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PROJECT TITLE: Summer Steelhead Creel Surveys on the
Grande Ronde, Wallowa, and Imnaha
Rivers for the 1991-92 Run Year

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Prepared by: Michael W. Flesher
Mary A. Buckman
Richard W. Carmichael
Rhine T. Messmer
Timothy A. Whitesel

Oregon Department of Fish and Wildlife
2501 SW First Street
P.O. Box 59
Portland, OR 97207

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SUMMARY

Objectives in FY 1992

1. Estimate angler effort in hours and days for summer steelhead fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.
2. Estimate total catch, catch rate, and number of fish harvested in summer steelhead fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.
3. Estimate the percent of hatchery summer steelhead in the total catch.
4. Determine length frequency, age composition, 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 summer steelhead harvested.
6. Determine residence of anglers in summer steelhead fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.

Accomplishments and Findings in FY 1992

On the lower Grande Ronde River, estimates indicate that 4,862 anglers fished for 19,617 hours from 1 September 1991 through 15 April 1992. They caught and released 410 wild and 494 hatchery steelhead and kept 879 hatchery steelhead.

On the upper Grande Ronde River, estimates indicate that 4,366 anglers fished for 11,374 hours from 16 February through 15 April 1992. They caught and released 114 wild and 366 hatchery steelhead and kept 708 hatchery steelhead.

On Catherine Creek, estimates indicate that 341 anglers fished for 955 hours from 1 March through 15 April 1992. They caught and released 31 wild and 186 hatchery steelhead and kept 103 hatchery steelhead.

On the lower Wallowa River at Rondowa, estimates indicate that 1,594 anglers fished for 9,209 hours from 1 February through 15 April 1992. They caught and released 229 wild and 537 hatchery steelhead and kept 832 hatchery steelhead. On the upper Wallowa River, estimates indicate that 5,304 anglers fished for 27,807 hours from 1 February through 15 April 1992. They caught and released 333 wild and 821 hatchery steelhead and kept 1,514 hatchery steelhead.

On the Imnaha River, estimates indicate that 762 anglers fished for 3,128 hours from 1 March through 15 April 1992. They caught and released 321 wild and 180 hatchery steelhead and kept 212 hatchery steelhead.

The catch rates during the 1991-92 run year averaged 11.0 hours per fish or better on all fisheries in the Grande Ronde and Imnaha river basins.

Management Implications and Recommendations in FY 1992

1. A record high number of anglers fished in the Grande Ronde basin recreational fisheries and a near record number fished in the Imnaha basin during the 1991-92 run year. This is attributable in part to anglers fishing the lower Grande Ronde River throughout the winter months, a sizable fishery at Rondowa, and above average adult returns of 1-ocean and 2-ocean fish to both basins.
2. Anglers caught and harvested record numbers of hatchery summer steelhead in all sport fisheries in the Grande Ronde and Imnaha river basins during the 1991-92 run year partly due to above average adult returns of 1-ocean and 2-ocean fish to each basin and increases in angler effort above previous years.
3. The catch rates averaged 11.0 hours per fish or better in all summer steelhead recreational fisheries in the Grande Ronde and Imnaha river basins during the 1991-92 run-year.
4. The low percentage of hatchery steelhead in the catch on the lower Grande Ronde River during the fall is of considerable concern since it indicates a difference in run timing of hatchery and wild summer steelhead into the basin. We recommend incorporating early returning fish into the Grande Ronde basin steelhead broodstock which may help enhance the traditional fall fishery on the lower Grande Ronde River.
5. The low level of angler effort on the Imnaha River is of concern because it limits harvest of returning adults and perpetuates surplus adults at the Little Sheep Creek Facility. In addition, more effort seems to be occurring during the spring rather than during the fall, when the fishery traditionally occurred. Angler effort and harvest targeted on Little Sheep Creek stock hatchery fish may be enhanced by increasing public and private access to the river, adopting a season extension, expanding the fishing area and increasing the angler daily catch limit.

INTRODUCTION

One of the primary objectives of the Lower Snake River Compensation Plan (LSRCP) in Oregon is to restore historic recreational and tribal fisheries for summer steelhead (*Oncorhynchus mykiss*) in the Grande Ronde and Imnaha river basins. The goal of the creel survey is to provide annual harvest information needed to assess LSRCP objectives and mitigation goals (Carmichael and Wagner 1983). This report summarizes results of creel surveys conducted during fall 1991 and spring 1992 on the Grande Ronde, Wallowa, and Imnaha rivers. Results of creel surveys conducted prior to fall 1991 are reported in previous LSRCP evaluation annual reports (Carmichael et al. 1986, 1987, 1988, 1989, 1990a; and Flesher et al. 1991). The steelhead angling season surveyed in this report was open from 1 September 1991 to 15 April 1992 during which only adipose-clipped fish could be kept.

STUDY AREA

Creel surveys on the Grande Ronde River were conducted on a 14.6 mile section on the lower river from the Oregon-Washington state line (RM 38.7) to Wildcat Creek (RM 53.3) and an upper 24.4 mile section from Highway 82 bridge at Island City (RM 158.8) to Meadow Creek (RM 183.2). A new 8.0 mile survey began on Catherine Creek (RM 143.9), a major tributary on the upper Grande Ronde River, from Davis Dam downstream of Highway 203 bridge (RM 15.0) to the Union city water supply tank (RM 21.2) above Union. Surveys on the Wallowa River were conducted on a 3.4 mile section on the lower river from its confluence with the Grande Ronde River at Rondowa (RM 0) to Howard Creek (RM 3.4) and an upper 17.8 mile section from Minam State Park (RM 8.2) to the mouth of the Lostine River (RM 26.0). Anglers who parked their vehicles at Minam State Park and hiked below to fish were included in the upper survey. The survey on the Imnaha River was conducted on the lower 19.6 miles from its confluence with the Snake River (RM 0) to the mouth of Big Sheep Creek (RM 19.6) near the town of Imnaha. The study area is shown in Figure 1.

