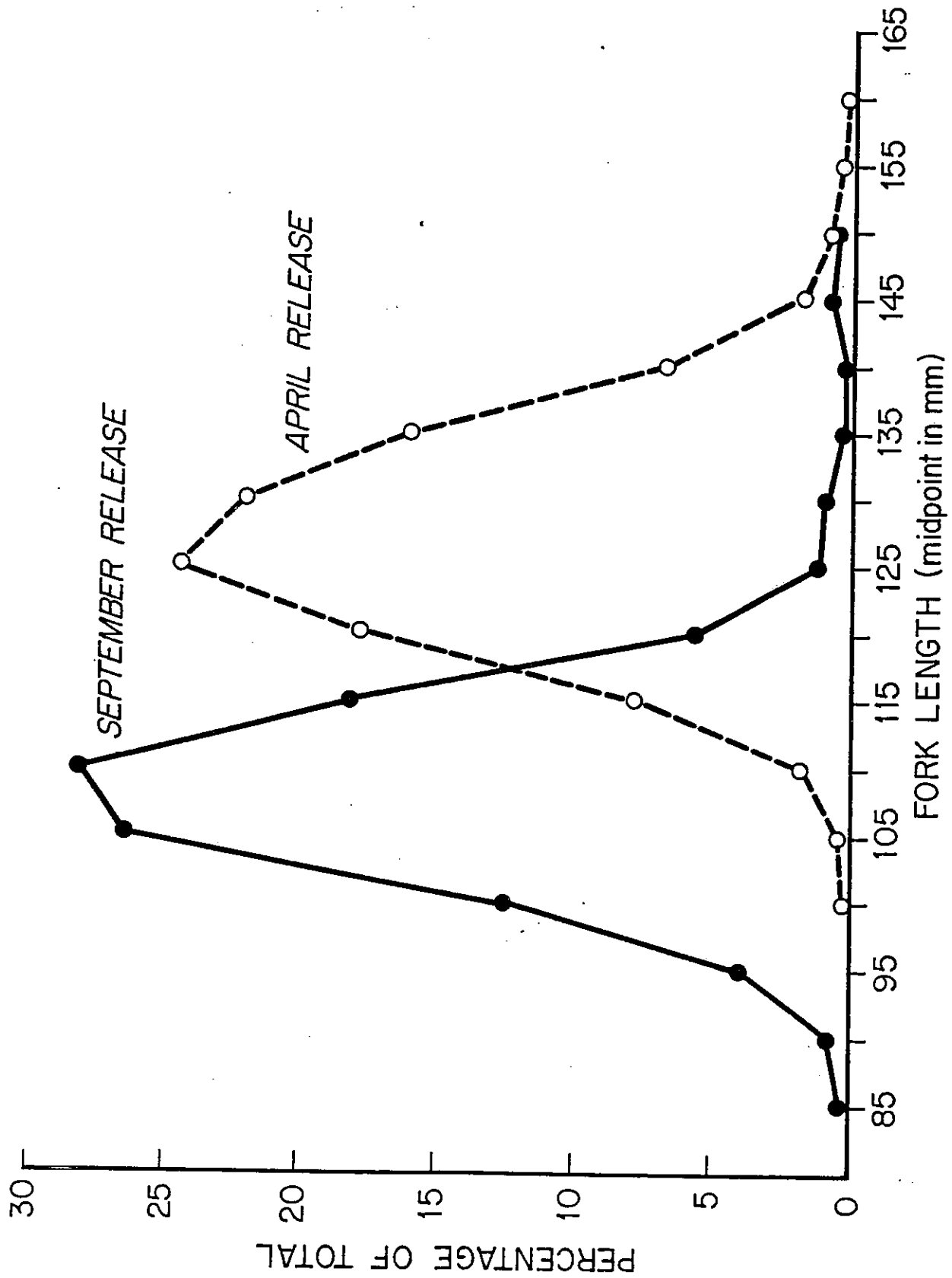


Figure 2. Length-frequency distributions of Lookingglass stock spring chinook salmon released at Lookingglass Hatchery on 24 September at 23.6-25.3 fish/1b (n=400) and on 1 April 1987 at 18.3 fish/1b (n=658).

Table 2. Release information for spring chinook salmon reared at Lookingglass, Irrigon, and Bonneville fish hatcheries and released in the Grande Ronde River basin, 1985 and 1986 broods. Standard deviation is shown in parenthesis.

Stock, brood year, date released	Number released	Size (fish/lb)	Location released	N ^a	Mean fork length (mm)
LOOKINGGLASS					
1985:					
07/17/86	88,543	53.5	Lookingglass Creek	300	85(0.7)
07/29/86	37,760	52.1	Catherine Creek	--	--
09/24/86	163,275	23.6-25.3	Lookingglass Creek	400	109(0.4)
11/01/86	164,886	23.8	Lookingglass Creek	600	114(1.0)
04/01/87	164,518	18.3	Lookingglass Creek	658	127(0.7)
04/06/87	111,711	17.1	Upper Grande Ronde	--	--
RAPID RIVER					
1985:					
04/01/87	393,639 ^b	9.1-9.7	Lookingglass Creek	642	158(3.7)
1986:					
05/20/87	173,974 ^b	35.6	Lookingglass Creek	498	102(0.1)
CARSON					
1985:					
06/11-16/86	379,450 ^c	24.0-25.0	Grande Ronde River	--	--
02/24-26/87	88,667 ^d	10.1-11.7	Catherine Creek	300	151(1.6)
03/30/87	84,295 ^d	11.5	Big Canyon Creek	310	148(2.5)
IMNAHA					
1985:					
04/20/87	123,530	8.0-8.4	Lookingglass Creek ^e	870	163(2.5)

^a Samples are composed of replicate groups of approximately 100 fish.

^b 100% right ventral fin marked for broodstock identification.

^c Reared at Irrigon Hatchery.

^d Initially reared at Bonneville Hatchery.

^e Released into Lookingglass Creek because the fish were infected with erythrocytic inclusion body syndrome.

Table 3. Vital statistics for spring chinook salmon that returned to Lookingglass Hatchery and the Imnaha River weir, 1986. J = jacks, M = males, F = females.

Location, origin	Total number	Number of Jacks	Number of Males	Number of Females	Number females spawned	Prespawning mortality (%)		
						J	M	F
Lookingglass Hatchery: Hatchery	396	84	152	160	149	4.8	5.3	4.4
Imnaha River Weir:								
Wild	319	22	173	124	53	13.6	31.8	56.5
Hatchery	21	7	7	7	6	0	0	14.3

Table 4. Run timing for adult spring chinook salmon that returned to Lookingglass Hatchery and the Imnaha River weir, 1986.

Time interval	Lookingglass Hatchery ^a		Imnaha River weir ^b			
	Number	% of total	Wild fish		Hatchery fish	
			Number	% of total	Number	% of total
06-13 May	0	0	--	--	--	--
14-20 May	7	1.8	--	--	--	--
21-27 May	37	9.3	--	--	--	--
28 May-03 June	63	15.9	--	--	--	--
04-10 June	44	11.1	--	--	--	--
11-17 June	101	25.4	--	--	--	--
18-24 June	53	13.3	--	--	--	--
25 June-01 July	4	1.0	56	17.4	1	5.5
02-08 July	34	8.6	26	8.1	0	0
09-15 July	0	0	29	9.0	0	0
16-22 July	10	2.5	45	14.0	2	11.1
23-29 July	0	0	30	9.3	0	0
30 July-05 August	5	1.3	13	4.0	1	5.5
06-12 August	0	0	14	4.4	1	5.5
13-19 August	21	5.3	19	5.9	3	16.7
20-26 August	0	0	51	15.8	5	27.9
27 August-02 September	18	4.5	28	8.7	2	11.1
03-09 September	0	0	10	3.1	3	16.7
10-16 September	0	0	1	0.3	0	0

^a Lookingglass trap operated from 6 May to 11 September.

^b Imnaha River weir operated from 26 June to 11 September. Fish were allowed to pass the weir from 4 July to 7 July.

Table 5. Spawning timing of female spring chinook salmon that returned to Lookingglass Hatchery and the Imnaha River weir, 1986.

