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# PROGRESS REPORTS

1995



## FISH DIVISION

### Oregon Department of Fish and Wildlife

Summer Steelhead Creel Surveys on the Grande Ronde, Wallowa, and Imnaha Rivers for the 1994-95 Run Year

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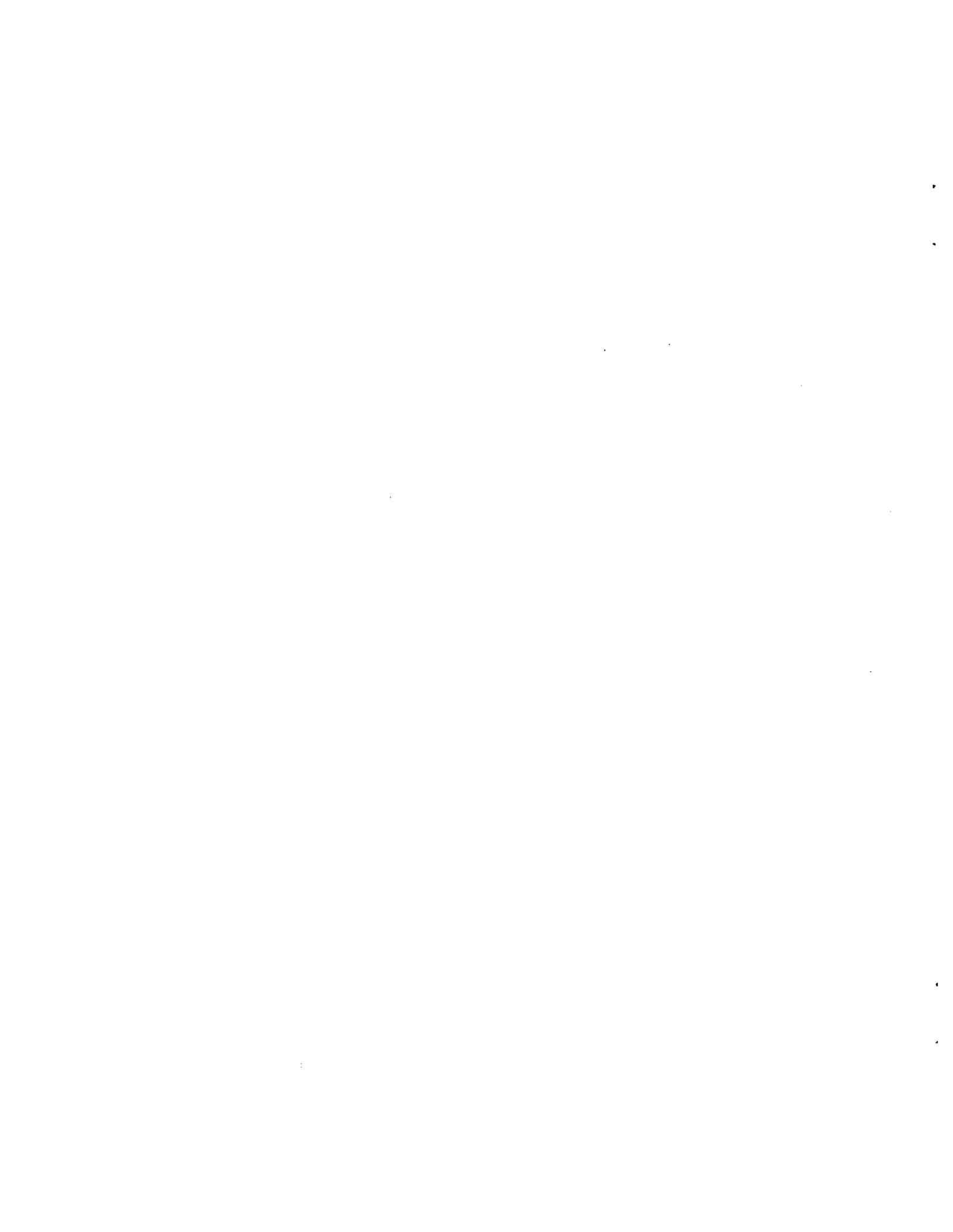
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Lower Snake River Compensation Plan.



## PREFACE

This report is for the funding period 1 April 1994 to 31 March 1995. The sampling period was from 1 September 1994 to 15 April 1995. The report summarizes statistical angler surveys conducted during the summer steelhead angling season in major fishing areas on the Grande Ronde, Wallowa, and Imnaha rivers. Hatchery adults harvested during the 1994-95 run year are primarily from the 1991 and 1992 brood years. Results of creel surveys conducted prior to fall 1994 are reported in previous LSRCP evaluation annual reports (Carmichael et al. 1986, 1988, 1989a, 1989b and 1991; Flesher et al. 1992, 1994a, 1994b and 1995). The steelhead angling season surveyed in this report, during which only adipose-clipped fish could be kept, was open from 1 September 1994 to 15 April 1995 in the Grande Ronde and Imnaha basins.



## Acknowledgements

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## SUMMARY

### Objectives

1. Estimate angler effort in hours and days for summer steelhead fisheries in the Grande Ronde and Imnaha basins.
2. Estimate total catch, catch rate, and number of fish harvested in summer steelhead fisheries in the Grande Ronde and Imnaha basins.
3. Estimate, by month, the percentage of hatchery summer steelhead in the total catch.
4. Determine the length frequency and sex composition of the fish that were caught.
5. Estimate, by tag code, the number of adipose-left ventral clipped plus coded-wire-tagged (AdLV+CWT) marked summer steelhead harvested.
6. Determine residence of anglers in summer steelhead fisheries in the Grande Ronde and Imnaha basins.
7. Compare historic estimates of catch rate, harvest, and angler effort with the 1994-95 run year estimates for the summer steelhead fishery on the Grande Ronde, Wallowa, and Imnaha rivers combined.
8. Examine exploitation of Grande Ronde and Imnaha basin steelhead outside and within the LSRCP compensation area and determine if it has changed over time.

### Accomplishments and Findings

On the lower Grande Ronde River, we estimated that 1,248 anglers fished for 6,363 hours from 1 September 1994 through 15 April 1995. They caught and released an estimated 150 wild and 45 hatchery steelhead and kept an estimated 107 hatchery steelhead. The catch rate index averaged 21 hours per fish. The percentage of steelhead caught that were hatchery fish ranged from 0% in September 1994 to 100% in December 1994. Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead was 594 mm ( $\pm 8$ ) for age 3 fish and 697 mm ( $\pm 9$ ) for age 4 or 5 fish. Age composition of harvested hatchery steelhead was 41% age 3 fish and 59% age 4 or 5 fish; the sex composition was 35% male and 65% female. Sixty-nine percent of the anglers were from Union or Wallowa counties, 13% were from other Oregon counties, 8% were Washington residents, and 10% resided outside the states of Oregon and Washington.

On the upper Grande Ronde River, we estimated that 822 anglers fished for 2,043 hours from 16 February through 15 April 1995. They caught and released an estimated 24 wild and 30 hatchery steelhead and kept an estimated 27 hatchery steelhead. The catch rate index averaged 25 hours per fish. The percentage of steelhead caught that were hatchery fish ranged from 20% in April to 100% in February. Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead was 610 mm ( $\pm 34$ ) for age 3 fish and 670 mm for an age 4 or 5 fish. Age composition of harvested hatchery steelhead was 80% age

3 fish and 20% age 4 or 5 fish; the sex composition was 80% male and 20% female. Eighty-four percent of the anglers were from Union or Wallowa counties, 10% were from other Oregon counties, 5% were Washington residents, and 1% resided outside the states of Oregon and Washington.

At Rondowa, we estimated that 275 anglers fished for 1,769 hours from 1 March through 15 April 1995. They caught and released an estimated 44 wild and 17 hatchery steelhead and kept an estimated 61 hatchery steelhead. The catch rate index averaged 15 hours per fish. The percentage of steelhead caught that were hatchery fish ranged from 36% in April to 76% in March. Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead was 593 mm ( $\pm 11$ ) for age 3 fish and 680 mm ( $\pm 91$ ) for age 4 or 5 fish. Age composition of harvested hatchery steelhead was 77% age 3 fish and 23% age 4 or 5 fish; the sex composition was 36% male and 64% female. Seventy percent of the anglers were from Union or Wallowa counties, 29% were from other Oregon counties, 0% were Washington residents, and 1% resided outside the states of Oregon and Washington.

On the Wallowa River, we estimated that 3,957 anglers fished for 19,047 hours from 1 February through 15 April 1995. They caught and released an estimated 300 wild and 245 hatchery steelhead and kept an estimated 565 hatchery steelhead. The catch rate index averaged 17 hours per fish. The percentage of steelhead caught that were hatchery fish ranged from 61% in April to 80% in February. Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead was 583 mm ( $\pm 7$ ) for age 3 fish and 680 mm ( $\pm 19$ ) for age 4 or 5 fish. Age composition of harvested hatchery steelhead was 73% age 3 fish and 27% age 4 or 5 fish; the sex composition was 55% male and 45% female. Fifty-nine percent of the anglers were from Union or Wallowa counties, 36% were from other Oregon counties, 2% were Washington residents, and 3% resided outside the states of Oregon and Washington.

On the Imnaha River, we estimated that 219 anglers fished for 1,048 hours from 1 March through 15 April 1995. They caught and released an estimated 39 wild steelhead and kept an estimated 24 hatchery steelhead. The catch rate index averaged 17 hours per fish. The percentage of steelhead caught that were hatchery fish ranged from 16% in April to 61% in March. Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead was 579 mm ( $\pm 27$ ) for age 3 fish. Age composition of harvested hatchery steelhead was 100% age 3 fish; the sex composition was 67% male and 33% female. Ninety-one percent of the anglers were from Union or Wallowa counties, 6% were from other Oregon counties, 1% were Washington residents, and 2% resided outside the states of Oregon and Washington.

The summer steelhead fisheries in the Grande Ronde and Imnaha basins for the 1994-95 run year were generally poorer than in recent years. This may have been due, in part, to low hatchery adult returns to both basins for the third consecutive year. However, estimates of catch rate index and angler effort nearly reached historic levels whereas harvest exceeded historic levels for combined summer steelhead fisheries in the Grande Ronde and Imnaha basins.

The number of anglers from other Oregon counties has increased while the number of local (Union or Wallowa counties) and out-of-state anglers has not changed since surveys began in 1986. The highest number of other Oregon residents and out-of-state anglers has consistently been observed on the

residents and out-of-state anglers has consistently been observed on the Wallowa River.

We found that there has been no significant change in the percent of AdLV+CWT marked recoveries of Grande Ronde and Imnaha basin steelhead above and below Lower Granite Dam for the 1985 through 1990 brood years. We also found that although exploitation of summer steelhead in the Columbia River tribal net (Zone 6) fishery has steadily increased, total exploitation in the Columbia River (Zones 1-6) has decreased since the original LSRCP compensation goals were established.

### Management Implications and Recommendations

1. The 1994-95 summer steelhead fisheries in the Grande Ronde and Imnaha basins were generally poorer than in recent years, based on estimates of angler effort, catch, and catch rates. This may have been due, in part, to low adult returns to both the Grande Ronde and Imnaha basins for the third consecutive year. This suggests that the potential exists for improvements in angler effort, catch, and catch rate if adult returns increase to the Grande Ronde and Imnaha basins. Higher adult returns may be achieved by either increasing smolt releases, increasing smolt-to-adult survival, or decreasing out-of-basin exploitation.
2. However, the fishery during the 1994-95 run year was similar to the historic fishery for the Grande Ronde and Imnaha basins combined. Catch rate and hours of angler effort nearly reached historic levels and harvest exceeded historic levels.
3. The number of anglers from other Oregon counties has increased, while the number of local (Union or Wallowa counties) and out-of-state anglers has not changed since surveys began in 1986. An increase in steelhead returns to the Grande Ronde and Imnaha basins may increase the number of local and out-of-state anglers.
4. Exploitation of Grande Ronde and Imnaha basin summer steelhead stocks above and below Lower Granite Dam has not changed for the 1985-90 brood years and exploitation of summer steelhead stocks in the Columbia River has decreased over time. This suggests that exploitation is not preventing us from reaching Oregon's adult compensation goal, given that existing exploitation rates, similar to those estimated in this report, were considered in the development of the original LSRCP goals. Either by increasing smolt releases, or increasing smolt-to-adult survival, or decreasing out-of-basin exploitation, will we be able to consistently reach Oregon's LSRCP adult goals and enhance summer steelhead fisheries in the Grande Ronde and Imnaha basins in the future.
5. To improve estimates of exploitation of Grande Ronde and Imnaha basin hatchery stocks, especially in areas outside of the LSRCP compensation area (below Lower Granite Dam), ways to gather information on AdLV+CWT marked recoveries from unreported and unsampled fisheries, such as Drano Lake (mouth of Little White Salmon River) and the night fishery in the McNary Dam forebay, should be explored.