METHODS

Generally, we followed the methods described by Carmichael et al. (1988). The survey on the lower Grande Ronde River (LGR) was from 1 September 1991 to 15 April 1992. The survey on the upper Grande Ronde River (UGR) was from 16 February to 15 April 1992. Surveys on the upper Wallowa River (WAL) and the lower Wallowa River at Rondowa (RON) were from 1 February to 15 April 1992. The surveys on Catherine Creek (CC) and the Imnaha River (IMN) were from 1 March to 15 April 1992. We sampled 50% of the weekends 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 (Saturday, Sunday) were represented equally and weekdays (Monday through Friday) were represented equally.

RESULTS

Lower Grande Ronde River

We estimated that 4,862 anglers fished for 19,617 hours on the lower Grande Ronde River. They caught and released 410 wild and 494 hatchery steelhead and kept 879 hatchery steelhead for a catch rate of 11.0 hours per fish (Figures 2-6, Appendix A-1). The percent of the steelhead caught that were hatchery fish ranged from 21% in September 1991 to 100% in April 1992 (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ C.I.) of harvested hatchery steelhead ranged from 588 mm (± 7) for 1-ocean females to 724 mm (± 29) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 81.8% 1-ocean fish and 18.2% 2-ocean fish while the sex composition was 49.5% males and 50.5% females (Table 1). On the lower Grande Ronde River, we recovered six adipose-left ventral clipped plus coded-wire-tagged (AdLV+CWT) steelhead from our hatchery releases (Table 2). Seventy-nine percent of the anglers were from Union or Wallowa counties, 10% were from other Oregon counties and 11% were non-residents (Table 3).

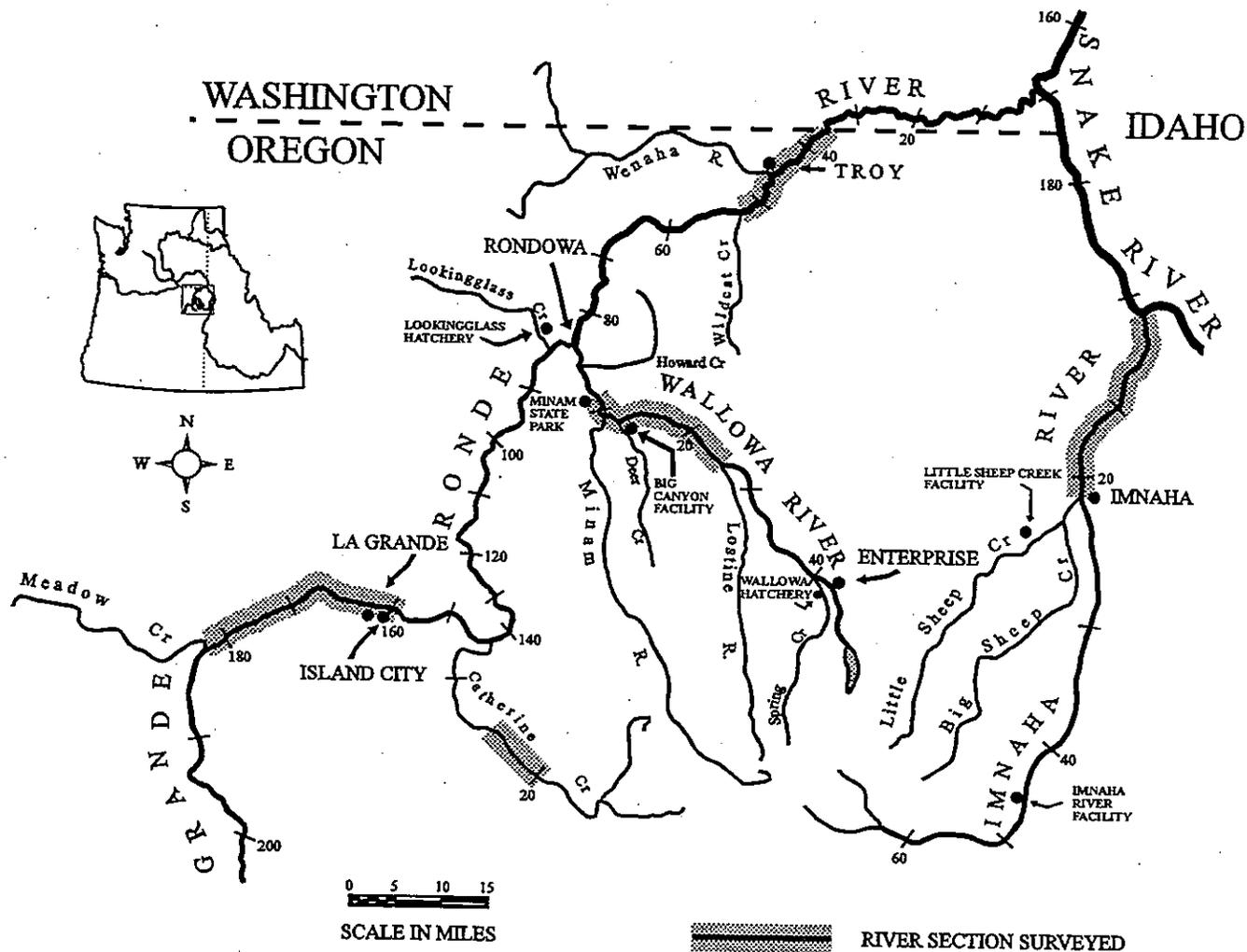


Figure 1. Map of northeastern Oregon showing where summer steelhead creel surveys were conducted in the Grande Ronde and Imnaha basins during the 1991-92 run year.