Time interval	Lookingglass Hatchery		Imnaha River weir		Imnaha River weir	
	Number	% of total	Wild fish	% of total	Hatchery fish	% of total
06-12 August	0	0	3	5.7	0	0
13-19 August	17	11.4	5	9.4	0	0
20-26 August	0	0	21	39.6	0	0
27 August-02 September	81	54.4	18	34.0	5	83.3
03-09 September	51	34.2	5	9.4	0	0
10-16 September	--	--	1	1.9	1	16.7

Table 6. Age composition of spring chinook salmon that returned to Lookingglass Hatchery and to the Imnaha River, historical (wild), 1984, 1985, and 1986. Historical age composition for Lookingglass is the average of 1964-1970 (Burck 1966-1971; Mullarkey 1968) and historical age composition for the Imnaha is the average of 1961-1976 (Bennett 1975; ODFW unpublished data). Age nomenclature is that of Gilbert and Rich (1927).

Location, origin	Age 3 ₂				Age 4 ₂			
	Historical	1984	1985	1986	Historical	1984	1985	1986
Lookingglass Hatchery:								
Hatchery	16.0	20.9	2.2	21.2	74.0	76.7	95.8	58.4
Imnaha River:								
Wild	5.0	28.6	21.2	7.0	44.0	34.3	62.3	64.4
Hatchery	--	--	100	33.3	--	--	--	66.7

Location, origin	Age 5 ₂				Age 6 ₂			
	Historical	1984	1985	1986	Historical	1984	1985	1986
Lookingglass Hatchery:								
Hatchery	10.0	2.4	2.0	20.4	0	0	0	0
Imnaha River:								
Wild	50.0	37.1	15.9	28.6	1.0	0	0.6	0
Hatchery	--	--	--	--	--	--	--	--

Table 7. Mean fork length (mm) for age-specific groups of adult spring chinook salmon, 1986. Age nomenclature is that of Gilbert and Rich (1927). Standard deviation is shown in parenthesis.

Location, origin	Age 3 ₂				Age 4 ₂			
	Males		Females		Males		Females	
	<i>N</i>	Length	<i>N</i>	Length	<i>N</i>	Length	<i>N</i>	Length
Lookingglass Hatchery:								
Hatchery	84	563(45)	1	621	121	787(57)	109	749(38)
Imnaha River:								
Wild	22	566(44)	0	--	144	770(47)	59	782(58)
Hatchery	7	586(36)	0	--	7	748(46)	7	735(48)

Location, origin	Age 5 ₂			
	Males		Females	
	<i>N</i>	Length	<i>N</i>	Length
Lookingglass Hatchery:				
Hatchery	31	929(52)	50	858(39)
Imnaha River:				
Wild	26	976(67)	64	914(48)
Hatchery	--	--	--	--

Table 8. Imnaha River weir spring chinook salmon prespawning mortality, 1986.

Trapping period	Number trapped	% prespawning mortality	
		Males	Females
06/27-07/15 ^a	112	44.6	86.7
07/16-08/05	106	27.9	48.0
08/06-09/11	122	16.7	8.3

^a Fish were allowed to pass the weir from 4 to 7 July.

Table 9. Degree of smolting for juvenile spring chinook salmon released into the Grande Ronde and Imnaha river basins, 1984-86 broods. Standard deviation is shown in parenthesis.

Stock, hatchery of rearing	Release date	Brood year	N	Mean length (mm)	Degree of smolting ^a (%)		
					Smolt	Intermediate	Parr
Carson:							
Lookingglass	04/02/86	1984	200	140(1.8)	28.6	71.4	0
Bonneville-							
Lookingglass	04/01-02/86	1984	400	156(3.4)	31.5	68.5	0
	03/31/87	1985	200	148(2.5)	13.0	85.5	1.5
	02/26/87	1985	200	151(1.6)	5.0	95.0	0
Lookingglass:							
Lookingglass	04/01/86	1984	200	131(2.6)	21.5	76.5	2.0
	07/17/86	1985	280	85(0.7)	0	1.8	98.2
	09/24/86	1985	405	110(0.1)	0	2.0	98.0
	11/01/86	1985	560	114(1.3)	0	2.8	97.2
	04/01/87	1985	400	127(0.7)	1.5	98.5	0
Rapid River:							
Lookingglass	04/01/87	1985	400	158(3.7)	41.7	58.3	0
Irrigon	05/20/87	1986	250	102(0.1)	2.8	97.2	0
Imnaha:							
Lookingglass	03/28/86	1984	204	150(7.6)	34.3	65.2	0.5
	04/20/87	1985	400	163(2.5)	50.0	50.0	0

^a Degree of smolting determined by visual inspection using the following criteria: Parr = parr marks and spotting prominent, body color not silver, and scales not deciduous. Intermediate = parr marks and spotting present but not distinct, body color beginning to appear silver and scales not deciduous. Smolt = parr marks and spotting not visible, body color silver, and scales deciduous.

Table 10. Egg take and egg survival of Wallowa, Grande Ronde (wild) and Imnaha summer steelhead, 1986 and 1987 broods.

Stock, brood year	Eggs taken	Egg Loss (%)	Egg-to-fry survival (%)	Egg-to-smolt survival (%)
Wallowa:				
1986	4,083,274	46.9	46.4 ^a	41.1
1987	3,348,000	30.9	64.8 ^b	(c)
Grande Ronde:				
1987	59,744	34.0	58.9	(c)
Imnaha:				
1986	191,721	29.4 ^d	68.3	60.2
1987	695,000	35.4	58.9	(b)

^a 449,952 eyed eggs were shipped to Lyons Ferry Hatchery and were not included in egg-to-fry survival.

^b 500,000 eyed eggs were shipped to Lyons Ferry Hatchery and were not included in egg-to-fry survival.

^c 1987 brood smolts will be released in the spring of 1988.

^d Egg loss does not include loss of 36,000 eggs killed in iodosept disinfectant.

Table 11. Vital statistics for summer steelhead released in the Grande Ronde and Imnaha river basins, 1985 and 1986 broods. Standard deviation is shown in parenthesis.

Stock, hatchery of rearing, brood year, date released	Number released	Size (fish/lb)	Location of release	N ^a	Mean fork length (mm)
WALLOWA					
Irrigon: 1985: 05/05/86	194,553	4.2	Wallowa Hatchery	642	213(2.4)
1986: 04/24-30/87	535,328	3.6-5.3	Wallowa Hatchery	1,048	216(2.7)
04/22-28/87	52,078	4.4	Spring Creek	345	215(1.7)
04/15-23/87	151,053	4.4-5.0	Lower Grande Ronde River	600	215(2.1)
04/08-24/87	291,332	4.4-4.9	Upper Grande Ronde River	--	--
04/13-27/87	72,438	4.4-5.0	Catherine Creek	--	--
04/20-30/87	160,032	4.5-7.0	Wallowa River	--	--
04/29/87	12,000	5.0	Hurricane Creek	206	206(1.1)
04/29/87	24,257	4.5-5.0	Prairie Creek	--	--
04/25/87	222,526	4.4	Big Canyon Creek	294	215(2.2)
Lyons Ferry: 1986: 04/28-29/87	52,335	5.4-5.9	Wildcat Creek	206	197(2.7)
IMNAHA					
Irrigon: 1985: 04/29-30/86	55,481	4.4-5.3	Little Sheep Creek	400	207(4.0)
04/25-29/86	55,252	5.6-6.5	Little Sheep Creek	600	192(5.1)
04/29/86	4,702	11.2	Little Sheep Creek	200	151(3.2)
1986: 05/01-05/87	82,916	4.6-5.0	Little Sheep Creek	287	205(3.5)
05/05/87	10,800	8.0	Little Sheep Creek	260	172(2.7)

^a Samples are composed of replicate groups of approximately 100 fish.

Table 12. Number of adult summer steelhead that returned to Big Canyon Creek, Wallowa Hatchery, and the Little Sheep Creek weir, 1986 and 1987.

Location, return year, origin	Total number	Males	Females	Number of females spawned	Prespawning mortality (%)	
					Males	Females
Big Canyon Creek:						
1987:						
Wild fish	10	1	9	8	0	0
Hatchery fish	172	48	124	0	(a)	(a)
Wallowa Hatchery:						
1986:						
Hatchery fish	1,960	973	987	812	5.7	2.0
1987:						
Hatchery fish	3,855	1,763	2,092	590	15.9	14.4
Little Sheep Creek weir:						
1986:						
Wild fish	49	14	35	32	35.7	5.7
Hatchery fish	23	7	16	10	57.1	37.5
1987:						
Wild fish	110	50 ⁵⁰	50 ⁶⁰	11	12.5	4.8
Hatchery fish	620	255	365	151	10.7	5.8

^a All hatchery fish at Big Canyon Creek were released above the weir.