## INTRODUCTION

Summer steelhead (*Oncorhynchus mykiss*) fisheries in the Grande Ronde and Imnaha basins were closed in 1974. This closure was prompted by declining adult returns, as indicated by adult counts at Ice Harbor Dam on the Snake River (U.S. Army Corps of Engineers 1990) and low steelhead redd counts on index streams in the Grande Ronde and Imnaha basins (U.S. Fish and Wildlife Service 1991). The Lower Snake River Compensation Plan (LSRCP), initiated by Congress in 1976, was developed to compensate for losses of anadromous salmonids in the Snake River basin from construction of the four lower Snake River Dams built between 1962 and 1976. Thus, the focus of the LSRCP is above Lower Granite Dam (Rkm 173). One of the primary objectives of the LSRCP in Oregon is to restore historic recreational and tribal fisheries for summer steelhead in the Grande Ronde and Imnaha river basins (Carmichael 1989). Approximately 1.68 M smolts are released in Oregon each year during late April and early May in the Grande Ronde and Imnaha basins. These fish provide hatchery adult returns which contribute to recreational fisheries and may supplement natural spawning populations in northeast Oregon. Consumptive recreational fisheries for summer steelhead re-opened in 1986, in part as a result of increases in hatchery adult returns.

We began our creel surveys for summer steelhead during the fall of 1985 in both the Grande Ronde and Imnaha basins. The goal of the creel surveys is to provide annual harvest information needed to assess LSRCP compensation goals (Carmichael and Wagner 1983). Previously, total harvest was estimated only from angler punch card returns. This report summarizes results of creel surveys conducted during the fall of 1994 and spring of 1995 in the Grande Ronde and Imnaha basins. In addition, we compared the 1994-95 fishery with the historic fishery. Finally, there is concern among managers that increased exploitation of Grande Ronde and Imnaha basin hatchery steelhead, particularly in areas outside Oregon's LSRCP compensation area (below Lower Granite Dam), is preventing us from reaching the LSRCP adult goal and is having a negative affect on Grande Ronde and Imnaha basin sport fisheries and hatchery escapement. To address this concern, we examined exploitation of Grande Ronde and Imnaha basin hatchery steelhead stocks and whether it has changed since the original LSRCP goals were established. The Grande Ronde and Imnaha basins encompass the major steelhead fisheries in Oregon that occur in streams which drain into the Snake River upstream of Lower Granite Dam.

## STUDY AREA

Creel surveys on the Grande Ronde River were conducted on a 23.5 km section on the lower river from the Oregon-Washington state line (Rkm 62.3) to Wildcat Creek (Rkm 85.8) and an upper 39.2 km section from Highway 82 bridge at Island City (Rkm 255.6) to Meadow Creek (Rkm 294.8). Surveys on the Wallowa River were conducted on a 5.5 km section from its confluence with the Grande Ronde River at Rondowa (Rkm 0) to Howard Creek (Rkm 5.5) and a 49.4 km section from Minam State Park (Rkm 13.2) to the mouth of Trout Creek (Rkm 62.6) near Enterprise. Anglers who parked their vehicles at Minam State Park to fish at or just below the park were included in the survey. The area from below Minam State Park to Howard Creek is roadless and is not surveyed. The survey on the Imnaha River was conducted on the lower 31.5 km from its

confluence with the Snake River (Rkm 0) to the mouth of Big Sheep Creek (Rkm 31.5) near the town of Imnaha. These areas are shown in Figure 1.

## METHODS

### Angler Surveys

Generally, we followed the methods described by Carmichael et al. (1989a). We sampled 50% of the weekends/holidays and 30% of the weekdays during each month of each survey. Initially, sample days were chosen randomly. They were then adjusted so that, as much as possible, weekend days and holidays were represented equally and weekdays were represented equally. Each sample day, beginning with a randomly selected start time, the creel surveyor conducted a pressure count which involved driving a vehicle along the entire survey route while tallying all anglers and vehicles every three hours. Between pressure counts, the surveyor interviewed anglers recording descriptions of each angler or their vehicle and their residence, the number of hours they had fished and the number and species caught. They also sampled all harvested fish recording fork length, sex, fin clip, external tags and collected scale samples. If the fish was coded-wire-tagged, as indicated by an adipose fin clip and left ventral fin clip (AdLV+CWT), the surveyor excised the head behind the eye and placed it with an identification number in a plastic bag for later processing. The Imnaha River and Rondowa fisheries were surveyed using check stations where the surveyor parked their vehicle in a highly visible location and set up an angler check station sign. The check station was designed so that anglers leaving the fishery area during a sample day would stop voluntarily and the surveyor would interview each angler and sample all of their harvested fish.

From each creel survey, we estimated total catch, harvest, catch rate, angler effort in hours and days, the percent of hatchery fish in the catch, and the number of AdLV+CWT marked fish harvested (Carmichael et al. 1989a). In addition, we determined the age and sex composition and mean fork length of harvested fish, and the residence of anglers in each fishery. Catch rate is an index, expressed as hours per fish, which results in lower catch rates reflecting better angling success. The survey on the lower Grande Ronde River was from 1 September 1994 to 15 April 1995. The survey on the Wallowa River was from 1 February to 15 April 1995. The survey on the upper Grande Ronde River was from 16 February to 15 April 1995. The surveys at Rondowa and on the Imnaha River were from 1 March to 15 April 1995.

### Comparison to the Historic Fishery

To determine if the recreational steelhead fishery during the 1994-95 run year reached or exceeded historic fishery levels, we compared catch rate, harvest, and angler effort estimates to historic median estimates from the Grande Ronde, Wallowa, and Imnaha rivers combined (see Flesher et al. 1995).

### Exploitation of Grande Ronde and Imnaha Basin Steelhead

To examine exploitation of Grande Ronde and Imnaha basin steelhead stocks and determine if it has changed since the original LSRCP goals were established, we used (1) adult recoveries of AdLV+CWT marked hatchery steelhead outside and within the LSRCP compensation area, and (2) exploitation

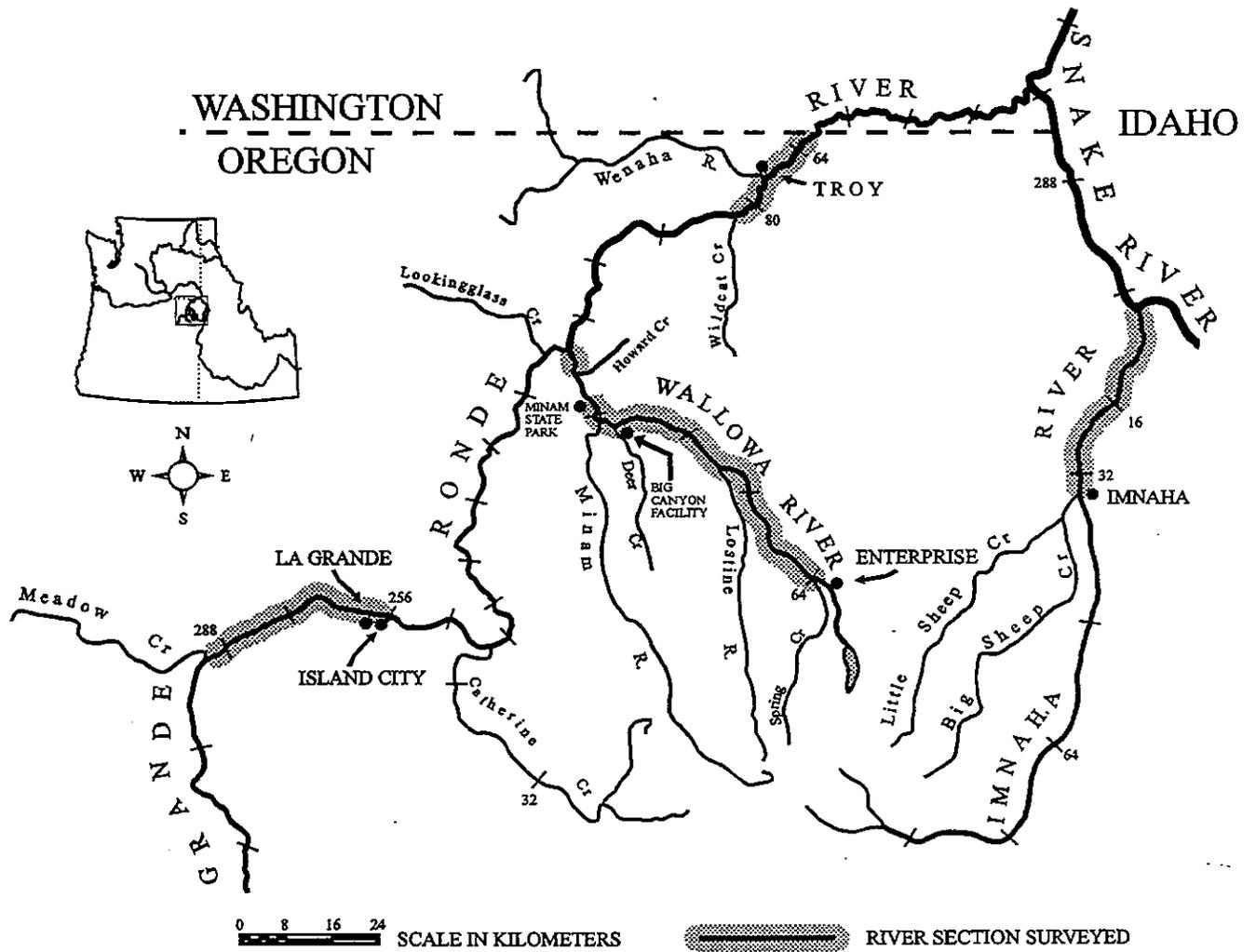


Figure 1. Map of northeastern Oregon showing where summer steelhead creel surveys were conducted in the Grande Ronde and Imnaha basins during the 1994-95 run year.

of summer steelhead in the Columbia River (Zones 1-6) over time. Within Oregon, the LSRCP compensation area is upstream of Lower Granite Dam, and focuses on the Grande Ronde and Imnaha basins (Carmichael 1989). Recovery areas outside Oregon's LSRCP compensation area (below Lower Granite Dam) include escapement to hatcheries or traps, and fisheries in the ocean, Columbia and lower Snake River and their tributaries. Recovery areas within the compensation area include escapement to the hatchery of release, escapement to other hatcheries or traps, sport fisheries in the Grande Ronde and Imnaha basins, and sport fisheries in the Snake River and other tributaries. Most recovery information was downloaded from the Pacific States Marine Fisheries Commission (PSMFC) database. Data not available from PSMFC included the Snake River sport fisheries in Washington and Idaho, which were gathered from Washington Department of Fish and Wildlife (Art Viola, Dayton, WA, personal communication) and Idaho Department of Fish and Game (Kent Ball, Salmon, ID, personal communication). We examined acclimated groups representative of Wallowa and Imnaha production for the 1985 through 1990 brood years. These groups are considered to represent most of the hatchery production for the Grande Ronde and Imnaha basins. We averaged the percent recovered by area to estimate exploitation from each area and then tested whether average recoveries had changed for the 1985 to 1990 brood years. We used regression analysis to test if the slope of the regression line was significantly different from zero. Values were considered significantly different if  $P < 0.05$ .

To examine whether exploitation of Grande Ronde and Imnaha basin summer steelhead has changed since the original LSRCP goals were established, we used harvest as a percent of the upriver run of summer steelhead in the mainstem Columbia River for the years 1954-63, 1964-73, 1974-83, and 1984-94. We assumed that Grande Ronde and Imnaha basin stocks would be harvested at the same rate as other summer steelhead stocks in mainstem Columbia River fisheries. We also assumed that these years would represent before (1954-63), during (1964-73), and after (1974-83 and 1984-94) the time that the original LSRCP goals were established. We used counts of summer steelhead past Bonneville Dam (Rkm 236) and harvest of summer steelhead in the Columbia River below Bonneville Dam in Zones 1-5 as the estimated upriver run of summer steelhead. To estimate exploitation, we divided total harvest in Zones 1-5 and Zone 6 (harvest from Bonneville to McNary Dam) by the estimated upriver run. All data were obtained from Table 64 in Columbia River Fish Runs and Fisheries (ODFW and WDFW 1995). Fishery Zones 1 through 5 are sections of the mainstem Columbia River from the mouth to Bonneville Dam, and Zone 6 is the section of the mainstem Columbia River from Bonneville Dam to McNary Dam (Rkm 470).