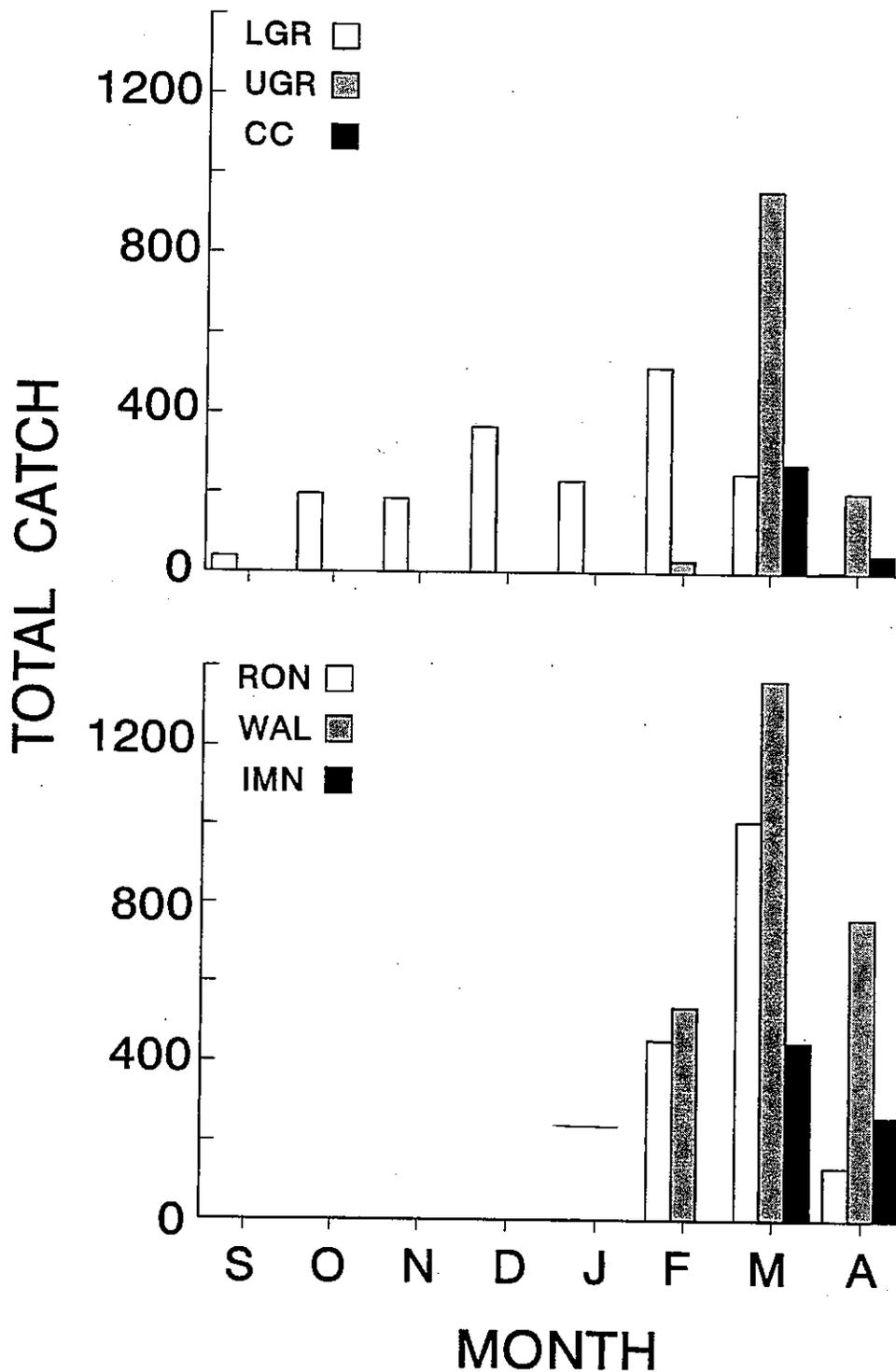


Figure 2. Estimated total catch of summer steelhead in the Grande Ronde and Imnaha basins during the 1991-92 run year. Survey areas and times include the lower Grande Ronde (LGR: 1 Sep-15 Apr), upper Grande Ronde (UGR: 16 Feb-15 Apr), upper Wallowa (WAL: 1 Feb-15 Apr) and Imnaha (IMN: 1 Mar-15 Apr) rivers; the lower Wallowa River at Rondowa (RON: 1 Feb-15 Apr), and Catherine Creek (CC: 1 Mar-15 Apr).