Table 13. Run timing for adult summer steelhead that returned to Big Canyon Creek (1987), Wallowa Hatchery, and the Little Sheep Creek weir, 1986 and 1987.

Year, time interval	Big Canyon Creek ^a		Wallowa Hatchery ^b		Little Sheep Creek weir ^c			
	Number	% of total	Number	% of total	Wild fish		Hatchery fish	
	Number	% of total	Number	% of total	Number	% of total	Number	% of total
1986:								
12-18 March	--	--	0	0	--	--	--	--
19-25 March	--	--	145	7.4	--	--	--	--
26 March-								
01 April	--	--	289	14.7	--	--	--	--
02-08 April	--	--	497	25.3	0	0	0	0
09-15 April	--	--	354	18.1	3	6.1	1	4.3
16-22 April	--	--	368	18.8	11	22.5	8	34.8
23-29 April	--	--	65	3.3	6	12.2	0	0
30 April-								
06 May	--	--	107	5.5	13	26.5	7	30.5
07-13 May	--	--	114	5.8	4	8.2	1	4.3
14-20 May	--	--	21	1.1	11	22.5	6	26.1
21-27 May	--	--	0	0	1	2.0	0	0
28 May-								
03 June	--	--	0	0	0	0	0	0
1987:								
11-17 March	--	--	0	0	--	--	--	--
12-18 March	--	--	679	17.6	--	--	--	--
19-25 March	--	--	556	14.4	0	0	0	0
26 March-								
01 April	--	--	846	21.9	1	0.9	13	2.3
02-08 April	52	28.6	1,136	29.5	42	38.2	142	22.9
09-15 April	7	3.8	300	7.8	11	10.0	122	19.7
16-22 April	62	34.1	208	5.4	23	20.9	138	22.2
23-29 April	43	23.6	70	1.8	30	27.3	178	28.7
30 April-								
06 May	12	6.6	0	0	2	1.8	20	3.2
07-13 May	6	3.3	60	1.6	1	0.9	6	1.0
14-20 May	0	0	0	0	--	--	--	--

^a Big Canyon Creek trap operated from 1 April to 18 May 1987.

^b Wallowa Hatchery trap operated from 11 March to 30 May 1986 and from 9 March to 18 May 1987.

^c Little Sheep Creek weir operated from 3 April to 8 June 1986 and from 21 March to 12 May 1987.

Table 14. Time of spawning for adult summer steelhead that returned to Wallowa Hatchery and the Little Sheep Creek weir, 1986 and 1987.

Year, time interval	Wallowa Hatchery		Little Sheep Creek weir			
	Number spawned	% of total	Wild fish		Hatchery fish	
			Number spawned	% of total	Number spawned	% of total
1986:						
26 March- 01 April	12	1.5	--	--	--	--
02-08 April	132	16.2	--	--	--	--
09-15 April	198	24.4	0	0	0	0
16-22 April	151	18.6	0	0	0	0
23-29 April	105	12.9	1	10.0	4	12.5
30 April- 06 May	120	14.8	1	10.0	3	9.4
07-13 May	85	10.5	3	30.0	7	21.9
14-20 May	9	1.1	3	30.0	4	12.5
21-27 May	0	0	0	0	0	0
28 May- 03 June	--	--	2	20.0	12	37.5
04-08 June	--	--	0	0	0	0
09-15 June	--	--	0	0	2	6.2
1987:						
26 March- 01 April	0	0	0	0	0	0
02-08 April	237	40.1	0	0	0	0
09-15 April	161	27.3	0	0	0	0
16-22 April	102	17.3	4	36.3	86	56.9
23-29 April	63	10.7	3	27.3	45	29.8
30 April- 06 May	0	0	1	9.1	14	9.3
07-13 May	27	4.6	3	27.3	6	4.0

Table 15. Percent age composition for adult summer steelhead, 1986.

Age group, number	Wallowa Hatchery ^a		Little Sheep Creek weir					
	Male	Female	Wild fish		Hatchery fish			
			Male	Female	Male	Female		
1.1 ³	47.9	1844	46.2	0	0	25.0	20	62.5
1.2 ⁴	1.2	82	3.0	0	0	0	3	12.5
2.1 ⁴	0.5	32	1.1	19.1	59.6	0		0
2.2 ⁵	0.1	2	0	2.1	19.2	0		0
Number of fish sampled	684 ^b	1960	851 ^b	10	37	4	23	12

^a All hatchery fish.

^b Does not include outplanted fish.

Table 16. Mean fork length (mm) by age group for adult summer steelhead that returned to Wallowa Hatchery and the Little Sheep Creek weir, 1986. Standard deviation is shown in parenthesis.

Age group	Wallowa Hatchery ^a			
	Males		Females	
	N	Length	N	Length
1.1	659	624(28)	781	603(25)
1.2	17	688(41)	51	689(36)
2.1	7	654(35)	19	611(31)
2.2	1	690	0	--

Age group	Little Sheep Creek weir							
	Wild fish				Hatchery fish			
	Males		Females		Males		Females	
	N	Length	N	Length	N	Length	N	Length
1.1	0	--	0	--	4	575(22)	10	598(46)
1.2	0	--	0	--	0	--	2	654(62)
2.1	9	578(18)	28	588(21)	0	--	0	--
2.2	1	614	9	678(41)	0	--	0	--

^a All hatchery fish.

Table 17. Adult summer steelhead outplanted from Wallowa Hatchery, 1987.

Location of outplanting	Number outplanted	
	Males	Females
Upper Grande Ronde River and tributaries:		
Upper Grande Ronde River	322	372
Catherine Creek	101	101
Phillips Creek	25	25
Indian Creek	50	50
Willow Creek	25	25
Wallowa River tributaries:		
Big Canyon Creek	35	75
Hurricane Creek	50	50
Whiskey Creek	28	57
Bear Creek	50	50
Little Bear Creek	25	25
Prairie Creek	50	50
Lostine River	50	50
Fishing Ponds:		
Marr Pond	147	0
Victor Pond	100	0
Wallowa Pond	157	0
Total	1,215	930

Table 18. Number of adult summer steelhead released above the Little Sheep Creek weir, 1987.

Trapping and release time period	Wild fish		Hatchery fish	
	Males	Females	Males	Females
26 March-01 April	0	0	3	2
02-08 April	26	5	61	17
09-15 April	1	5	20	23
16-22 April	0	12	11	33
23-29 April	2 ³	15	20	78
30 April-06 May ^a	5	0	26	16
30 April-06 May	0	0	3	16
07-13 May ^a	0	1	5	1
	<i>Σ</i>	<i>Σ</i>	<i>Σ</i>	<i>Σ</i>
	2	35	3	170

^a Fish captured during earlier time periods.

(Handwritten mark)

Table 19. Dorsal fin heights (mm) for adult summer steelhead, 1986-87.

Location, origin	Year	N	Mean height	Range	Percent >51 mm
Wallowa Hatchery:					
Hatchery	1986	1,522	52	4-70	74.5
Hatchery	1987	1,584	49	2-86	55.3
Little Sheep Creek:					
Wild	1986	42	56	46-70	95.2
Hatchery	1986	18	30	5-51	5.5
Wild	1987	23	58	52-70	100
Hatchery	1987	291	36	3-67	8.9

Table 20. Incidence (%) of an eroded fin or fins on summer steelhead smolts reared at Irrigon Hatchery and released in the Grande Ronde and Imnaha river basins, 1985 and 1986 brood years. D = dorsal, V = one or both ventrals, LP = left pectoral, RP = right pectoral, BP = both pectorals. Standard deviation is shown in parenthesis.