## RESULTS

### 1994-95 Run Year

We sampled an average of 51.8% of the weekends/holidays and 29.7% of the weekdays during each month of each survey for a total of 165 sample days.

## Lower Grande Ronde River

We estimated that 1,248 anglers fished for 6,363 hours on the lower Grande Ronde River. They caught and released 150 wild and 45 hatchery steelhead and kept 107 hatchery steelhead for a catch rate index of 21 hours per fish (Figures 2-6, Appendix A-1). The percentage of steelhead caught that were hatchery fish ranged from 0% in September 1994 to 100% in December 1994 (Figure 7, Appendix B). Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead ranged from 593 mm ( $\pm 11$ ) for age 3 females to 704 mm ( $\pm 11$ ) for age 4 or 5 females (Table 1). Age composition of harvested hatchery steelhead was 41% age 3 fish and 59% age 4 or 5 fish; the sex composition was 35% male and 65% female (Table 1). On the lower Grande Ronde River, anglers harvested an estimated 20 adipose-left ventral clipped plus coded-wire-tagged (AdLV+CWT) marked steelhead from our hatchery releases, an estimated 4 AdLV+CWT marked steelhead that were coded-wire-tagged by the National Marine Fisheries Service (NMFS) as smolts in the Snake River at Lower Granite Dam, and an estimated 14 AdLV+CWT marked steelhead that were strays from Washington Department of Fish and Wildlife releases in the Tucannon River, Washington (Table 2). Sixty-nine percent of the anglers were from Union or Wallowa counties, 13% were from other Oregon counties, 8% were Washington residents and 10% resided outside the states of Oregon and Washington (Table 3).

## Upper Grande Ronde River

On the upper Grande Ronde River, we estimated that 822 anglers fished for 2,043 hours. They caught and released 24 wild and 30 hatchery steelhead and kept 27 hatchery steelhead for a catch rate index of 25 hours per fish (Figures 2-6, Appendix A-2). The percentage of steelhead caught that were hatchery fish ranged from 20% in April to 100% in February (Figure 7, Appendix B). Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead ranged from 610 mm ( $\pm 66$ ) for age 3 males to 670 mm for an age 4 or 5 male (Table 1). Age composition of harvested hatchery steelhead was 80% age 3 fish and 20% age 4 or 5 fish; the sex composition was 80% male and 20% female (Table 1). Anglers did not harvest any AdLV+CWT marked steelhead on the upper Grande Ronde River (Table 2). Eighty-four percent of the anglers were from Union or Wallowa counties, 10% were from other Oregon counties, 6% were Washington residents and 1% resided outside the states of Oregon and Washington (Table 3).

## Rondowa

At Rondowa, we estimated that 275 anglers fished for 1,769 hours. They caught and released 44 wild and 17 hatchery steelhead and kept 61 hatchery steelhead for a catch rate index of 15 hours per fish (Figures 2-6, Appendix A-3). The percentage of steelhead caught that were hatchery fish ranged from 36% in April to 76% in March (Figure 7, Appendix B). Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead ranged from 588 mm ( $\pm 18$ ) for age 3 females to 705 mm for an age 4 or 5 male (Table 1). Age composition of harvested hatchery steelhead was 77% age 3 fish and 23% age 4 or 5 fish; the sex composition was 36% male and 64% female (Table 1). At Rondowa, anglers harvested an estimated 6 AdLV+CWT marked steelhead from our hatchery releases (Table 2). Seventy percent of the anglers were from Union

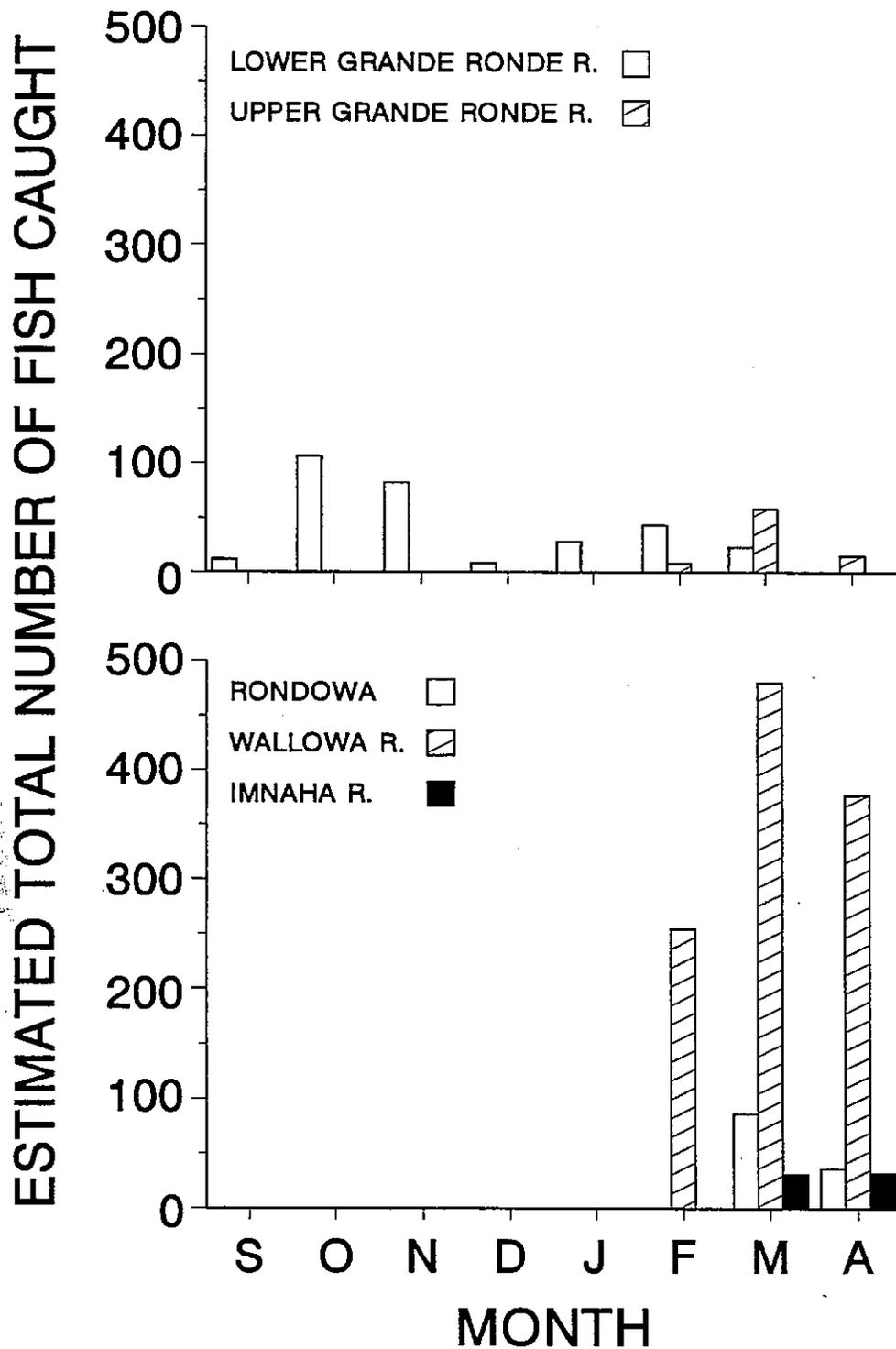


Figure 2. Estimated total catch of summer steelhead in the Grande Ronde and Imnaha basins during the 1994-95 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), Wallowa (1 February-15 April), upper Grande Ronde (16 February-15 April), and Rondowa and Imnaha (1 March-15 April).

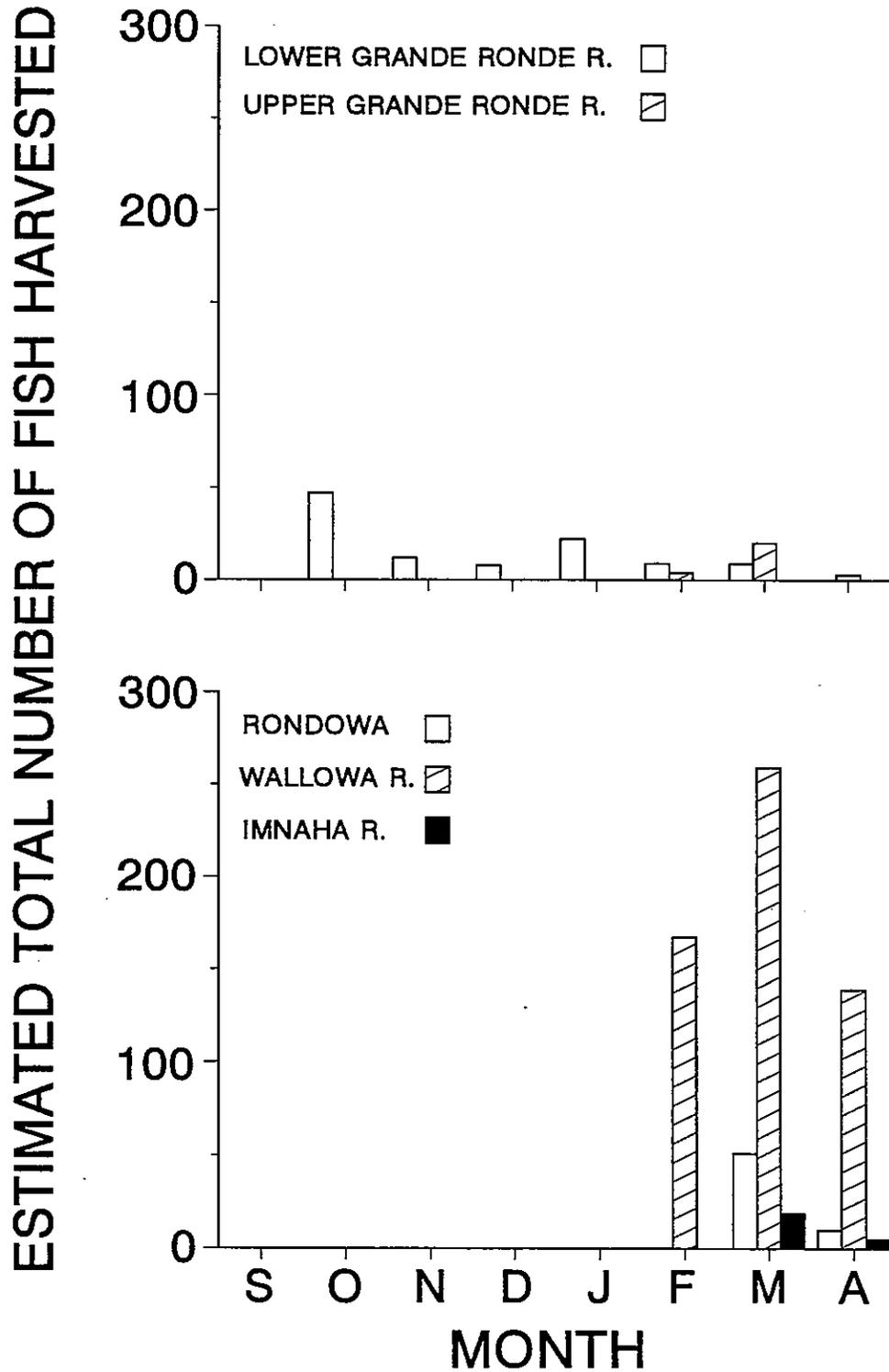


Figure 3. Estimated total harvest of summer steelhead in the Grande Ronde and Imnaha basins during the 1994-95 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), Wallowa (1 February-15 April), upper Grande Ronde (16 February-15 April), and Rondowa and Imnaha (1 March-15 April).