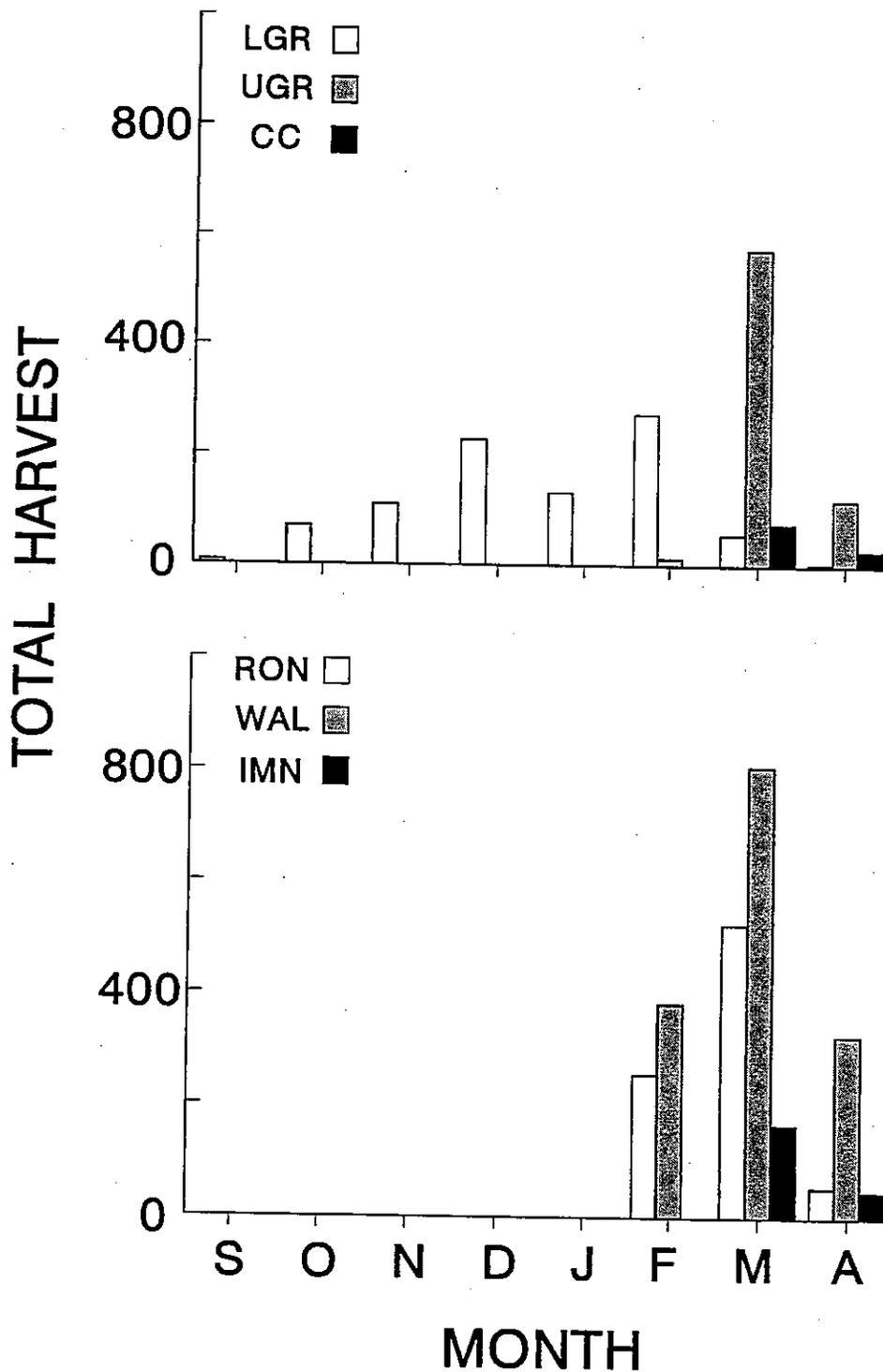


Figure 3. Estimated total harvest of summer steelhead in the Grande Ronde and Imnaha basins during the 1991-92 run year. Survey areas and times include the lower Grande Ronde (LGR: 1 Sep-15 Apr), upper Grande Ronde (UGR: 16 Feb-15 Apr), upper Wallowa (WAL: 1 Feb-15 Apr) and Imnaha (IMN: 1 Mar-15 Apr) rivers; the lower Wallowa River at Rondowa (RON: 1 Feb-15 Apr), and Catherine Creek (CC: 1 Mar-15 Apr).