Stock, brood year	N	Mean length (mm)	Eroded fin(s) (%) ^a					No eroded fins (%)
			D	V	LP	RP	BP	
Wallowa:								
1985	668	213(2.4)	92.2	3.5	9.3	4.5	1.6	7.2
1986	200	215(2.1)	95.5	49.5	7.0	6.5	3.0	2.5
1986	200	219(0.9)	98.0	50.6	17.2	14.2	12.3	0
1986	200	215(2.2)	99.0	49.0	20.5	7.5	5.5	0
1986	200	215(1.7)	95.0	20.3	22.5	25.5	10.5	3.0
Imnaha:								
1985	151	211(0.1)	90.7	80.4	1.3	2.6	0	0.7
1985	150	203(0.6)	95.3	81.9	14.0	10.0	4.7	1.3
1985	300	197(0.9)	78.7	15.3	16.0	1.3	3.0	8.0
1985	300	188(2.6)	91.7	54.3	5.7	6.7	1.3	6.0
1985	200	151(3.2)	78.5	7.5	2.0	1.5	1.5	21.5
1986	176	205(3.5)	84.1	2.0	16.5	5.7	2.3	13.1
1986	146	172(2.7)	79.4	0	11.0	2.0	0.7	19.2

^a No adipose, caudal, or anal fin erosion in any of the release groups.

Table 21. Degree of smolting, precociousness, and descaling of summer steelhead smolts released into the Grande Ronde and Imnaha river basins, 1985 and 1986 broods. Standard deviation is shown in parenthesis.

Stock, hatchery of rearing, sampling date	Brood year	N	Mean length (mm)	Degree of smolting (%)				De- scaled fish %
				Smolt	Inter- mediate	Parr	Pre- cocious males	
Wallowa:								
Irrigon:								
04/29/86	1985	668	213(2.4)	6.3	88.9	4.8	0	0.4
04/15/87 ^a	1986	200	215(2.1)	17.5	82.0	0	0.5	0
04/22/87 ^b	1986	200	219(0.9)	34.3	61.8	1.0	2.9	1.5
04/23/87 ^c	1986	200	215(2.2)	21.5	76.5	1.5	0.5	0
04/27/87 ^d	1986	200	215(1.7)	48.0	52.0	0	0	0
Lyons Ferry:								
04/28/87 ^e	1986	206	197(2.7)	84.5	11.2	2.4	1.9	1.0
Imnaha:								
Irrigon:								
04/22/86	1985	151	211(0.1)	6.6	78.8	13.3	1.3	3.3
04/23/86	1985	150	203(0.6)	6.0	81.3	12.0	0.7	0
04/28/86	1985	300	197(0.9)	21.0	67.7	11.3	0	0.7
04/30/86	1985	300	188(2.6)	1.3	84.0	14.4	0.3	0
04/29/86	1985	200	151(3.2)	1.0	31.5	67.5	0	0.5
05/05/87	1986	176	205(3.5)	22.2	77.3	0	0.5	1.1
05/05/87	1986	176	172(2.7)	10.3	89.0	0	0.7	0

^a Lower acclimation pond, Wallowa Hatchery.

^b Upper acclimation pond, Wallowa Hatchery.

^c Big Canyon Creek release.

^d Spring Creek release.

^e Wildcat Creek release.

Table 22. Fish disease examinations at Lower Snake River Compensation Plan hatcheries, 1986-87. StS = summer steelhead; ChS = spring chinook salmon; CWD = cold water disease; BGD = bacterial gill disease; BKD = bacterial kidney disease; EIBS = erythrocytic inclusion body syndrome (formerly called VEN); IHNV = infectious hematopoietic necrosis virus.

Hatchery, species-stock	Brood year	Reason--diagnosis	Date of examination
Wallowa:			
StS-Wallowa	1986	Certification, history--IHNV detected in 58 family groups	Mar-Jun 1986
	1986	Increased loss, egg mortality--95% of losses due to air bubble suffocation and <i>Myxobacteria</i> attack via dead eggs to live eggs	May 1986
	1986	Preliberation--no disease	Mar 1987
	1986	Increase loss--mechanical injury (fish pump) stress death syndrome	Apr 1987
	1987	Certification, history--IHNV detected in 3 family groups	May 1987
Little Sheep Creek:			
StS-Imnaha	1986	Certification, history--no fish viral agent detected	Apr-Jul 1986
	1987	Certification, history--IHNV detected in 3 family groups	May 1987
Irrigon:			
StS-Wallowa	1986	Routine--no disease	Jul 1986
	1986	Increased loss--one mortality with BGD, all others no BGD	Jul 1986
	1986	Increased loss--heavy infestations of <i>Ichthyophthirius</i> ponds 6, 9, 10, 12	Oct 1986
	1986	Pretransfer--no disease	Jan 1987
StS-Imnaha	1986	Routine--no disease	Jul 1986
	1986	Routine--no disease	Jul 1986
Pahsimeroi:			
ChS-Rapid River	1986	Certification, history--no fish viral agent detected	Sep-Oct 1986
Bonneville:			
ChS-Carson	1985	Preliberation and erythromycin feeding for BKD--some blue slime on a few sunburn fish, no other disease	Aug-Sep 1986

Table 22. Continued.

Hatchery, species-stock	Brood year	Reason--diagnosis	Date of examination	
Bonneville- Lookingglass: ChS-Carson	1985	Routine--no disease	Jan 1987	
	1985	Routine--no disease	Feb 1987	
Lookingglass: ChS-Rapid River	1985	Routine--no disease	Apr 1986	
	1985	Increased loss--loss is 90% gill fungus, 10% occasional puffbelly runt with BKD pustulated kidney. Gill fungus loss at 10-15/1b	Jun 1986	
	1985	Increased loss--possible reactions to formaline treatments or MS-222	Jul 1986	
	1985	Increased loss--blue slime on a few sunburn fish, no ectoparasites seen	Aug 1986	
	1985	Increased loss--Electric shock syndrome	Sep 1986	
	1985	Increased loss--EIBS and some chronic CWD. BKD in some runt fish	Jan 1987	
	1985	Increased loss--EIBS, BKD	Feb 1987	
	1986	EIBS exam pretransfer--no disease	Mar 1987	
	1986	Routine--no disease	Mar 1987	
	1986	Increased loss--probable mechanical abrasion	May 1987	
	ChS-Lookingglass	1985	Routine-- <i>Costia</i>	Apr 1986
		1985	Routine--no disease	Apr 1986
		1985	Routine--no disease	Jun 1986
1985		Increased loss--some gill fungus and throat abrasion	Jul 1986	
1985		Increased loss--electric shock syndrome	Sep 1986	
1986		Certification, history--IHNV detected in one family group	Aug-Oct 1986	
1985		Routine--no disease	Jan 1987	
1985		Routine--no disease	Feb 1987	
1985		Routine--no disease	Mar 1987	

Hatchery, species-stock	Brood year	Reason--Diagnosis	Date of examination
Lookingglass (continued): ChS-Imnaha	1985	Routine--no disease	Apr 1986
	1985	Routine--no disease	Jun 1986
	1985	Routine--no disease	July 1986
	1985	Increased loss--electric shock syndrome	Sep 1986
	1986	Increased loss--no disease, stress- death syndrome	Aug 1987
	1986	Certification, history--IHNV detected in one family group	Aug-Oct 1987
	1985	Increased loss--EIBS, some chronic CWD	Jan 1987
	1986	Increased loss--probable CWD or other external <i>Mycobacteria</i>	Jan 1987
	1985	Increased loss--EIBS, BKD	Feb 1987
	1986	Routine--no disease	Mar 1987

Table 23. Release information for spring chinook salmon reared at Lookingglass Hatchery, marked Ad+CWT and released in the Grande Ronde River basin, 1985 and 1986 broods. Standard deviation is shown in parenthesis.