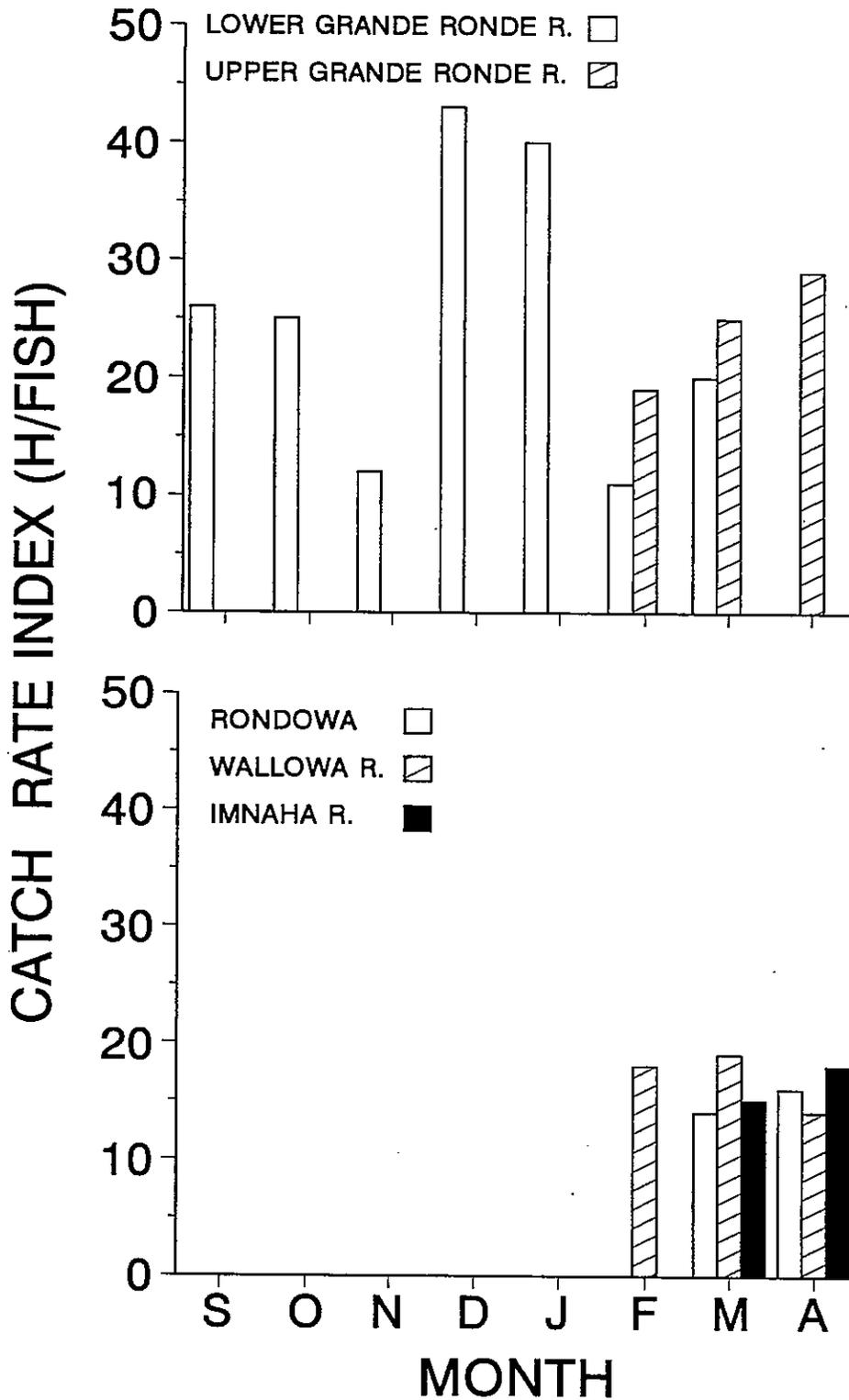


Figure 4. Estimated catch rate index (h/fish) for summer steelhead in the Grande Ronde and Imnaha basins during the 1994-95 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), Wallowa (1 February-15 April), upper Grande Ronde (16 February-15 April), and Rondowa and Imnaha (1 March-15 April). *Note: A lower catch rate index implies better angling success.*

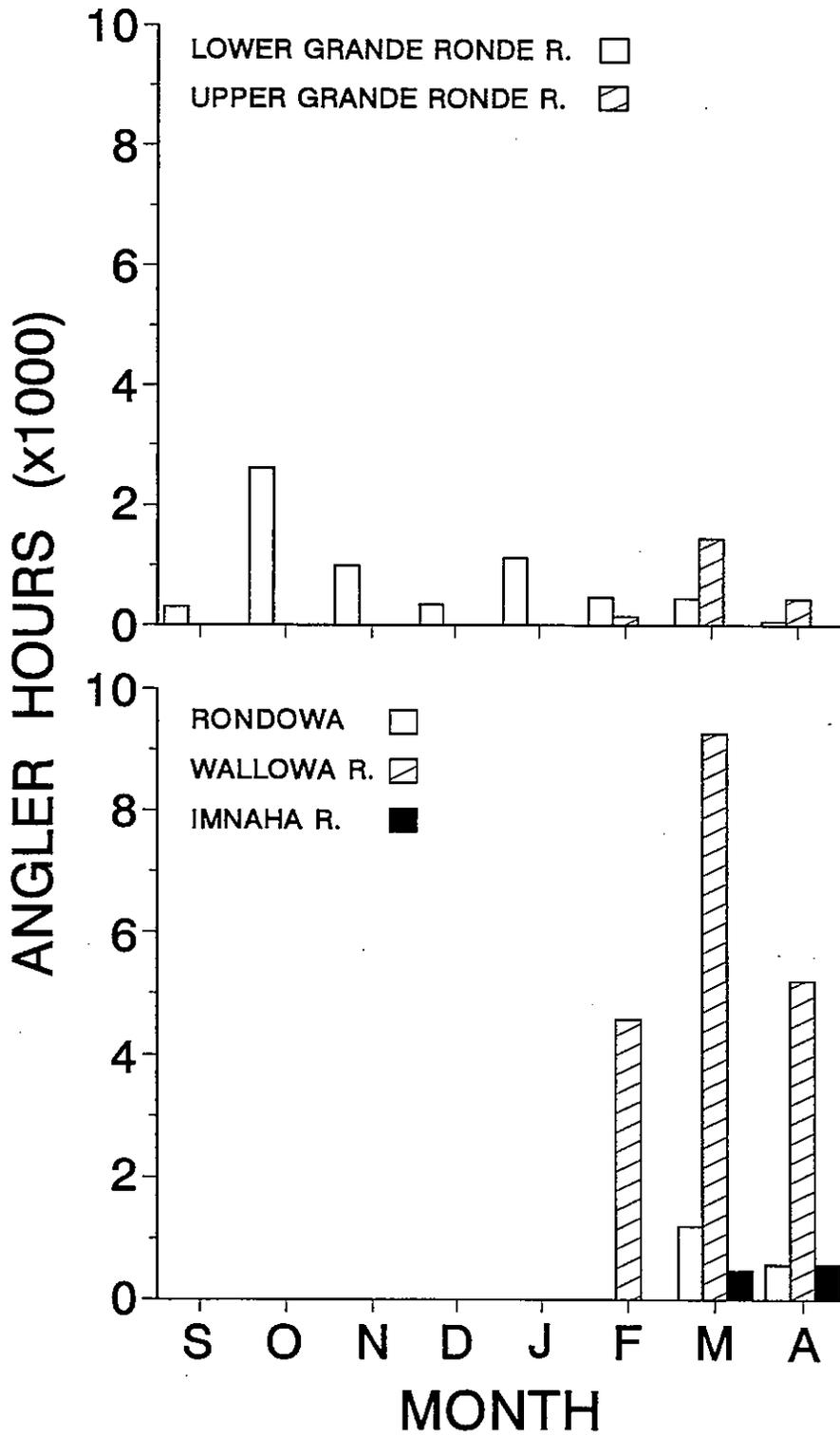


Figure 5. Estimated number of angler days for summer steelhead in the Grande Ronde and Imnaha basins during the 1994-95 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), Wallowa (1 February-15 April), upper Grande Ronde (16 February-15 April), and Rondowa and Imnaha (1 March-15 April).

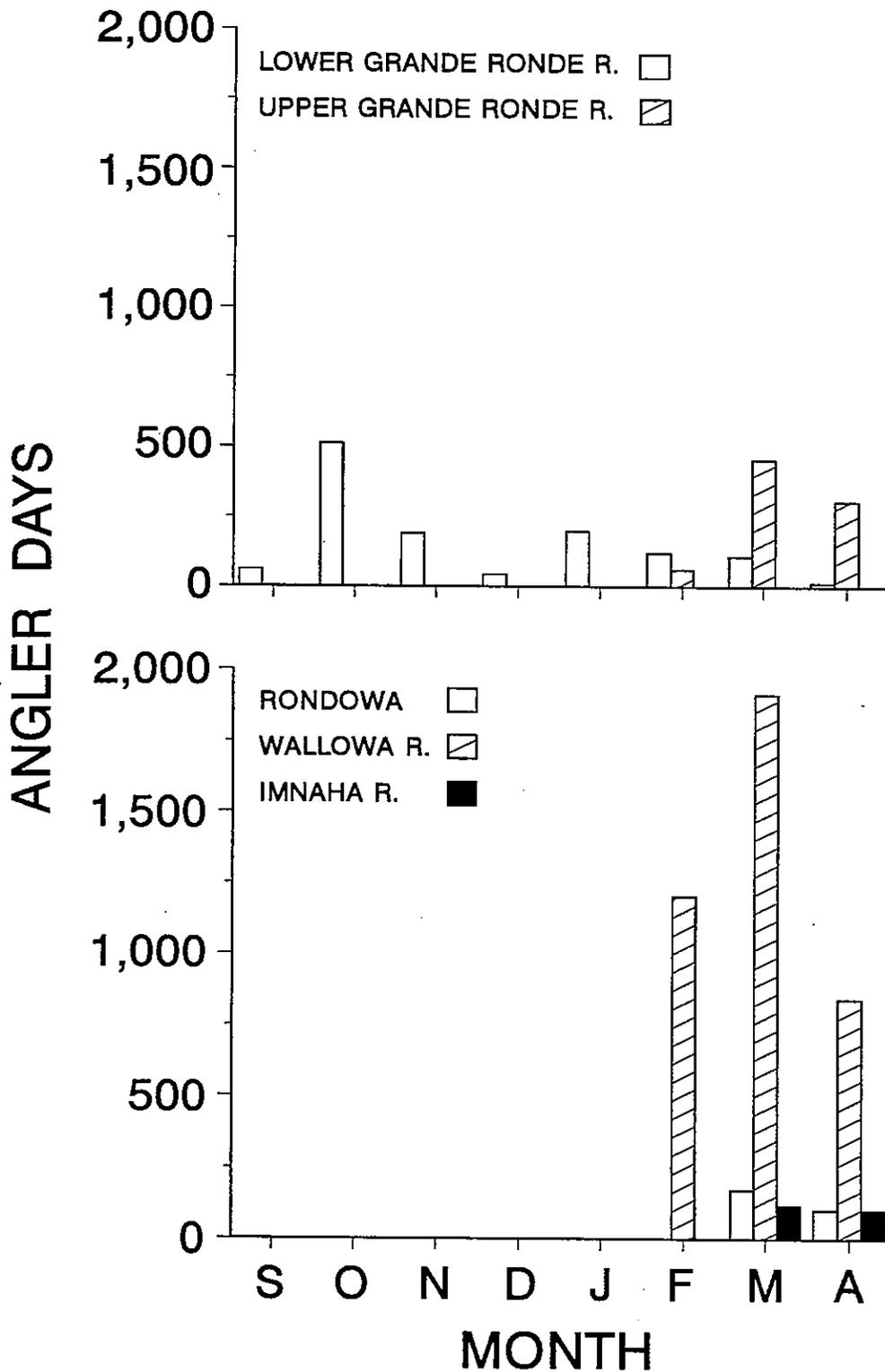


Figure 6. Estimated number of angler hours for summer steelhead in the Grande Ronde and Imnaha basins during the 1994-95 run year. Survey areas and times include the lower Grande Ronde (1 September-15 April), Wallowa (1 February-15 April), upper Grande Ronde (16 February-15 April), and Rondowa and Imnaha (1 March-15 April).