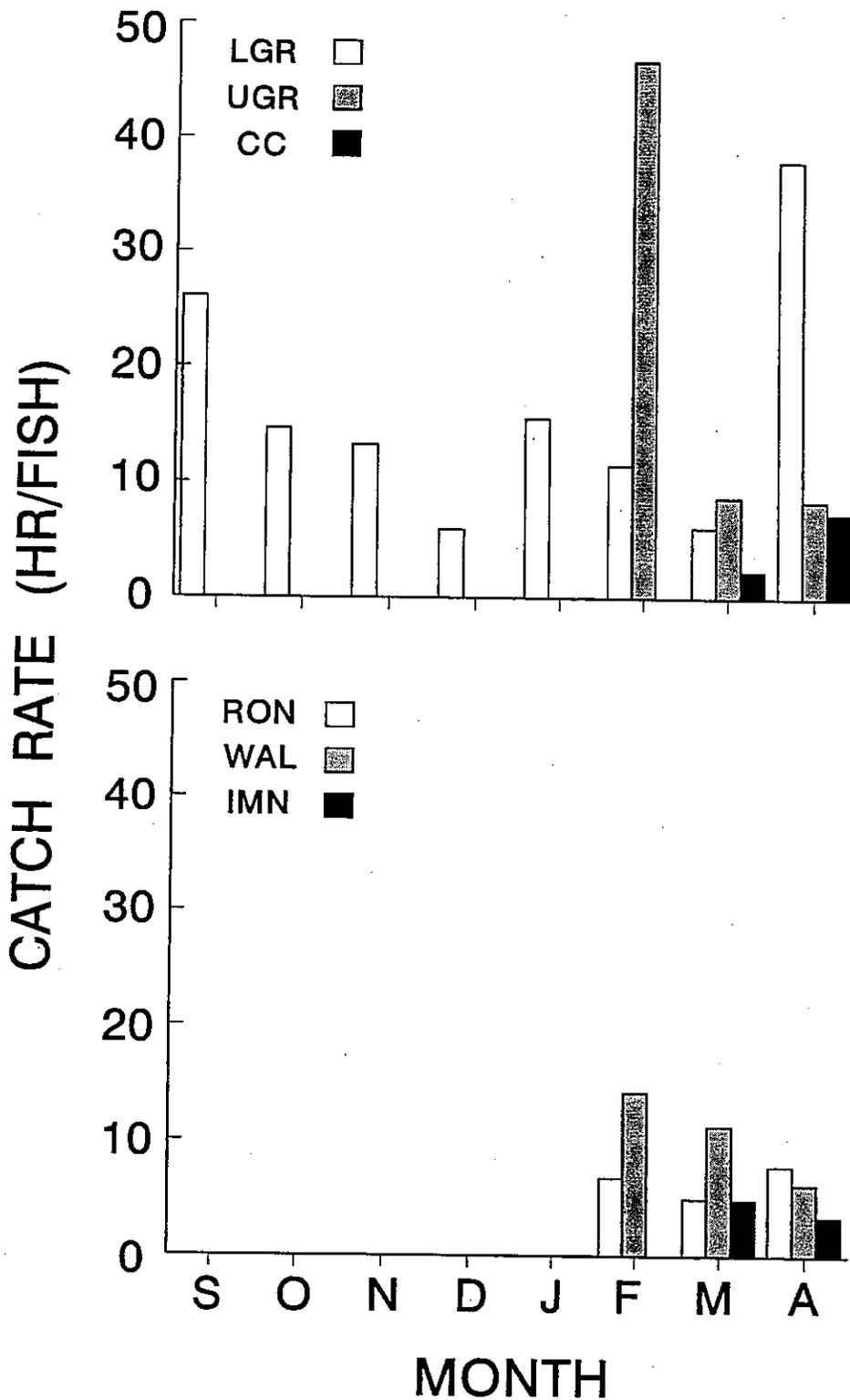


Figure 4. Estimated catch rate (fish/hr) for summer steelhead in the Grande Ronde and Imnaha basins during the 1991-92 run year. Survey areas and times include the lower Grande Ronde (LGR: 1 Sep-15 Apr), upper Grande Ronde (UGR: 16 Feb-15 Apr), upper Wallowa (WAL: 1 Feb-15 Apr) and Imnaha (IMN: 1 Mar-15 Apr) rivers; the lower Wallowa River at Rondowa (RON: 1 Feb-15 Apr), and Catherine Creek (CC: 1 Mar-15 Apr).

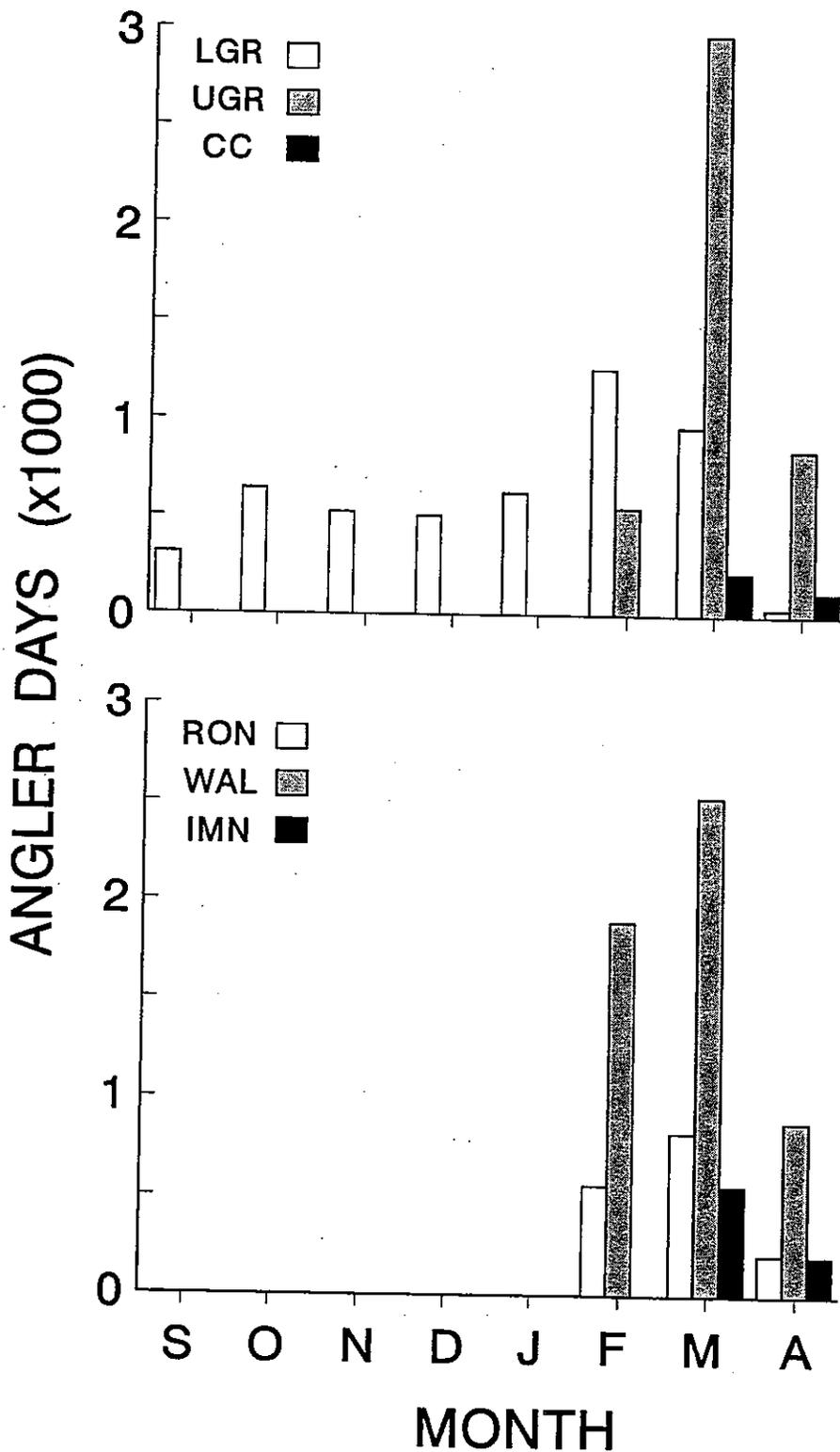


Figure 5. Estimated angler days fished for summer steelhead in the Grande Ronde and Imnaha basins during the 1991-92 run year. Survey areas and times include the lower Grande Ronde (LGR: 1 Sep-15 Apr), upper Grande Ronde (UGR: 16 Feb-15 Apr), upper Wallowa (WAL: 1 Feb-15 Apr) and Imnaha (IMN: 1 Mar-15 Apr) rivers; the lower Wallowa River at Rondowa (RON: 1 Feb-15 Apr), and Catherine Creek (CC: 1 Mar-15 Apr).