Stock, location of release	Tag code	Date released	Number released	N ^a	Mean ^b weight (g/fish)	Mean fork length (mm)	Mean ^c condition factor
Carson:							
Big Canyon Creek	07 39 56	03/02/87	39,355	310	45.3(1.7)	148(2.8)	1.27
	07 39 57	03/02/87	39,502	310	45.3(1.7)	148(2.5)	1.27
Lookingglass:							
Lookingglass Creek	07 39 54	07/17/86	42,773	300	7.7(0.2)	85(0.7)	1.24
	07 39 55	07/17/86	43,258	300	7.7(0.2)	85(0.7)	1.24
	07 38 03	09/24/86	52,614	200	16.2(0.9)	109(0.1)	1.24
	07 38 04	09/24/86	52,583	200	17.1(0.9)	110(0.1)	1.24
	07 38 07	11/01/86	52,377	300	18.8(0.7)	114(1.3)	1.21
	07 38 08	11/01/86	52,915	300	18.9(0.5)	115(0.4)	1.24
	07 38 05	04/01/87	52,852	316	24.8(0.4)	127(0.2)	1.17
	07 38 06	04/01/87	52,360	342	25.9(0.6)	128(0.9)	1.16
Rapid River:							
Lookingglass Creek	07 38 11	04/01/87	49,871	341	46.6(2.2)	157(0.3)	1.14
	07 38 12	04/01/87	50,018	301	47.3(2.5)	160(5.0)	1.14
	07 40 11d	05/20/87	40,831	498	12.6(0.3)	102(0.1)	1.14
	07 40 12d	05/20/87	41,293	498	12.6(0.3)	102(0.1)	1.14
	07 40 13d	05/20/87	40,782	498	12.6(0.3)	102(0.1)	1.14
Imnaha:							
Lookingglass Creek	07 38 09	04/20/87	53,307	301	54.9(1.8)	164(2.6)	1.16
	07 38 10	04/20/87	52,047	305	52.7(2.0)	161(0.5)	1.16

^a Length samples are composed of replicate groups of approximately 100 fish.
^b Weight and condition factor samples consist of 100 fish for 1986 releases and 50 fish for 1987 releases.
^c Standard deviations of all mean condition factors are < 0.02.
^d 1986 brood.

Table 24. Recovery information for Ad+CWT spring chinook salmon that returned to Lookingglass Hatchery, Imnaha River weir, and the Minam River, 1986. Standard deviation is shown in parenthesis.

Location	Tag code	Number recovered		Mean fork length (mm)		Mean weight (kg)	
		Male	Female	Male	Female	Male	Female
Lookingglass Hatchery	07 28 20	1	0	818	--	5.2	--
	07 28 60	15	8	758(50)	740(31)	4.1(0.85)	3.8(0.71)
	07 28 61	4	1	845(32)	744	5.5(0.86)	5.5
	07 28 62	5	5	803(25)	757(38)	4.7(0.87)	4.0(1.01)
	07 30 02	1	0	624	--	2.5	--
	07 31 11 ^a	1	0	533	--	1.8	--
	07 31 53	2	0	552(20)	--	1.8(0.28)	--
	07 31 55	1	0	490	--	1.1	--
	07 31 56	2	0	587(18)	--	2.0(0.07)	--
	23 18 08	1	0	485	--	1.2	--
Imnaha River weir	07 28 20	5	5	755(36)	748(51)	4.1(0.58)	3.9(0.87)
	07 28 60	1	2	673	703(8)	2.7	3.1(0.64)
	07 30 12	1	0	560	--	1.9	--
	07 30 13	3	0	604(43)	--	2.1(0.52)	--
	07 30 16	1	0	605	--	2.0	--
Minam River	07 28 60	2	1	711(0)	737	--	--

^a *Cole Rivers Hatchery stray.*

Table 25. Release information for summer steelhead reared at Irrigon Hatchery, marked Ad-LV+CWT and released in the Grande Ronde and Imnaha river basins, 1986 brood. Standard deviation is shown in parenthesis.

Stock, location of release	Tag code	Date released	Number released	N ^a	Mean weight (g)	Mean fork length (mm)	Mean ^b condition factor
Wallowa:							
Wallowa	07 40 25C	04/25-27/87	25,374	239	96.9(1.2)	214(1.0)	0.98
Hatchery	07 40 26C	04/24-27/87	26,136	239	96.9(1.2)	214(1.0)	0.98
	07 41 25d	04/24-27/87	46,571	239	124.5(2.3)	231(1.7)	0.99
	07 41 26d	04/25-27/87	50,019	239	96.9(1.2)	214(1.0)	0.98
	07 41 28d	04/22-28/87	50,385	345	110.1(4.4)	215(1.7)	1.01
Imnaha:							
Little Sheep Creek	07 41 22C	05/01-05/87	47,836	547	89.9(3.7)	201(3.4)	1.01

^a Samples are composed of replicate groups of approximately 100 fish.

^b Standard deviations of the mean condition factors are < 0.01.

^c Progeny from parents diagnosed IHNV positive.

^d Tag codes composed of two replicates.

Table 26. Recovery information for Ad+CWT summer steelhead that returned to Wallowa Hatchery. Standard deviation is shown in parenthesis.

Year, tag code	Number recovered		Mean fork length (mm)		Mean weight (kg)	
	Male	Female	Male	Female	Male	Female
1986:						
23-16-51	1	1	665	590	2.4	2.0
23-16-52	1	0	549	--	1.4	--
63-28-39	4	15	737(29)	694(31)	3.3(0.4)	2.9(0.4)
63-28-40	0	15	--	705(40)	--	3.1(0.4)
1987:						
23-16-51	0	1	--	688	--	2.3
23-16-52	0	1	--	710	--	2.7

Table 27. Release information for 1985 and 1986 brood spring chinook salmon and 1986 brood summer steelhead, cold branded and released in the Grande Ronde and Imnaha river basins. Standard deviation is shown in parenthesis.

Species, stock, location of release	Brand	Date released	Number released	N ^a	Mean weight (g)	Mean fork length (mm)	Mean condition factor ^b
Chinook salmon:							
Lookingglass Hatchery							
	LA J 1	09/24/86	20,431	200	17.7(0.9)	110(0.1)	1.24
	LA J 3	09/24/86	20,522	200	16.3(0.7)	109(0.1)	1.22
	LA J 2	04/01/87	20,194	342	25.9(0.6)	128(0.9)	1.16
	LA J 4	04/01/87	20,415	316	24.8(0.4)	127(0.2)	1.17
Rapid River:							
Lookingglass Hatchery							
	LD J 2	05/20/87	20,303	498	12.6(0.3)	102(0.1)	1.14
	LD J 4	05/20/87	20,375	498	12.6(0.3)	102(0.1)	1.14
Summer steelhead:							
Wallowa Hatchery							
	RD J 1	04/25-27/87	14,485	137	126.5(2.9)	232(1.6)	0.99
	LD J 1	04/25-27/87	14,638	102	122.0(3.2)	229(1.9)	0.99
	LD J 3	04/25-27/87	14,598	152	97.4(2.3)	213(1.6)	0.98
	RD J 3	04/25-27/87	14,534	87	95.0(3.1)	212(2.2)	0.97
Imnaha:							
Little Sheep Creek							
	RD J 4	05/01-04/87	15,660	547	89.9(3.7)	201(3.4)	1.01
	LD J 4	05/01-04/87	15,642	547	89.9(3.7)	201(3.4)	1.01

^a Samples are composed of replicate groups of approximately 100 fish.
^b Standard deviations of all mean condition factors are ≤ 0.01 .

Table 28. Recovery information for cold-branded Carson stock chinook salmon released from Lookingglass Hatchery and recaptured at Lower Granite Dam in 1986, 1984 brood.

Brand	Date of release	Estimated number recovered (observed)	Percent of number released	Cumulative percent recovered by Julian week									
				14	15	16	17	18	19	20	21		
RA J 1	09/18/85	159(15)	0.8	35.2	80.5	86.8	93.1	100					
RA J 3	09/18/85	333(29)	1.7	44.1	91.6	96.7	96.7	96.7	100				
RA J 2	04/02/86	3,746(369)	18.8	14.6	54.1	78.5	93.7	99.4	99.7	100			
RA J 4	04/02/86	2,593(268)	13.0	3.5	26.9	60.2	88.6	99.3	99.3	99.7	100		

Table 29. Recovery information for cold-branded Mallowa and Imnaha stock summer steelhead recaptured at Lower Granite Dam in 1986, 1985 brood.

Stock, brand	Average size at release (g/fish)	Estimated number recovered (observed)	Percent of number released	Cumulative percent recovered by Julian week														
				18	19	20	21	22	23	24	25	26	27					
Mallowa:																		
RA J 1	120.0	1,915(117)	12.9	0	7.2	12.3	53.2	91.0	94.3	98.2	99.3	99.3	100					
RA J 3	110.6	1,633(95)	11.0	0.7	14.0	18.7	44.3	80.8	96.6	98.7	100							
LA J 1	85.6	987(58)	6.6	0	3.3	7.8	34.0	78.3	87.7	91.1	96.7	98.9	100					
LA J 3	81.0	553(31)	3.7	0	8.3	14.3	33.5	73.4	87.9	92.0	94.0	100						
Imnaha:																		
RA J 2	82.5	922(5)	7.0	0	5.9	13.0	29.5	61.5	93.8	98.8	98.8	100						
RA J 4	82.5	1,626(84)	12.3	0	11.0	18.1	46.4	83.8	95.8	95.8	99.3	100						

Table 30. Estimated catch statistics for summer steelhead in the Grande Ronde River, section 1 (Wildcat Creek to Troy), from 1 September to 31 December 1986. Total catch includes 95% confidence interval. Catch rates for total month and season are weighted by total hours fished within each component stratum.