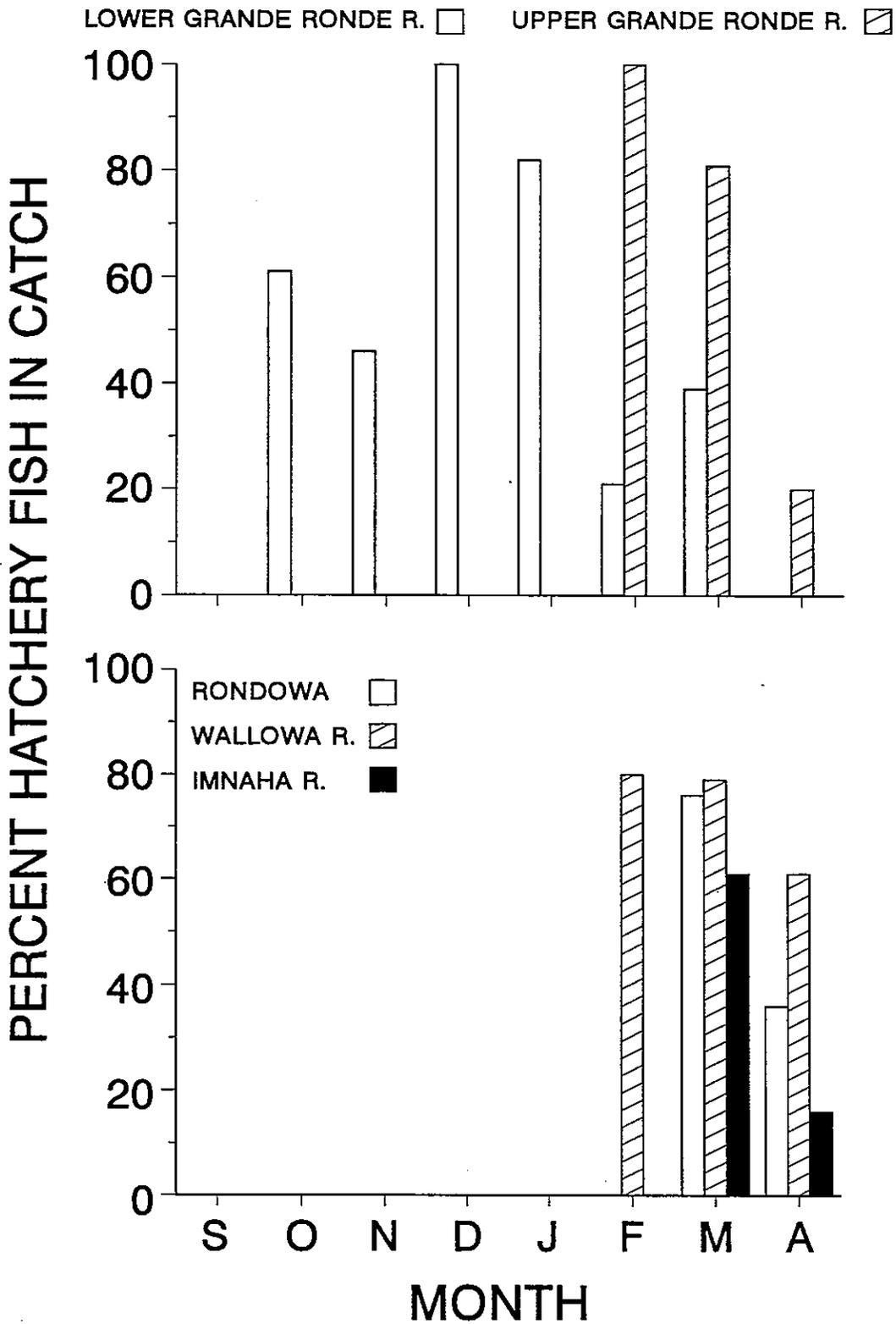


Figure 7. Estimated percentage of summer steelhead caught in the Grande Ronde and Imnaha basins during the 1994-95 run year that were hatchery fish. Survey areas and times include the lower Grande Ronde (1 September-15 April), Wallowa (1 February-15 April), upper Grande Ronde (16 February-15 April), and Rondowa and Imnaha (1 March-15 April) rivers.

Table 1. Percent age composition and mean fork length of hatchery summer steelhead sampled in creel surveys in the Grande Ronde and Imnaha basins during the 1994-95 run year. Age estimated from length frequencies of hatchery returns in 1995. Age 3 fish are 1:1 (years spent in freshwater prior to ocean migration:years spent in the ocean prior to spawning migration). Age 4 or 5 fish are either 1:2, 2:1, 1:3 or 2:2. Mean fork length includes  $\pm 95\%$  confidence interval.

| Creel survey area, sex    | Age composition (%) |       |            | Mean fork length (mm) |               |    |               |
|---------------------------|---------------------|-------|------------|-----------------------|---------------|----|---------------|
|                           | N                   | age 3 | age 4 or 5 | N                     | age 3         | N  | age 4 or 5    |
| <b>Lower Grande Ronde</b> |                     |       |            |                       |               |    |               |
| Male                      | 53                  | 49    | 51         | 26                    | 594 $\pm$ 12  | 27 | 683 $\pm$ 18  |
| Female                    | 97                  | 36    | 64         | 35                    | 593 $\pm$ 11  | 62 | 704 $\pm$ 11  |
| Total                     | 150                 | 41    | 59         | 61                    | 594 $\pm$ 8   | 89 | 697 $\pm$ 9   |
| <b>Upper Grande Ronde</b> |                     |       |            |                       |               |    |               |
| Male                      | 4                   | 75    | 25         | 3                     | 610 $\pm$ 66  | 1  | 670           |
| Female                    | 1                   | 100   | 0          | 1                     | 610           | 0  | --            |
| Total                     | 5                   | 80    | 20         | 4                     | 610 $\pm$ 34  | 1  | 670           |
| <b>Rondowa</b>            |                     |       |            |                       |               |    |               |
| Male                      | 8                   | 88    | 12         | 7                     | 602 $\pm$ 14  | 1  | 705           |
| Female                    | 14                  | 71    | 29         | 10                    | 588 $\pm$ 18  | 4  | 686 $\pm$ 123 |
| Total                     | 22                  | 77    | 23         | 17                    | 593 $\pm$ 11  | 5  | 680 $\pm$ 91  |
| <b>Wallowa</b>            |                     |       |            |                       |               |    |               |
| Male                      | 47                  | 83    | 17         | 39                    | 583 $\pm$ 10  | 8  | 674 $\pm$ 43  |
| Female                    | 38                  | 60    | 40         | 23                    | 583 $\pm$ 11  | 15 | 683 $\pm$ 24  |
| Total                     | 85                  | 73    | 27         | 62                    | 583 $\pm$ 7   | 23 | 680 $\pm$ 19  |
| <b>Imnaha</b>             |                     |       |            |                       |               |    |               |
| Male                      | 6                   | 100   | 0          | 6                     | 571 $\pm$ 31  | 0  | --            |
| Female                    | 3                   | 100   | 0          | 3                     | 595 $\pm$ 118 | 0  | --            |
| Total                     | 9                   | 100   | 0          | 9                     | 579 $\pm$ 27  | 0  | --            |

Table 2. Observed and expanded number of AdLV+CWT marked summer steelhead recovered in the Grande Ronde and Imnaha basins during the 1994-95 run year. No AdLV+CWT marked fish were recovered in the upper Grande Ronde River. Marked recoveries were expanded for the entire fishery.

| Creel survey area  | Tag code | Release site | Experimental group | Brood year | Number recovered |          |
|--------------------|----------|--------------|--------------------|------------|------------------|----------|
|                    |          |              |                    |            | Observed         | Expanded |
| Lower Grande Ronde | 07 61 02 | Deer Cr.     | Acclimated         | 92         | 1                | 4        |
|                    | 07 61 03 | Deer Cr.     | Acclimated         | 92         | 2                | 11       |
|                    | 07 61 05 | Deer Cr.     | Direct Stream      | 92         | 1                | 5        |
|                    | 23 24 17 | --           | NMFS <sup>a</sup>  | 91         | 1                | 4        |
|                    | 63 42 60 | --           | WDFW <sup>b</sup>  | 91         | 2                | 11       |
|                    | 63 48 17 | --           | WDFW <sup>b</sup>  | 92         | 1                | 3        |
| Rondowa            | 07 53 60 | Spring Cr.   | 4/1b               | 90         | 1                | 4        |
|                    | 07 53 52 | Deer Cr.     | Acclimated         | 92         | 1                | 2        |
| Wallowa            | 07 53 51 | Deer Cr.     | Acclimated         | 90         | 1                | 4        |
|                    | 07 58 55 | Deer Cr.     | Acclimated         | 91         | 2                | 10       |
|                    | 07 58 57 | Deer Cr.     | Direct Stream      | 91         | 1                | 8        |
|                    | 07 61 02 | Deer Cr.     | Acclimated         | 92         | 2                | 12       |
|                    | 07 61 03 | Deer Cr.     | Acclimated         | 92         | 1                | 9        |
|                    | 07 61 05 | Deer Cr.     | Direct Stream      | 92         | 2                | 10       |
|                    | 07 61 06 | Spring Cr.   | Production         | 92         | 1                | 8        |
| Imnaha             | 07 60 61 | L. Sheep Cr. | Acclimated         | 92         | 1                | 3        |

<sup>a</sup> Steelhead with tag code 23 24 17 were marked by National Marine Fisheries Service (NMFS) in the Snake River at Lower Granite Dam (Rkm 173), then barged and released in the Columbia River below Bonneville Dam at Rkm 227 on 10 May 1992.

<sup>b</sup> Steelhead with tag code 63 42 60 were released by Washington Department of Fish and Wildlife (WDFW) from Curl Lake (Rkm 66) on the Tucannon River, Washington, on 15 April 1992. Steelhead with tag code 63 48 17 were released by WDFW in the Tucannon River, Washington, at Marengo (Rkm 42) on 22 April 1993.

Table 3. Residence of summer steelhead anglers interviewed during creel surveys in the Grande Ronde and Imnaha basins during the 1994-95 run year.

| Creel survey area  | Number of anglers | Percent from              |                       |            |              |
|--------------------|-------------------|---------------------------|-----------------------|------------|--------------|
|                    |                   | Union or Wallowa counties | Other Oregon counties | Washington | Other states |
| Lower Grande Ronde | 354               | 69                        | 13                    | 8          | 10           |
| Upper Grande Ronde | 192               | 84                        | 10                    | 5          | 1            |
| Rondowa            | 109               | 70                        | 29                    | 0          | 1            |
| Wallowa            | 938               | 59                        | 36                    | 2          | 3            |
| Imnaha             | 86                | 91                        | 6                     | 1          | 2            |

or Wallowa counties, 29% were from other Oregon counties, 0% were Washington residents and 1% resided outside the states of Oregon and Washington (Table 3).

#### Wallowa River

On the Wallowa River, we estimated that 3,957 anglers fished for 19,047 hours. They caught and released 300 wild and 245 hatchery steelhead and kept 565 hatchery steelhead for a catch rate index of 17 hours per fish (Figures 2-6, Appendix A-4). The percentage of steelhead caught that were hatchery fish ranged from 61% in April to 80% in February (Figure 7, Appendix B). Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead ranged from 583 mm ( $\pm 10$ ) for age 3 males to 683 ( $\pm 24$ ) mm for age 4 or 5 females (Table 1). Age composition of harvested hatchery steelhead was 73% age 3 fish and 26% age 4 or 5 fish; the sex composition was 55% male and 45% female (Table 1). On the Wallowa River, anglers harvested an estimated 61 AdLV+CWT marked steelhead from our hatchery releases (Table 2). Fifty-nine percent of the anglers were from Union or Wallowa counties, 36% were from other Oregon counties, 1% were Washington residents and 3% resided outside the states of Oregon and Washington (Table 3).

#### Imnaha River

On the Imnaha River, we estimated that 219 anglers fished for 1,048 hours. They caught and released 39 wild steelhead and kept 24 hatchery steelhead for a catch rate index of 17 hours per fish (Figures 2-6, Appendix A-5). The percentage of steelhead caught that were hatchery fish ranged from 16% in April to 61% in March (Figure 7, Appendix B). Mean fork length ( $\pm 95\%$  confidence interval) of harvested hatchery steelhead ranged from 571 mm ( $\pm 31$ ) for age 3 males to 595 mm ( $\pm 118$ ) for age 3 females (Table 1). Age composition of harvested hatchery steelhead was 100% age 3 fish; the sex composition was 67% male and 33% female (Table 1). Anglers harvested an estimated 3 AdLV+CWT marked steelhead from our hatchery releases (Table 2). Ninety-one percent of

the anglers were from Union or Wallowa counties, 6% were from other Oregon counties, 1% were Washington residents and 2% resided outside the states of Oregon and Washington (Table 3).

### **Comparison to the Historic Fishery**

For the historic fishery, the median catch rate index was 16.1 hours per fish, the median hours of angler effort was 30,651 hours, and the predicted median creel survey harvest was 486 fish for the Grande Ronde, Wallowa, and Imnaha rivers combined (Flesher et al. 1995). During the 1994-95 run year, the catch rate index was 18.0 hours per fish, the total hours of angler effort was 30,270 hours, and the estimated creel survey harvest was 784 fish for the Grande Ronde, Wallowa, and Imnaha rivers combined.