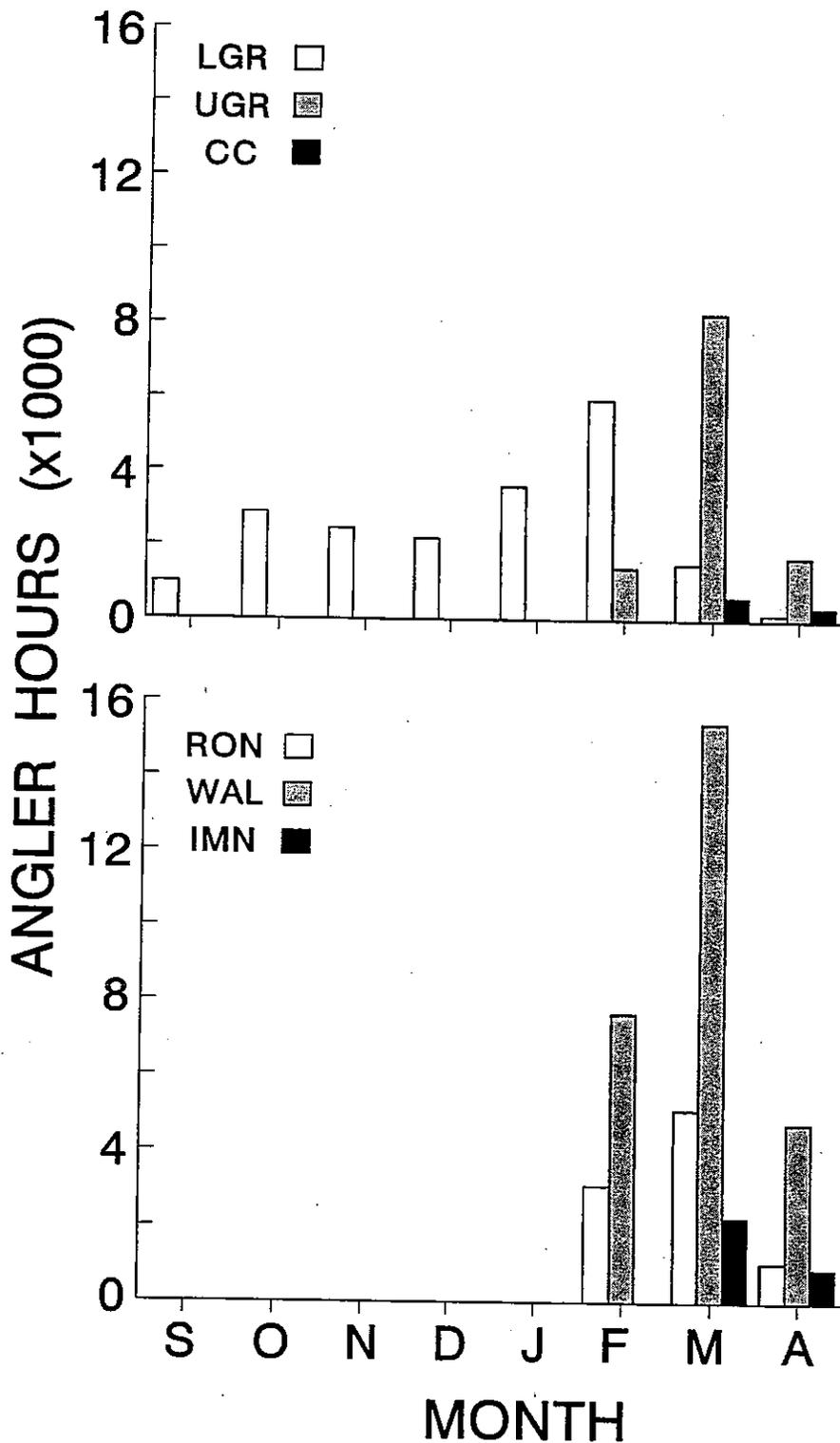


Figure 6. Estimated angler hours fished for summer steelhead in the Grande Ronde and Imnaha basins during the 1991-92 run year. Survey areas and times include the lower Grande Ronde (LGR: 1 Sep-15 Apr), upper Grande Ronde (UGR: 16 Feb-15 Apr), upper Wallowa (WAL: 1 Feb-15 Apr) and Imnaha (IMN: 1 Mar-15 Apr) rivers; the lower Wallowa River at Rondowa (RON: 1 Feb-15 Apr), and Catherine Creek (CC: 1 Mar-15 Apr).