Month, day type	Days sampled	Available days in stratum	Total hours fished	Total catch ± 8	Number harvested	Catch rate (hours/fish)	Estimated angler days
September:							
Weekday	6	22	165.5	38 ± 8	0	4.4	52
Weekend	4	8	319.6	19 ± 32	0	16.8	73
Total	10	30	485.1	57 ± 31	0	12.5	125
October:							
Weekday	8	23	340.3	38 ± 33	17	9.0	155
Weekend	4	8	453.3	101 ± 97	4	4.5	69
Total	12	31	793.6	139 ± 98	21	6.4	224
November:							
Weekday	6	18	354.3	23 ± 21	0	15.4	142
Weekend	5	12	407.5	28 ± 25	3	14.6	204
Total	11	30	761.8	51 ± 32	3	15.0	346
December:							
Weekday	4	22	194.8	25 ± 45	6	7.8	108
Weekend	3	9	395.4	67 ± 56	15	5.9	101
Total	7	31	590.2	92 ± 71	21	6.5	209
Season Total	40	122	2,630.7	339 ± 128	45	10.0	904

Table 31. Estimated catch statistics for summer steelhead in the Grande Ronde River, section 2 (Troy to Oregon/Washington state line), from 1 September to 31 December 1986. Total catch includes 95% confidence interval. Catch rates for month and season are weighted by total hours fished within each component stratum.

Month, day type	Days sampled	Available days in stratum	Total hours fished	Total catch	Catch rate (hours/ fish)	Estimated angler days
September:						
Weekday	6	22	300.2	45 ± 47	6.7	131
Weekend	4	8	463.1	12 ± 14	38.6	89
Total	10	30	763.3	57 ± 49	26.1	220
October:						
Weekday	8	23	422.9	51 ± 33	8.3	192
Weekend	4	8	492.1	49 ± 64	10.0	149
Total	12	31	915.0	100 ± 69	9.2	341
November:						
Weekday	6	18	115.1	5 ± 6	23.0	46
Weekend	5	12	237.4	22 ± 34	10.8	140
Total	11	30	352.5	27 ± 33	14.8	186
December:						
Weekday	4	22	12.0	3 ± 5	4.0	7
Weekend	3	9	161.4	43 ± 41	3.8	28
Total	7	31	173.4	46 ± 40	3.8	35
Season Total	40	122	2,204.2	230 ± 99	15.5	782

Table 32. Estimated catch statistics for summer steelhead in the Wallowa River during February, March, and April 1987. Total catch and number of fish harvested includes 95% confidence interval. Catch rates for total month and season are weighted by total hours fished within each component stratum.

Month, day type	Days sampled	Available days in stratum	Total hours fished	Total catch	Number harvested		Catch rate (hours/fish)	Estimated angler days
					Adipose clipped	Short dorsal fin		
February:								
Weekday	6	18	1,501.8	51 ± 45	17 ± 21	25 ± 21	29.4	560
Weekend	4	10	2,216.8	91 ± 81	6 ± 11	22 ± 23	24.4	598
Total	10	28	3,718.6	142 ± 91	23 ± 23	47 ± 31	26.4	1,158
March:								
Weekday	7	22	10,048.7	1,095 ± 199	40 ± 82	211 ± 87	9.2	2,404
Weekend	4	9	6,009.1	418 ± 251	34 ± 40	169 ± 108	14.4	1,081
Total	11	31	16,057.8	1,513 ± 317	74 ± 91	380 ± 137	11.1	3,485
April:								
Weekday	3	11	4,808.8	613 ± 221	31 ± 23	48 ± 58	7.8	1,266
Weekend	2	4	2,638.0	253 ± 178	10 ± 18	28 ± 82	10.4	467
Total	5	15	7,446.8	866 ± 266	41 ± 27	76 ± 91	8.7	1,733
Season Total	26	74	27,223.2	2,521 ± 675	138 ± 98	503 ± 166	12.5	6,376

Table 33. Estimated catch statistics for summer steelhead in the Imnaha River during October and November 1986, and March 1987. Total catch includes 95% confidence interval. Catch rates for month and season are weighted by total hours fished within each component stratum.

Month, day type	Days sampled	Available days in stratum	Total hours fished	Total catch	Catch rate (hours/fish)	Estimated angler days
October:						
Weekday	3	23	53.7	8 ^a ± 11	7.0	15.3
Weekend	4	8	0	0	--	--
Total	7	31	53.7	8 ^a ± 11	7.0	15.3
November:						
Weekday	5	18	46.8	0	--	14.4
Weekend	4	12	52.5	3 ± 4	17.5	27.0
Total	9	30	99.3	3 ± 4	33.1	41.4
March:						
Weekday	4	22	1,001.6	121 ± 156	8.3	269.5
Weekend	4	9	645.5	68 ± 98	9.6	177.7
Total	8	31	1,647.1	189 ± 183	9.0	447.2
Season Total	24	92	1,800.1	200 ± 183	10.3	503.9

^a Catch expanded from one adipose-clipped fish caught and released.

Grande Ronde and Imnaha subbasin production reports (Carmichael₁ et al. 1986a, 1986b; Carmichael et al. 1987a, 1987b) for spring chinook salmon and summer steelhead were completed by the spring 1987. These reports were printed and distributed in October 1987 and are available upon request.

Catch statistics for summer steelhead fisheries on the Grande Ronde, Wallowa, and Imnaha rivers are presented in Tables 30, 31, 32, and 33. A summary of angler origin for each river is presented in Table 34.

Table 34. Origin of steelhead anglers as determined from creel surveys conducted during fall 1986 and spring 1987 on the Grande Ronde, Wallowa, and Imnaha rivers.

River	Anglers interviewed	Angler origin (%)		
		Wallowa and Union counties	Other Oregon residents	Out-of-state
Grande Ronde	332	78.6	11.5	9.9
Wallowa	1,264	85.0	12.8	2.2
Imnaha	213	84.2	12.8	3.0

No IHNV was detected in progeny from broodstock diagnosed positive for the presence of IHNV (Table 25) during rearing at Irrigon Hatchery and fish were acclimated and released at Wallowa Hatchery as scheduled.

Discussion

Fish Culture Monitoring

We have experienced high egg losses for Imnaha chinook salmon each year since the program began in 1982 and egg losses for the 1986 brood were similar to previous years. Extra care and caution was taken by hatchery personnel in spawning, handling, and transporting eggs from Imnaha to Lookingglass Hatchery, but this did not reduce the mortality. Apparently we will have to plan for annual egg losses of 25% with Imnaha River chinook.

We are presently in the process of switching from Carson stock to Rapid River stock for the Grande Ronde chinook salmon program. We have chosen to switch because the Rapid River stock is a known upper Snake River stock and is thought to have better capability to reproduce naturally in the Grande Ronde basin. In 1986 we obtained 897,000 eggs of Rapid River stock from Pahsimeroi Hatchery. At Lookingglass Hatchery 636,000 eggs were taken in 1986 to serve as backup to the Rapid River stock. The Lookingglass stock, which is primarily progeny from Carson stock releases, will be used for outplanting in the upper Grande Ronde basin until we achieve full smolt production with Rapid River stock.

We began an experimental rearing program at Irrigon Hatchery with 1986 brood Rapid River chinook salmon to determine the feasibility and effectiveness of subyearling spring chinook salmon smolts. To accelerate development we placed 180,000 eggs in incubation at 15°C. We experienced high egg and fry loss. Overall survival from egg to smolt was 23.8%. We placed additional fry that were hatched at Lookingglass Hatchery in the experimental rearing program to provide for production of 173,768 smolts that were released at a size of 12.7 grams in mid-May at Lookingglass Hatchery. We planned to achieve an average size of 23.0 grams by 1 May, however the constraints of water temperature and the need to handle fish for marking may preclude achieving the desired size.