### **Exploitation of Grande Ronde and Imnaha Basin Steelhead**

Adult recoveries of AdLV+CWT marked steelhead released from the Grande Ronde and Imnaha basins for the 1985-90 brood years averaged 32% Columbia River Tribal Net (Zone 6), 7% Columbia River Sport, 7% Deschutes River combined (sport, tribal, and hatchery or trap returns), 1% Snake River Sport below Lower Granite Dam, 14% Snake River Sport above Lower Granite Dam, less than 1% other hatchery or trap returns above Lower Granite Dam, 6% Grande Ronde and Imnaha basin sport, and 33% escapement to hatchery of release. For the 1985 to 1990 brood years, the percent recoveries below Lower Granite Dam ranged from 38% to 55%, and the recoveries above Lower Granite Dam ranged from 12% to 33% for sport fisheries and 26% to 40% for escapement to hatchery of release. The percent of AdLV+CWT marked recoveries of Grande Ronde and Imnaha basin steelhead above and below Lower Granite Dam has not changed for the 1985 through 1990 brood years.

Exploitation of summer steelhead in the Columbia River (Zones 1-6) averaged 44.1%, 32.3%, 12.0%, and 23.7% for the years 1954-63, 1964-73, 1974-83, and 1984-94, respectively. The tribal net (Zone 6) fishery (including ceremonial and subsistence) was 4.9%, 8.3%, 10.1%, and 21.4% of the exploitation for the same time periods.

## **DISCUSSION**

### **1994-95 Run Year**

The summer steelhead fisheries in the Grande Ronde and Imnaha basins during the 1994-95 run year were generally poorer than in recent years. Angler effort (Figure 8) and harvest (Figure 9) dropped for the third consecutive year since the peak during the 1991-92 run year. Total catch was the lowest since the 1990-91 run year when managers had to restrict angling regulations due to low adult returns in both basins. On the Imnaha River, angler effort and total catch were the lowest since we began surveys in 1986. Catch rates were poor (over 14 h/fish) in all fisheries, and the catch rate on the lower Grande Ronde River (21 h/fish) was the poorest since 1986. The percentage of hatchery fish in the catch in all fisheries was low compared to recent years, and probably due, in part, to low hatchery adult returns.

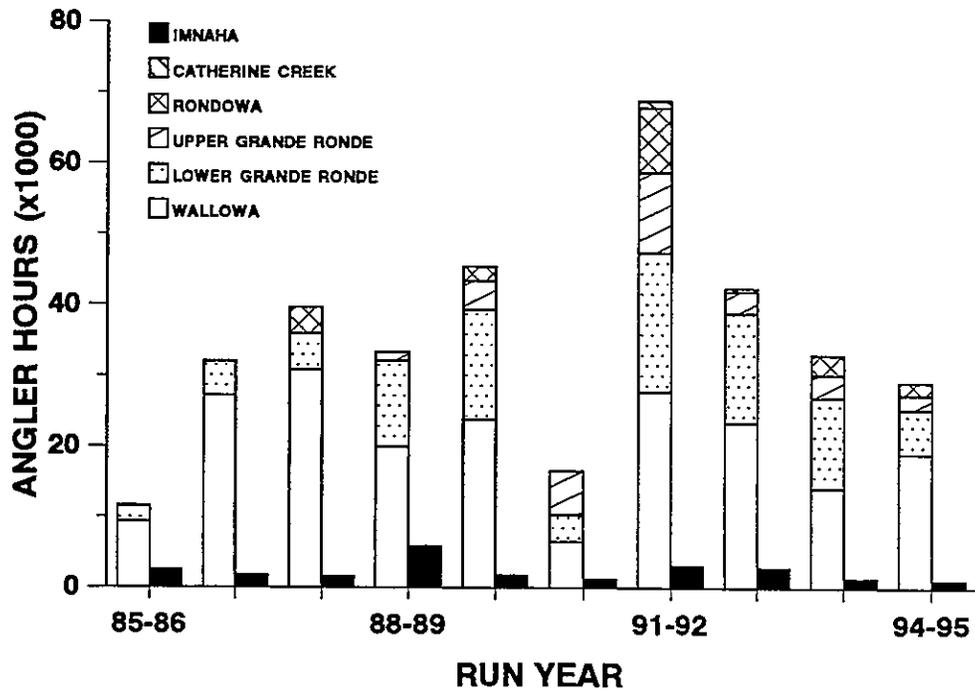


Figure 8. Angler effort for summer steelhead in the Grande Ronde and Imnaha basins for the 1985-86 to 1994-95 run years.

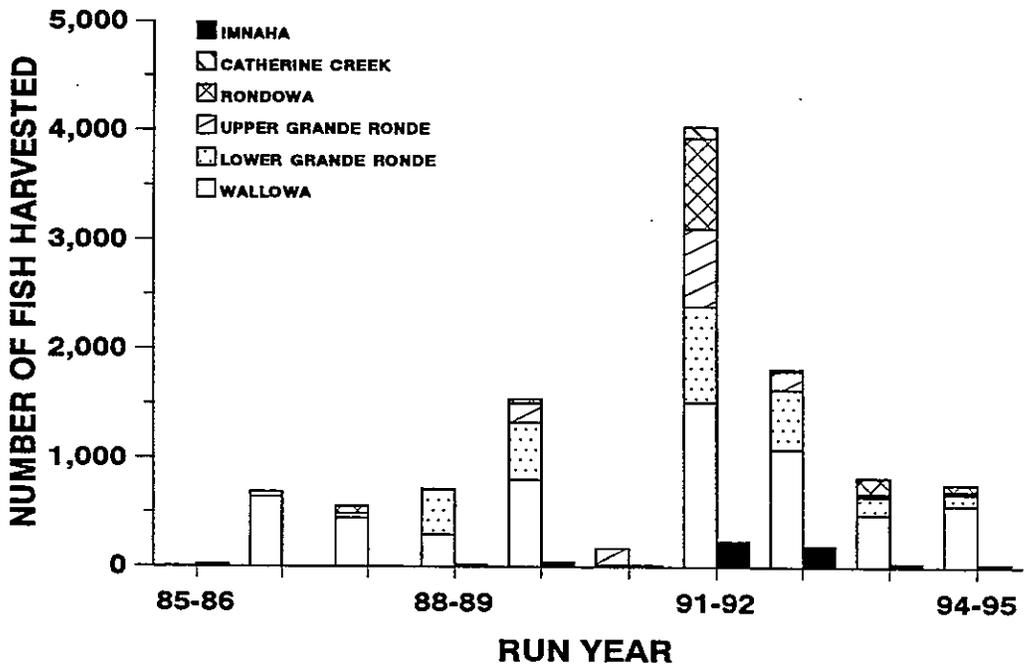


Figure 9. Number of hatchery summer steelhead harvested by anglers in the Grande Ronde and Imnaha basins for the 1985-86 to 1994-95 run years.

The number of anglers in summer steelhead fisheries in Grande Ronde and Imnaha basins that reside in other Oregon counties has increased while the number of local (from Union or Wallowa counties) and out-of-state anglers has not changed since surveys began in 1986 (Figure 10). The highest number of other Oregon residents and out-of-state anglers has consistently been observed on the Wallowa River.

The 1994-95 steelhead fishery nearly reached historic levels of catch rate and angler effort, and exceeded historic levels of harvest for combined fisheries in the Grande Ronde and Imnaha basins. Catch rate and angler effort were 90% and 99% of historic values, respectively. Creel survey harvest was 61% higher than the predicted historic creel survey harvest, based on the relationship between recent punch card and creel survey harvest estimates (Fletcher et al. 1995). Low hatchery adult returns during the 1994-95 run year (Whitesel et al. in preparation) probably contributed to catch rate and angler effort not exceeding historic values.

### **Exploitation of Grande Ronde and Imnaha Basin Steelhead**

We addressed the concern by managers that exploitation of Grande Ronde and Imnaha basin steelhead stocks has increased over time by examining (1) adult recoveries of AdLV+CWT marked hatchery steelhead from the 1985-90 brood years outside and within Oregon's LSRCP compensation area, and (2) exploitation of summer steelhead stocks in the Columbia River (Zones 1-6) since the original LSRCP goals were developed. We found that almost one-half (47%) of the returning AdLV+CWT marked steelhead were recovered as adults in the Columbia and Snake rivers and their tributaries outside of Oregon's LSRCP compensation area (Figure 11). Most (32%) of the recoveries outside the compensation area came from the Columbia River tribal net (Zone 6) fishery. When Snake River sport harvest above Lower Granite Dam is included, almost 61% of the adults are recovered in areas other than the Grande Ronde and Imnaha basins. This results in only 39% of the returning adults available for Grande Ronde and Imnaha basin sport fisheries and escapement to the hatchery of release. For the 1985 to 1990 brood years, we found no significant difference in the percent of marked recoveries above and below Lower Granite Dam (Figure 12). This finding suggests that even though out-of-basin exploitation is high, especially in the Columbia River tribal net (Zone 6) fishery, exploitation has not increased for the 1985 through 1990 brood years returning to the Grande Ronde and Imnaha basins. We then examined whether exploitation of summer steelhead in the Columbia River has changed since the original LSRCP goals were established and found that although exploitation in the Columbia River tribal net (Zone 6) fishery has steadily increased, overall exploitation of summer steelhead in the Columbia River (Zones 1-6) has decreased over time (Figure 13). These findings suggest that exploitation of Grande Ronde and Imnaha basin steelhead is not preventing us from reaching Oregon's LSRCP adult compensation goals, given that existing exploitation rates, similar to those estimated in this report, were considered in the development of the original LSRCP goals. Also, when adult AdLV+CWT marked recoveries from unreported fisheries such as Drano Lake at the mouth of the Little White Salmon River, and unsampled fisheries such as the night fishery in the McNary Dam forebay (Mark Schuck, WDFW, personal communication), become available, estimated exploitation will probably be higher, which will make our ability to reach adult compensation goals more difficult.

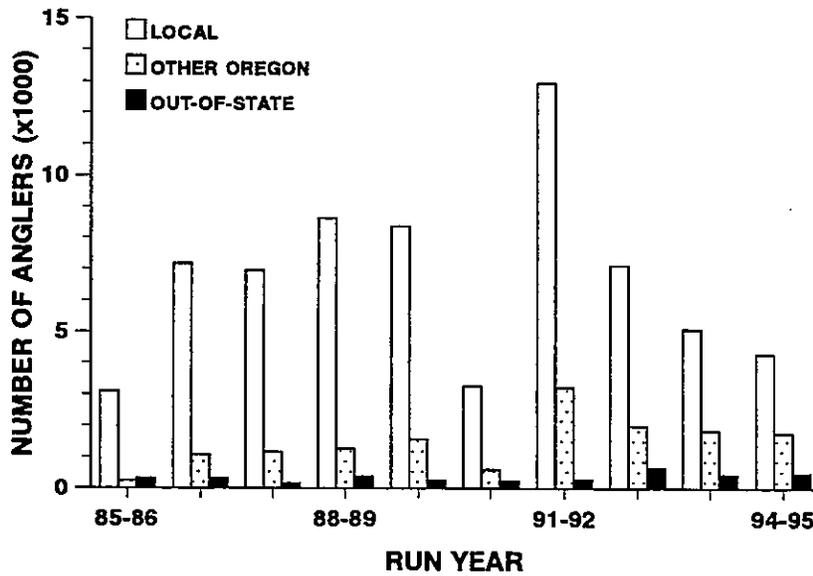


Figure 10. Number of local (Union or Wallowa county), other Oregon county, and out-of-state anglers that fished in summer steelhead fisheries in the Grande Ronde and Imnaha basins for the 1985-86 to 1994-95 run years.

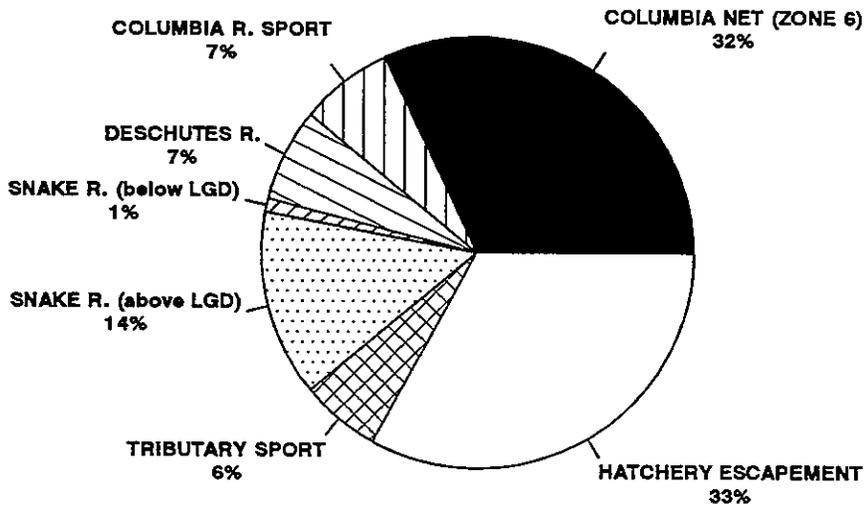


Figure 11. Average (1985-90 brood years) percent of AdLV+CWT marked recoveries of Grande Ronde and Imnaha basin steelhead from major recovery areas in the Columbia and Snake rivers and their tributaries.