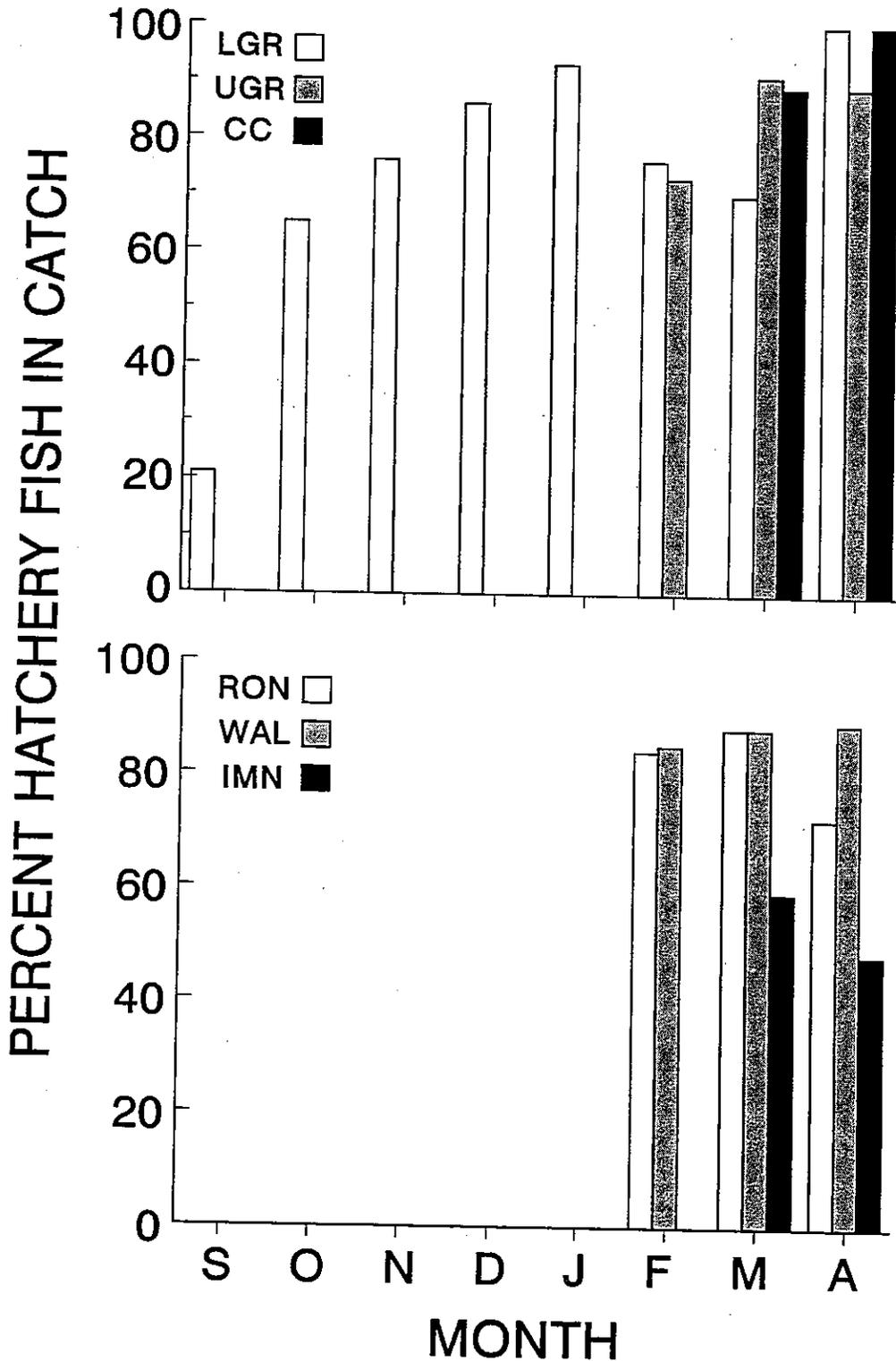


Figure 7. Estimated percent of the summer steelhead caught that were hatchery fish in the Grande Ronde and Imnaha basins during the 1991-92 run year. Survey areas and times include the lower Grande Ronde (LGR: 1 Sep-15 Apr), upper Grande Ronde (UGR: 16 Feb-15 Apr), upper Wallowa (WAL: 1 Feb-15 Apr) and Imnaha (IMN: 1 Mar-15 Apr) rivers; the lower Wallowa River at Rondowa (RON: 1 Feb-15 Apr), and Catherine Creek (CC: 1 Mar-15 Apr).

Table 1. Percent age composition and mean fork length of summer steelhead sampled in creel surveys in the Grande Ronde and Imnaha basins during the 1991-92 run year. Mean fork length includes $\pm 95\%$ confidence interval. Age is expressed as years spent in freshwater prior to ocean migration: years spent in the ocean prior to spawning migration.

Creel survey area, sex	Age composition (%)				Mean fork length (mm)					
	N	1:1	1:2	2:1	N	1:1	N	1:2	N	2:1
Lower Grande Ronde										
Male	98	89	11	0	87	598 \pm 6	11	724 \pm 29	--	--
Female	100	75	25	0	75	588 \pm 7	25	693 \pm 18	--	--
Upper Grande Ronde										
Male	37	81	19	0	30	600 \pm 12	7	707 \pm 85	--	--
Female	33	73	27	0	24	594 \pm 11	9	707 \pm 27	--	--
Catherine Creek										
Male	1	100	0	0	1	550	--	--	--	--
Female	4	75	25	0	3	608 \pm 72	1	685	--	--
Lower Wallowa at Rondowa										
Male	109	85	14	1	92	592 \pm 6	15	739 \pm 27	1	609
Female	119	71	29	0	80	590 \pm 6	34	705 \pm 12	--	--
Upper Wallowa										
Male	120	82	18	0	98	608 \pm 6	22	725 \pm 21	--	--
Female	138	54	46	0	75	592 \pm 6	63	697 \pm 11	--	--
Imnaha										
Male	39	74	26	0	29	598 \pm 13	10	731 \pm 12	--	--
Female	27	56	44	0	15	606 \pm 36	12	688 \pm 17	--	--

Table 2. Observed and expanded number of AdLV+CWT summer steelhead recovered in the Grande Ronde and Imnaha basins during the 1991-92 run year. No AdLV+CWT fish were recovered in Catherine Creek or in the upper Grande Ronde River. Tag recoveries were expanded for the entire fishery.

Creeel survey area	Tag code	Experimental Group	Brood Year	Number recovered		% of release
				Observed	Expanded	
Lower Grande Ronde	07 45 42	4/1b	88	1	8	0.03
	07 51 18	Direct Stream	89	3	14	0.05
	07 51 20	4/1b	89	1	4	0.02
	07 51 21	4/1b	89	2	4	0.02
	07 51 22	Acclimated,5/1b	89	1	2	0.01
	07 51 23	Acclimated,5/1b	89	1	5	0.02
Lower Wallowa at Rondowa	07 51 19	Direct Stream	89	1	4	0.02
	07 51 20	4/1b	89	1	4	0.02
	07 51 21	4/1b	89	3	9	0.03
	07 51 22	Acclimated,5/1b	89	3	9	0.03
	07 51 23	Acclimated,5/1b	89	1	2	0.01
	23 20 20	NMFS ^a	89	1	4	--
Upper Wallowa	07 46 50	Acclimated,5/1b	88	1	6	0.02
	07 46 52	Direct Stream	88	1	5	0.01
	07 51 18	Direct Stream	89	3	18	0.07
	07 51 19	Direct Stream	89	3	17	0.06
	07 51 20	4/1b	89	2	14	0.05
	07 51 21	4/1b	89	2	8	0.03
	07 51 22	Acclimated,5/1b	89	2	11	0.04
	63 14 22	WDW ^a	89	1	4	--
Imnaha	07 46 56	Production	88	2	4	0.01
	07 46 57	Production	88	1	2	0.01
	07 51 24	Production	89	6	12	0.05
	07 51 25	Production	89	2	6	0.02

^aThe fish with tagcode 23-20-20 was marked by the National Marine Fisheries Service (NMFS) at Little Goose Dam, then barged and released just below Bonneville Dam in 1990. The fish with tagcode 63-14-22 was a stray steelhead released by Washington Department of Wildlife (WDW) in Asotin Creek on the Snake River (RM 145.3).