We continued to use multiple release strategies for chinook salmon at Lookingglass Hatchery in 1986-87. We released presmolts in early summer and in fall, yearling smolts of the Rapid River and Lookingglass stock in spring, and zero-age Rapid River smolts in spring. Before 1987 all smolts produced at Lookingglass Hatchery had been released at the hatchery, at Big Canyon Creek, and in Catherine Creek. In 1987, smolts from Lookingglass were released into the upper Grande Ronde River for the first time. Lookingglass Hatchery produced 73,399 lb of 1985 brood smolts for the Grande Ronde basin, exceeding the original program goal of 45,000 lb (900,000 smolts at 20 fish/lb). This increased poundage resulted from releasing smolts in the spring that were substantially larger than 20 fish/lb and using pond space originally scheduled to rear Imnaha stock chinook salmon. Smolts of the 1985 brood Rapid River stock were all released at Lookingglass Hatchery to begin development of this stock for our Grande Ronde chinook salmon program. All Rapid River stock smolts were RV fin marked for broodstock identification.

We encountered serious disease problems with spring chinook salmon in 1986-87. The 1985 brood Rapid River and Imnaha chinook salmon were diagnosed with EIBS in January 1987. Fish remained infected throughout the spring and were released with high levels of blood inclusions and anemia. Because this was the first observation of this virus in Imnaha chinook salmon, the 1985 brood smolts were released at Lookingglass Hatchery instead of the Imnaha River. All smolts were LV fin marked just prior to release to allow for broodstock identification. Adults that return to Lookingglass in 1989 and 1990 may have to be hauled to the Imnaha facility for holding and spawning because adult holding space at Lookingglass Hatchery will be needed for Rapid River and Lookingglass stock adults. IHNV levels were low in the Lookingglass and Imnaha adults in 1986 with only one family group infected in each stock.

We installed the weir at Imnaha in 1986 earlier than in any previous years in an attempt to capture adults from the early in the run. In 1986, adults from our first hatchery releases returned. Few hatchery fish returned, however, hatchery fish returned later than wild fish. By 12 August 66.2% of the wild fish had been trapped while only 27.6% of the hatchery fish had been trapped. Tagging studies conducted from 1947 to 1965 indicated that both summer chinook and spring chinook salmon were present in the Imnaha system (Galbreath 1966). If summer chinook salmon are present in the Imnaha system we are most likely developing our hatchery broodstock from the summer race because of our broodstock collection timing over the past 5 years. Our goal for the Imnaha chinook salmon hatchery stock is to

maintain genotypic variation and life history characteristics identical to the wild stock and to maintain the characteristics of the wild population. To accomplish this we must at a minimum (1) obtain eggs from all components of the run; (2) infuse wild gametes into the hatchery stock annually; (3) allow a random cross section of adults to pass and spawn above the weir site; and (4) use spawning strategies that maximize genetic variation. We have been unable to accomplish this because of the inability to capture early returning adults. When the permanent facility is completed we will be better able to trap fish from the beginning through the end of the run.

The return rate for the 1982 brood hatchery chinook salmon smolts released into the Imnaha River through four-year-old return was poor (0.14%). Fourteen jacks returned in 1985 and only 21 four-year-old fish returned in 1986. Typically, jacks compose only a small proportion of the return. The ratio of jacks to four-year-old fish for the 1982 brood hatchery fish was unusually high. Adult return to Lookingglass Hatchery was down considerably from 1985, but was higher than 1982-84. The jack return was greater in 1986 than in any previous years indicating a strong return for 1987.

The number of eggs taken for the 1986 and 1987 brood Wallowa stock steelhead exceeded our program goals. Severe egg loss occurred both years at Wallowa Hatchery, and we actually needed more green eggs than originally anticipated. Egg losses were attributed to air bubble problems in the incubation trays, human errors, and to unknown causes. We achieved the egg take goal for the Imnaha summer steelhead program at Little Sheep Creek for the first time in 1987. We experienced high egg loss in 1987 for similar reasons that were described for the Wallowa stock.

Wild steelhead adults were collected at Big Canyon Creek and Lookingglass Hatchery in 1987 to start a new broodstock for the Grande Ronde steelhead program. We had planned to evaluate the difference in adult movement and in fishery contribution patterns between the Wallowa Hatchery stock and the wild stock. We did not achieve our egg take goal of 100,000 and insufficient smolts were produced to conduct the evaluation. We achieved our Wallowa stock steelhead smolt production goal for the Grande Ronde basin for the first time in 1987. A total of 1.5 million steelhead smolts were produced at Irrigon Hatchery. This exceeded the program goal of 1.35 million. In addition, 52,000 smolts were released into the lower Grande Ronde River in Oregon from Washington Department of Wildlife's Lyons Ferry Hatchery. Steelhead smolt releases into the Imnaha basin in 1987 were less than one-third of the production goal of 330,000.

The adult steelhead return to Wallowa Hatchery in 1987 was the highest on record. Fish in excess of broodstock needs were outplanted throughout the Grande Ronde basin. Wild steelhead escapement, based on redd counts, in the Grande Ronde basin from 1985 to 1987 (West 1985-87; Witty 1985-87) was the highest observed since 1967. Wild populations appear healthy and somewhat stable and do not need extensive supplementation. Adults should be outplanted only in streams that are severely underseeded or without natural production. Smolt releases should be made in areas that will provide maximum contribution to recreational fisheries. The genetic risks to the endemic steelhead population associated with extensive smolt and adult

outplanting into spawning tributaries may outweigh the potential natural production benefits. Until we develop a better understanding of the benefits and costs of outplanting hatchery fish into healthy populations of wild fish we should proceed cautiously.

IHNV was detected in 21% and 1.5% of the steelhead family groups spawned at Wallowa Hatchery in 1986 and 1987 respectively. Because of a high egg loss in 1986, we were forced to rear a majority of the eggs from the IHNV positive parents to meet the production goal. In 1987 we reared progeny from positive parents until the fry reached an average weight of 3 gr at which time they were destroyed. No virus was detected in either the 1986 or 1987 broods that were progeny from IHNV positive parents.

More adult steelhead returned to Little Sheep Creek in 1987 than in any previous year; however, only 15.1% of the adults were of wild origin. We developed broodstock collection strategies in 1987 to ensure that natural escapement above the weir site was adequate to seed available habitat (150 pairs minimum) and that a random cross section of adults were passed above the weir and used for hatchery broodstock. We achieved egg take goal and exceeded natural escapement goal. We used 22% of the wild females that returned to the weir for hatchery broodstock. In future years we plan to use a greater proportion of the wild fish as broodstock so that the genotypic variation and life history characteristics of the hatchery stock remain as similar as possible to the wild population.

Survival Studies

Studies of smolt to adult survival and juvenile outmigration performance focus on two objectives: (1) develop and recommend rearing and release strategies that will produce maximum survival to adult and (2) estimate annual adult production that results from LSRCP smolt releases in Oregon. We began hatchery effectiveness studies with spring chinook salmon at Lookingglass Hatchery with the 1983 brood. Few jacks returned from the 1983 brood release. We were unable to estimate total adult production (catch and escapement) for the 1986 run because so few adults were produced from the releases at Lookingglass Hatchery. Ocean and in-river exploitation rates are considered low; therefore, total adult production that resulted from releases in the Grande Ronde basin could not have been much greater than the escapement to Lookingglass Hatchery (394 fish). Adult return that resulted from hatchery smolts released in the Imnaha for the 1982 brood was poor. Thirteen hatchery jacks returned in 1985 and only 21 four-year olds returned in 1986. This is an unusually low number of adults in proportion to the jack return. The number of smolts released into the Imnaha in 1987 was the largest to date, yet it was far below the goal of 490,000.

We released our first groups of cold branded spring chinook salmon and summer steelhead smolts for outmigration performance evaluation in 1986. The cumulative passage index at Lower Granite Dam for spring chinook salmon smolts released in the spring was approximately 13 times greater than the index for fish released in the fall. The migration timing at Lower Granite Dam for fish released in the spring was 2 weeks later than the timing of fish released in the fall.

Release of marked 1986 brood summer steelhead at Wallowa Hatchery represented the second year of size-at-release comparisons. The first marked adults from the 1985 brood release will return in 1988. We were unable to estimate total adult production for summer steelhead from the 1986-87 run year because no Wallowa stock or Imnaha stock steelhead of the 1983 or 1984 broods were marked. The passage index at Lower Granite Dam for summer steelhead released at an average size of 124.5 gr/fish was 2.3 times greater than the index for fish released at an average size of 96.9 gr/fish.