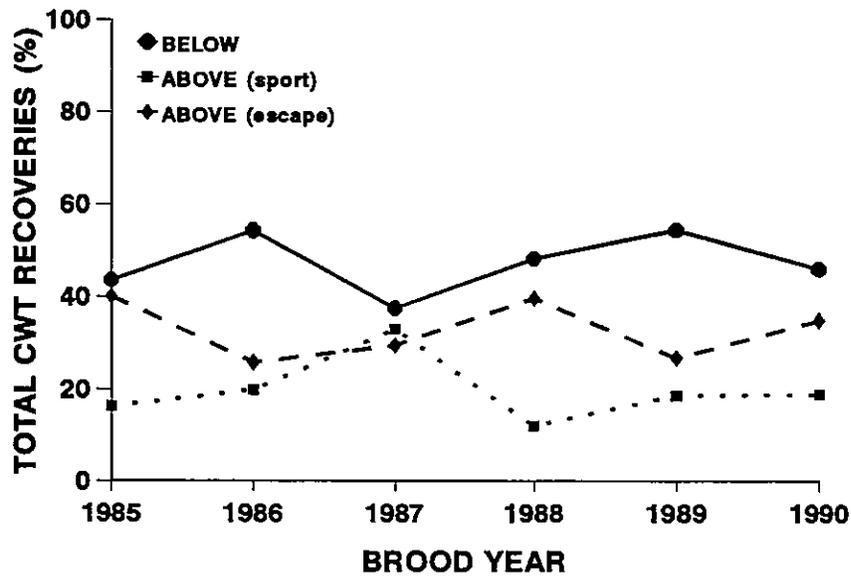


Figure 12. Percent of AdLV+CWT marked recoveries of Grande Ronde and Imnaha basin steelhead below Lower Granite Dam, and in sport fisheries and escapement to hatchery of release above Lower Granite Dam for the 1985-90 brood years.

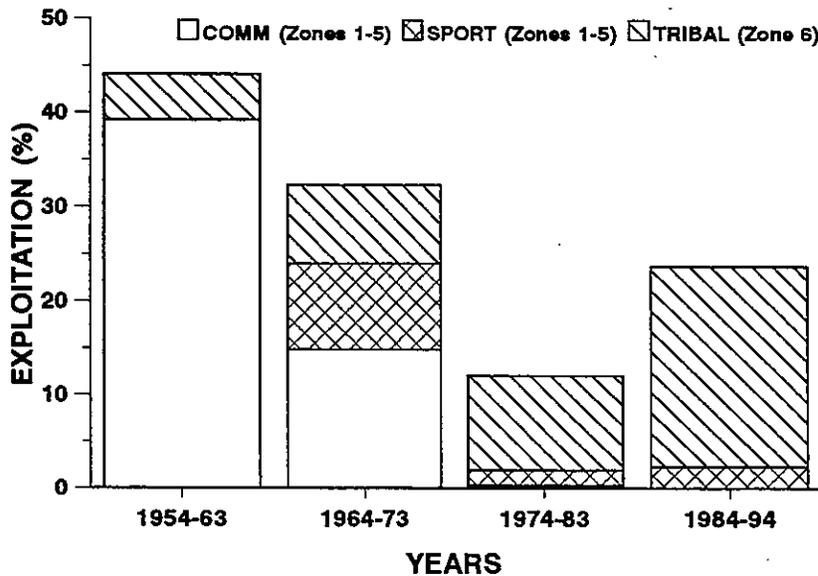


Figure 13. Exploitation of summer steelhead in the Columbia River commercial (Zones 1-5), sport (Zones 1-5), and tribal (Zone 6) fisheries for the years 1953-63, 1964-73, 1974-83, and 1984-94 (data from ODFW and WDFW, 1995).

To date, Oregon's adult summer steelhead compensation goal to Lower Granite Dam of 11,184 fish has not been met (Messmer et al. in preparation). Until we consistently meet this adult compensation goal, both Grande Ronde and Imnaha basin sport fisheries and escapement to hatchery of release will be adversely affected. Either by increasing smolt releases, or increasing smolt-to-adult survival, or reducing out-of-basin exploitation, will we be able to reach Oregon's LSRCP adult compensation goal and enhance Grande Ronde and Imnaha basin sport fisheries and hatchery escapement in future years.

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Appendix A-1. Fishery statistics for summer steelhead on the lower Grande Ronde River during the 1994-95 run year. Statistics include  $\pm 95\%$  confidence interval except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested.

| Month,<br>day type | Sample size |         | Total<br>hours | Total<br>catch | Total<br>harvest | Catch rate<br>fish/h (h/fish) | Angler<br>days |
|--------------------|-------------|---------|----------------|----------------|------------------|-------------------------------|----------------|
|                    | Days        | Anglers |                |                |                  |                               |                |
| September:         |             |         |                |                |                  |                               |                |
| Weekday            | 5           | 8       | 224 $\pm$ 237  | 4 $\pm$ 14     | 0                | 0.020 $\pm$ 0.061(56)         | 34 $\pm$ 36    |
| Weekend            | 5           | 7       | 86 $\pm$ 47    | 8 $\pm$ 11     | 0                | 0.090 $\pm$ 0.128(11)         | 27 $\pm$ 15    |
| Total              | 10          | 15      | 310 $\pm$ 242  | 12 $\pm$ 18    | 0                | 0.039 $\pm$ 0.057(26)         | 61 $\pm$ 48    |
| October:           |             |         |                |                |                  |                               |                |
| Weekday            | 6           | 47      | 1237 $\pm$ 286 | 61 $\pm$ 31    | 27 $\pm$ 34      | 0.049 $\pm$ 0.025(20)         | 238 $\pm$ 55   |
| Weekend            | 6           | 68      | 1371 $\pm$ 325 | 45 $\pm$ 28    | 20 $\pm$ 15      | 0.033 $\pm$ 0.020(30)         | 274 $\pm$ 65   |
| Total              | 12          | 115     | 2608 $\pm$ 433 | 106 $\pm$ 42   | 47 $\pm$ 37      | 0.040 $\pm$ 0.016(25)         | 512 $\pm$ 85   |
| November:          |             |         |                |                |                  |                               |                |
| Weekday            | 6           | 14      | 429 $\pm$ 198  | 27 $\pm$ 18    | 0                | 0.062 $\pm$ 0.040(16)         | 86 $\pm$ 40    |
| Weekend            | 6           | 46      | 567 $\pm$ 183  | 55 $\pm$ 25    | 12 $\pm$ 10      | 0.100 $\pm$ 0.043(10)         | 103 $\pm$ 33   |
| Total              | 12          | 60      | 996 $\pm$ 270  | 82 $\pm$ 31    | 12 $\pm$ 10      | 0.082 $\pm$ 0.030(12)         | 189 $\pm$ 51   |
| December:          |             |         |                |                |                  |                               |                |
| Weekday            | 7           | 7       | 161 $\pm$ 150  | 0              | 0                | -- (--)                       | 20 $\pm$ 19    |
| Weekend            | 5           | 10      | 182 $\pm$ 122  | 8 $\pm$ 6      | 8                | 0.044 $\pm$ 0.035(23)         | 24 $\pm$ 16    |
| Total              | 12          | 17      | 343 $\pm$ 193  | 8 $\pm$ 6      | 8                | 0.023 $\pm$ 0.019(43)         | 44 $\pm$ 25    |
| January:           |             |         |                |                |                  |                               |                |
| Weekday            | 6           | 28      | 468 $\pm$ 455  | 25 $\pm$ 31    | 22               | 0.053 $\pm$ 0.067(19)         | 94 $\pm$ 91    |
| Weekend            | 5           | 56      | 657 $\pm$ 379  | 3 $\pm$ 4      | 0                | 0.004 $\pm$ 0.006(219)        | 104 $\pm$ 60   |
| Total              | 11          | 84      | 1125 $\pm$ 592 | 28 $\pm$ 31    | 22               | 0.024 $\pm$ 0.028(40)         | 198 $\pm$ 104  |
| February:          |             |         |                |                |                  |                               |                |
| Weekday            | 6           | 14      | 197 $\pm$ 124  | 19 $\pm$ 15    | 6 $\pm$ 15       | 0.095 $\pm$ 0.077(10)         | 44 $\pm$ 28    |
| Weekend            | 4           | 24      | 268 $\pm$ 81   | 24 $\pm$ 13    | 3 $\pm$ 4        | 0.086 $\pm$ 0.049(11)         | 77 $\pm$ 23    |
| Total              | 10          | 38      | 465 $\pm$ 148  | 43 $\pm$ 20    | 9 $\pm$ 15       | 0.090 $\pm$ 0.044(11)         | 121 $\pm$ 39   |
| March:             |             |         |                |                |                  |                               |                |
| Weekday            | 7           | 14      | 316 $\pm$ 192  | 23 $\pm$ 61    | 9                | 0.073 $\pm$ 0.167(14)         | 75 $\pm$ 46    |
| Weekend            | 4           | 7       | 134 $\pm$ 63   | 0              | 0                | -- (--)                       | 34 $\pm$ 16    |
| Total              | 11          | 21      | 450 $\pm$ 202  | 23 $\pm$ 61    | 9                | 0.051 $\pm$ 0.117(20)         | 109 $\pm$ 49   |
| April:             |             |         |                |                |                  |                               |                |
| Weekday            | 3           | 1       | 30             | 0              | 0                | -- (--)                       | 6              |
| Weekend            | 2           | 3       | 36             | 0              | 0                | -- (--)                       | 8              |
| Total              | 5           | 4       | 66             | 0              | 0                | -- (--)                       | 14             |
| Grand total        | 83          | 354     | 6363 $\pm$ 877 | 302 $\pm$ 90   | 107 $\pm$ 41     | 0.047 $\pm$ 0.013(21)         | 1248 $\pm$ 172 |

Appendix A-2. Fishery statistics for summer steelhead on the upper Grande Ronde River during the 1994-95 run year. Statistics include  $\pm 95\%$  confidence interval except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested.

| Month,<br>day type | <u>Sample size</u> |         | Total<br>hours | Total<br>catch | Total<br>harvest | <u>Catch rate</u><br>fish/h (h/fish) | Angler<br>days |
|--------------------|--------------------|---------|----------------|----------------|------------------|--------------------------------------|----------------|
|                    | Days               | Anglers |                |                |                  |                                      |                |
| February:          |                    |         |                |                |                  |                                      |                |
| Weekday            | 3                  | 7       | 49 $\pm$ 62    | 8 $\pm$ 14     | 4                | 0.158 $\pm$ 0.289(6)                 | 20 $\pm$ 25    |
| Weekend            | 2                  | 9       | 101 $\pm$ 40   | 0              | 0                | -- (--)                              | 42 $\pm$ 17    |
| Total              | 5                  | 16      | 150 $\pm$ 74   | 8 $\pm$ 14     | 4                | 0.052 $\pm$ 0.095(19)                | 62 $\pm$ 31    |
| March:             |                    |         |                |                |                  |                                      |                |
| Weekday            | 7                  | 71      | 804 $\pm$ 254  | 43 $\pm$ 18    | 5 $\pm$ 11       | 0.054 $\pm$ 0.022(19)                | 322 $\pm$ 102  |
| Weekend            | 4                  | 65      | 650 $\pm$ 374  | 15 $\pm$ 30    | 15 $\pm$ 30      | 0.023 $\pm$ 0.046(43)                | 133 $\pm$ 77   |
| Total              | 11                 | 136     | 1454 $\pm$ 452 | 58 $\pm$ 35    | 20 $\pm$ 32      | 0.040 $\pm$ 0.024(25)                | 455 $\pm$ 141  |
| April:             |                    |         |                |                |                  |                                      |                |
| Weekday            | 3                  | 20      | 293 $\pm$ 163  | 6 $\pm$ 7      | 0                | 0.021 $\pm$ 0.023(49)                | 172 $\pm$ 96   |
| Weekend            | 3                  | 20      | 146 $\pm$ 110  | 9 $\pm$ 13     | 3                | 0.060 $\pm$ 0.087(16)                | 133 $\pm$ 100  |
| Total              | 6                  | 40      | 439 $\pm$ 197  | 15 $\pm$ 14    | 3                | 0.034 $\pm$ 0.033(29)                | 305 $\pm$ 137  |
| Grand total        | 22                 | 192     | 2043 $\pm$ 498 | 81 $\pm$ 40    | 27 $\pm$ 32      | 0.040 $\pm$ 0.020(25)                | 822 $\pm$ 200  |

Appendix A-3. Fishery statistics for summer steelhead at Rondowa during the 1994-95 run year. Statistics include  $\pm 95\%$  confidence interval except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested.

| Month,<br>day type | <u>Sample size</u> |         | Total<br>hours | Total<br>catch | Total<br>harvest | <u>Catch rate</u><br>fish/h (h/fish) | Angler<br>days |
|--------------------|--------------------|---------|----------------|----------------|------------------|--------------------------------------|----------------|
|                    | Days               | Anglers |                |                |                  |                                      |                |
| March:             |                    |         |                |                |                  |                                      |                |
| Weekday            | 6                  | 27      | 660 $\pm$ 379  | 54 $\pm$ 34    | 27 $\pm$ 26      | 0.081 $\pm$ 0.044(12)                | 97 $\pm$ 56    |
| Weekend            | 4                  | 35      | 541 $\pm$ 77   | 32 $\pm$ 31    | 24 $\pm$ 23      | 0.059 $\pm$ 0.040(17)                | 75 $\pm$ 11    |
| Total              | 10                 | 62      | 1201 $\pm$ 387 | 86 $\pm$ 45    | 51 $\pm$ 35      | 0.071 $\pm$ 0.030(14)                | 172 $\pm$ 55   |
| April:             |                    |         |                |                |                  |                                      |                |
| Weekday            | 3                  | 18      | 403 $\pm$ 108  | 26 $\pm$ 12    | 10 $\pm$ 9       | 0.066 $\pm$ 0.025(16)                | 58 $\pm$ 16    |
| Weekend            | 3                  | 29      | 165 $\pm$ 52   | 10 $\pm$ 21    | 0                | 0.061 $\pm$ 0.082(17)                | 45 $\pm$ 14    |
| Total              | 6                  | 47      | 568 $\pm$ 120  | 36 $\pm$ 25    | 10 $\pm$ 9       | 0.065 $\pm$ 0.030(16)                | 103 $\pm$ 22   |
| Grand total        | 16                 | 109     | 1769 $\pm$ 405 | 122 $\pm$ 52   | 61 $\pm$ 36      | 0.069 $\pm$ 0.023(15)                | 275 $\pm$ 63   |

Appendix A-4. Fishery statistics for summer summer steelhead on the Wallowa River during the 1994-95 run year. Statistics include  $\pm 95\%$  confidence interval except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested.

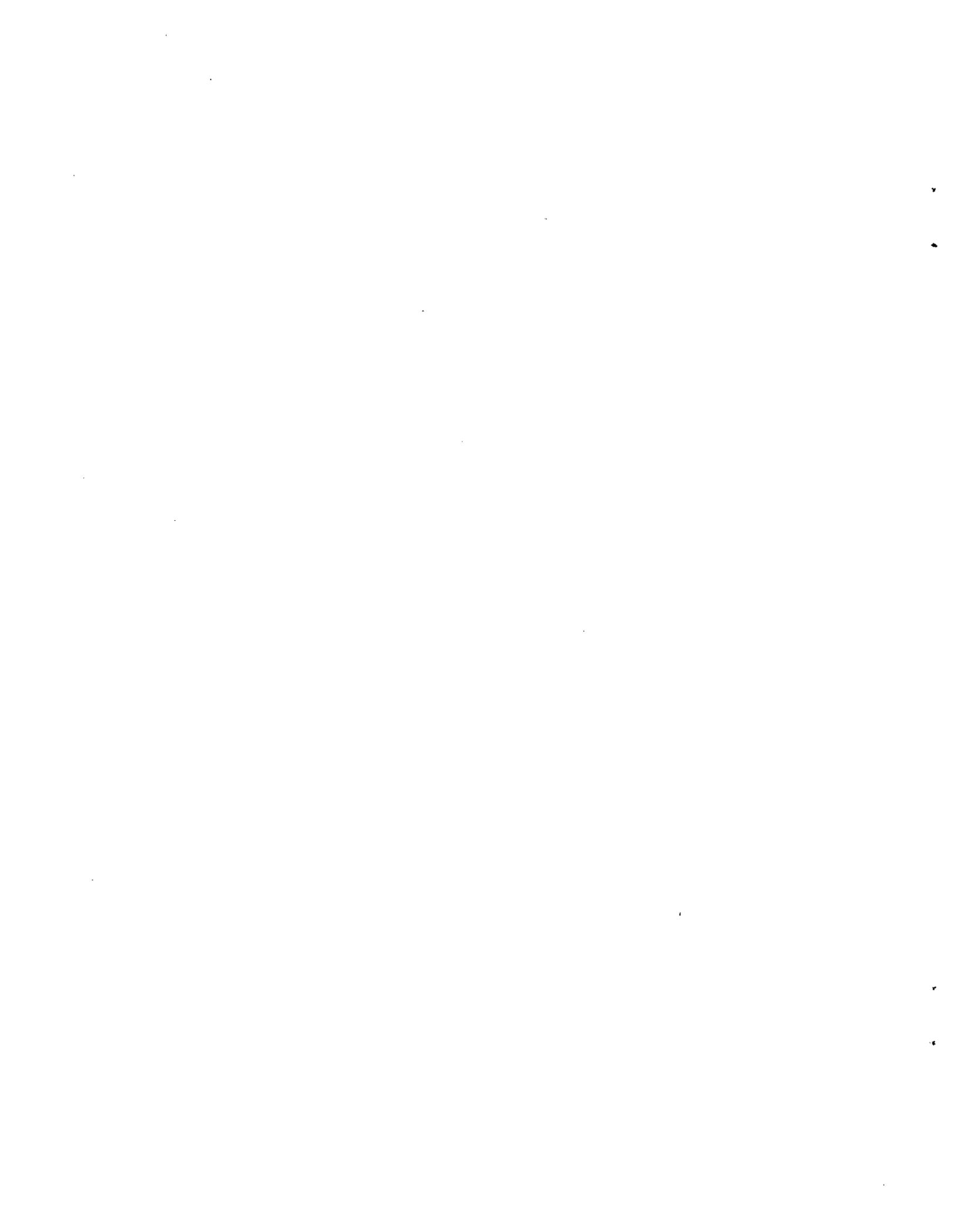
| Month,<br>day type | <u>Sample size</u> |         | Total<br>hours   | Total<br>catch | Total<br>harvest | <u>Catch rate</u><br>fish/h (h/fish) | Angler<br>days |
|--------------------|--------------------|---------|------------------|----------------|------------------|--------------------------------------|----------------|
|                    | Days               | Anglers |                  |                |                  |                                      |                |
| February:          |                    |         |                  |                |                  |                                      |                |
| Weekday            | 6                  | 112     | 1967 $\pm$ 947   | 55 $\pm$ 24    | 38 $\pm$ 27      | 0.028 $\pm$ 0.012(36)                | 579 $\pm$ 279  |
| Weekend            | 4                  | 95      | 2621 $\pm$ 1885  | 199 $\pm$ 86   | 129 $\pm$ 63     | 0.076 $\pm$ 0.033(13)                | 624 $\pm$ 449  |
| Total              | 10                 | 207     | 4588 $\pm$ 2109  | 254 $\pm$ 89   | 167 $\pm$ 69     | 0.055 $\pm$ 0.019(18)                | 1203 $\pm$ 553 |
| March:             |                    |         |                  |                |                  |                                      |                |
| Weekday            | 7                  | 250     | 5785 $\pm$ 1111  | 310 $\pm$ 96   | 170 $\pm$ 89     | 0.054 $\pm$ 0.017(19)                | 1231 $\pm$ 236 |
| Weekend            | 4                  | 207     | 3479 $\pm$ 280   | 170 $\pm$ 54   | 89 $\pm$ 44      | 0.049 $\pm$ 0.016(20)                | 682 $\pm$ 55   |
| Total              | 11                 | 457     | 9264 $\pm$ 1146  | 480 $\pm$ 110  | 259 $\pm$ 99     | 0.052 $\pm$ 0.012(19)                | 1913 $\pm$ 237 |
| April:             |                    |         |                  |                |                  |                                      |                |
| Weekday            | 3                  | 120     | 2961 $\pm$ 198   | 258 $\pm$ 66   | 96 $\pm$ 76      | 0.087 $\pm$ 0.022(11)                | 456 $\pm$ 30   |
| Weekend            | 3                  | 154     | 2234 $\pm$ 302   | 118 $\pm$ 59   | 43 $\pm$ 33      | 0.053 $\pm$ 0.026(19)                | 385 $\pm$ 52   |
| Total              | 6                  | 274     | 5195 $\pm$ 361   | 376 $\pm$ 88   | 139 $\pm$ 83     | 0.072 $\pm$ 0.017(14)                | 841 $\pm$ 58   |
| Grand total        | 27                 | 938     | 19047 $\pm$ 2427 | 1110 $\pm$ 167 | 565 $\pm$ 146    | 0.058 $\pm$ 0.009(17)                | 3957 $\pm$ 504 |

Appendix A-5. Fishery statistics for summer steelhead on the Imnaha River during the 1994-95 run year. Statistics include  $\pm 95\%$  confidence interval except for catch rate when expressed as h/fish. Only adipose-marked fish were harvested.

| Month,<br>day type | <u>Sample size</u> |         | Total<br>hours | Total<br>catch | Total<br>harvest | <u>Catch rate</u><br>fish/h (h/fish) | Angler<br>days |
|--------------------|--------------------|---------|----------------|----------------|------------------|--------------------------------------|----------------|
|                    | Days               | Anglers |                |                |                  |                                      |                |
| March:             |                    |         |                |                |                  |                                      |                |
| Weekday            | 7                  | 29      | 340 $\pm$ 192  | 23 $\pm$ 17    | 13 $\pm$ 11      | 0.068 $\pm$ 0.043(15)                | 94 $\pm$ 53    |
| Weekend            | 4                  | 11      | 133 $\pm$ 160  | 8 $\pm$ 25     | 6 $\pm$ 18       | 0.060 $\pm$ 0.160(17)                | 22 $\pm$ 26    |
| Total              | 11                 | 40      | 473 $\pm$ 250  | 31 $\pm$ 30    | 19 $\pm$ 21      | 0.066 $\pm$ 0.055(15)                | 116 $\pm$ 61   |
| April:             |                    |         |                |                |                  |                                      |                |
| Weekday            | 3                  | 16      | 282 $\pm$ 60   | 10 $\pm$ 18    | 3                | 0.036 $\pm$ 0.052(28)                | 54 $\pm$ 11    |
| Weekend            | 3                  | 30      | 293 $\pm$ 216  | 22 $\pm$ 4     | 2 $\pm$ 1        | 0.074 $\pm$ 0.009(13)                | 49 $\pm$ 36    |
| Total              | 6                  | 46      | 575 $\pm$ 224  | 32 $\pm$ 18    | 5 $\pm$ 1        | 0.055 $\pm$ 0.026(18)                | 103 $\pm$ 40   |
| Grand total        | 17                 | 86      | 1048 $\pm$ 336 | 63 $\pm$ 35    | 24 $\pm$ 21      | 0.060 $\pm$ 0.028(17)                | 219 $\pm$ 70   |

Appendix B. The percentage of summer steelhead caught in the Grande Ronde and Imnaha basins during the 1994-95 run year that were hatchery fish. Sample size is shown in parentheses.

| Creeel survey area       | Sep   | Oct     | Nov    | Dec    | Jan    | Feb     | Mar     | Apr     |
|--------------------------|-------|---------|--------|--------|--------|---------|---------|---------|
| Lower Grande Ronde       | 0(12) | 61(106) | 46(82) | 100(8) | 82(28) | 21(43)  | 39(23)  | --(0)   |
| Upper Grande Ronde       | --    | --      | --     | --     | --     | 100(8)  | 81(58)  | 20(15)  |
| Lower Wallowa at Rondowa | --    | --      | --     | --     | --     | --      | 76(86)  | 36(36)  |
| Upper Wallowa            | --    | --      | --     | --     | --     | 80(254) | 79(480) | 61(376) |
| Imnaha                   | --    | --      | --     | --     | --     | --      | 61(31)  | 16(32)  |





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