Natural Escapement Monitoring

We have expanded the traditional chinook salmon index surveys in an attempt to estimate total redds in the Grande Ronde and Imnaha basins. We are preparing a comprehensive progress report of methods and results of the spawning ground surveys conducted in 1986 and 1987. The original focus of our natural escapement studies was primarily to identify the degree of straying of hatchery fish into the Wenaha and Minam rivers, which are managed for wild fish production. In 1986 the first marked adults from releases at Lookingglass Hatchery returned to the the Grande Ronde basin. Three Ad+CWT adults were recovered on the Minam River, representing 11.1% of all Ad+CWT adults that were recovered in the basin. Although the sample size was extremely small we must be concerned with this level of straying, particularly in future years when hatchery escapements approach mitigation goals. We plan to continue the spawning ground survey study through 1990 at which time we will make recommendations for future spawning survey efforts.

Creel Surveys

The steelhead fishery in 1986 in the Grande Ronde and Imnaha river basins was the first consumptive steelhead fishery in these basins since 1974. The Imnaha and Wallowa rivers had been closed to steelhead angling since 1974, and the Grande Ronde had been opened only for catch-and-release from the mouth to Wildcat Creek during the fall since 1983. Areas in all three rivers were opened to allow harvest of steelhead with adipose fin marks. Special emergency regulations to allow harvest of unmarked steelhead with dorsal fins less than 2 inches in height and a season extension to 15 April from 31 March were adopted on the Grande Ronde and Wallowa rivers in February 1987 to harvest surplus hatchery steelhead destined for Wallowa Hatchery.

We anticipated increased angling effort in 1986 in the fall fishery on the lower Grande Ronde River because of new regulations that allowed harvest of hatchery fish. We did not see a substantial increase in effort. Few hatchery fish were caught, especially from September through November. Hatchery fish composed a larger percentage of catch (27.8%) in December than in any other month. One of the primary management objectives for the Wallowa Hatchery stock is to contribute to the fall fishery in the Troy area. Traditionally, fishing for indigenous steelhead has been best in the month of September through November in the Troy area. During 1985 and 1986 catch rates for wild fish were high in the fall; however, catch rates for

hatchery fish were poor. We are concerned that the movement and holding pattern of the Wallowa Hatchery stock is different than that of the wild stock. The hatchery stock was developed primarily from late returning fish of unknown origin that were taken from mainstem Snake River dams in the spring. The hatchery fish appeared to be moving up the Grande Ronde later in the year than some wild fish. Because of our concerns with the Wallowa stock, we proposed additional studies to further evaluate the movement and migration pattern of adult Wallowa stock steelhead. We developed a study proposal with Washington Department of Wildlife biologists in the summer of 1987 to conduct telemetry studies on adult steelhead in the Snake and Grande Ronde rivers. This study was funded and results should be available by fall 1988.

Angler effort in February and March on the Wallowa River in 1987 increased 112% over effort in 1986. Catch rate was better in March and in April than in February. The angler effort and catch rate indicate that the potential exists for extensive harvest in the Wallowa River from Minam to the Lostine River. A substantial unsurveyed catch occurred in the Rondowa area. We plan to conduct a limited creel survey in the Rondowa area in 1988.

Angling pressure was low and few fish were caught during the fall on the Imnaha River. Catch estimates from angler catch record returns for the late 1960s and 1970s indicated that substantial harvest occurred during the fall. We believe that in the past two years fish have not moved into the Imnaha during the fall, but have remained in the Snake River.

Planning

See Carmichael, et al. (1986a, 1986b), and Carmichael et al. (1987a, and 1987b) for discussion.

Disease Investigation

IHNV was detected in steelhead for the first time in 1985 at Little Sheep Creek and Wallowa Hatchery. We destroyed 208,000 eggs, many of which were from wild fish at Little Sheep Creek. This study was begun by ODFW pathologists to determine if we could rear progeny from IHNV infected adults in virus free water at Irrigon Hatchery and to compare the IHNV carrier rates between progeny of IHNV positive parents and progeny of IHNV negative parents. We completed rearing the 1986 brood to the release stage and reared the 1987 brood Imnaha and Wallowa stock to 150 fish/lb without any incidence of IHNV. One-salt adults from the 1986 brood release will return to Wallowa Hatchery in 1989. The pathology staff will individually sample each Ad-LV+CWT adult to determine IHNV carrier rate for the positive progeny and for the negative progeny. We will develop a better understanding of the relationships between IHNV carrier rate and progeny carrier rate after adult return is completed for the 1986 brood.

EVALUATION OF THE BENEFITS PROVIDED BY RELEASING SPRING CHINOOK SALMON PRESOLTS IN THE GRANDE RONDE RIVER AND ITS TRIBUTARIES

Introduction

Surplus chinook salmon eggs are taken each year to assure that smolt production goals are achieved at Lookingglass Hatchery. Now that we are attempting to switch our broodstock from Carson stock to Rapid River we will be requesting eggs from Idaho to meet full program for the Grande Ronde. We will continue to take enough eggs from returning adults at Lookingglass to meet full production in case Idaho is not able to meet our request. Surplus fish were released as presmolts in 1984, 1985, and 1986. In 1984 we released presmolts into Catherine Creek, the upper Grande Ronde River, and Lookingglass Creek. In 1985 and 1986 presmolts were released only into Lookingglass Creek. We have marked presmolts each year to determine if they contribute to catch and escapement. The objectives and tasks are described in the summary section of this report and in the five-year study plan (Carmichael 1987).

Methods

Replicate groups of presmolts were marked Ad+CWT and released into Lookingglass Creek. Marked adults from the first presmolt release of the 1983 brood returned in 1987.

Results and Discussion

We released 88,543 presmolts on 17 July in Lookingglass Creek (Table 22) and 37,760 presmolts on 19 July in Catherine Creek. These fish were progeny of adults that returned to Lookingglass Hatchery in 1985. Release information for marked fish that were released into Lookingglass Creek was presented in Table 22. One marked jack from 1983 brood presmolts returned to Lookingglass in 1986.

EVALUATION OF THE BENEFITS PROVIDED BY REPROGRAMMING SPRING CHINOOK SALMON SMOLTS FROM LOWER COLUMBIA RIVER HATCHERIES

Introduction

When we started this project in 1984 a great deal of planning was underway to reprogram lower Columbia River hatcheries to produce more chinook salmon for release in upriver areas. The reprogramming was never carried out and few chinook salmon smolts were reared at lower Columbia River hatcheries and released in upriver areas. In Oregon, Carson stock spring chinook salmon of the 1983, 1984, and 1985 broods were reared at Bonneville or Oxbow hatcheries and were released in the Grande Ronde basin.

This program was discontinued after the 1985 brood, and we have no immediate plans to begin the program again. New hatchery facilities, in addition to LSRCP hatcheries, may be constructed in the future to provide additional chinook salmon production for northeast Oregon streams.

We are evaluating the contribution of smolts that were reprogrammed to LSRCP areas to determine if LSRCP hatcheries have met mitigation goals and to determine the effectiveness of releasing smolts from lower river hatcheries into upriver areas. The objectives and tasks for this project are described in the summary section of this report and in the five-year study plan (Carmichael 1987).

Methods

We marked Ad+CWT two groups of 40,000 1985 brood Carson stock chinook at Bonneville Hatchery. These fish were transferred from Bonneville Hatchery to Lookingglass Hatchery and then were released in Big Canyon Creek.

Results and Discussion

We released 172,962 of the 1985 brood Carson stock chinook salmon smolts that were reared at Bonneville in the Grande Ronde Basin. Marked fish (CWT codes 07 39 56 and 07 39 57) were released at the Big Canyon Creek facility, and 88,607 unmarked fish were released in Catherine Creek. Releases of the 1983 brood represented the third year that fish from Bonneville and Oxbow were released in the Grande Ronde basin. We expected jacks to return to Lookingglass in 1986 from fish that were released in the fall of 1984, however, no marked jacks from reprogrammed releases were recovered. We do not have plans to release reprogrammed fish again. Work on this project will involve recovering marked adults and summarizing catch and escapement information.

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