Table 3. Residence of summer steelhead anglers interviewed during creel surveys in the Grande Ronde and Imnaha basins during the 1991-92 run year.

Creel survey area	Number of anglers	Wallowa and Union counties	Other Oregon counties	Out-of-state
Lower Grande Ronde	1,193	79%	10%	11%
Upper Grande Ronde	726	89%	10%	1%
Catherine Creek	71	92%	8%	0%
Upper Wallowa	1,361	62%	36%	2%
Lower Wallowa at Rondowa	510	78%	21%	1%
Imnaha	356	90%	7%	3%

Upper Grande Ronde River

On the upper Grande Ronde River, we estimated that 4,366 anglers fished for 11,374 hours. They caught and released 114 wild and 366 hatchery steelhead and kept 708 hatchery steelhead for a catch rate of 9.6 hours per fish (Figures 2-6, Appendix A-2). The percent of the steelhead caught that were hatchery fish ranged from 73% in February to 91% in March (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ C.I.) of harvested hatchery steelhead ranged from 594 mm (± 11) for 1-ocean females to 707 mm (± 27) for 2-ocean females (Table 1). Age composition of harvested hatchery steelhead was 77.1% 1-ocean fish and 22.9% 2-ocean fish while the sex composition was 52.9% males and 47.1% females (Table 1). No AdLV+CWT steelhead have been released or were recovered on the upper Grande Ronde River (Table 2). Eighty-nine percent of the anglers were from Union or Wallowa counties, 10% were from other Oregon counties and 1% were non-residents (Table 3).

Catherine Creek

On Catherine Creek, we estimated that 341 anglers fished for 955 hours. They caught and released 31 wild and 186 hatchery steelhead and kept 103 hatchery steelhead for a catch rate of 3.0 hours per fish (Figures 2-6, Appendix A-3). The percent of the steelhead caught that were hatchery fish was 89% in March and 100% in April (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ C.I.) of harvested hatchery steelhead ranged from 550 mm for a 1-ocean male to 685 mm for a 2-ocean female (Table 1). Age composition of harvested hatchery steelhead was 80.0% 1-ocean fish and 20.0% 2-ocean fish while the sex composition was 20.0% males and 80.0% females (Table 1). No AdLV+CWT steelhead have been previously released or were recovered in Catherine Creek (Table 2). Ninety-two percent of the anglers were from Union or Wallowa counties and 8% were from other Oregon counties (Table 3).

Lower Willowa River at Rondowa

On the lower Willowa River at Rondowa, we estimated that 1,594 anglers fished for 9,209 hours. They caught and released 229 wild and 537 hatchery steelhead and kept 832 hatchery steelhead for a catch rate of 5.8 hours per fish (Figures 2-6, Appendix A-4). The percent of the steelhead caught that were hatchery fish ranged from 72% in April to 88% in March (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ C.I.) of harvested hatchery steelhead ranged from 590 mm (± 6) for 1-ocean females to 739 mm (± 27) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 78.1% 1-ocean fish and 21.9% 2-ocean fish while the sex composition was 47.8% males and 52.2% females (Table 1). One, 1-ocean fish caught at Rondowa had spent two years in freshwater before migrating to the ocean. On the lower Willowa River at Rondowa, we recovered five AdLV+CWT steelhead from our hatchery releases and one AdLV+CWT fish which was tagged by National Marine Fisheries Service (NMFS) at Little Goose Dam between 29 April and 3 May 1989 and barged and released below Bonneville Dam (Table 2). Sixty-two percent of the anglers were from Union or Willowa counties, 36% were from other Oregon counties and 2% were non-residents (Table 3).

Upper Willowa River

On the upper Willowa River, we estimated that 5,304 anglers fished for 27,807 hours. They caught and released 333 wild and 821 hatchery steelhead and kept 1,514 hatchery steelhead for a catch rate of 10.4 hours per fish (Figures 2-6, Appendix A-5). The percent of the steelhead caught that were hatchery fish ranged from 85% in February to 89% in April (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ C.I.) of harvested hatchery steelhead ranged from 592 mm (± 6) for 1-ocean females to 725 mm (± 21) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 67.1% 1-ocean fish and 32.9% 2-ocean fish while the sex composition was 46.5% males and 53.5% females (Table 1). On the upper Willowa River, we recovered seven AdLV+CWT steelhead from our hatchery releases and one stray AdLV+CWT fish which was tagged by Washington Department of Wildlife (WDW) and released in Asotin Creek (RM 145.3) on the Snake River (Table 2). Seventy-eight percent of the anglers were from Union or Willowa counties, 21% were from other Oregon counties and 1% were non-residents (Table 3).

Imnaha River

On the Imnaha River, we estimated that 762 anglers fished for 3,128 hours. They caught and released 321 wild and 180 hatchery steelhead and kept 212 hatchery steelhead for a catch rate of 4.4 hours per fish (Figures 2-6, Appendix A-6). The percent of the steelhead caught that were hatchery fish ranged from 48% in April to 59% in March (Figure 7, Appendix B). Mean fork length ($\pm 95\%$ C.I.) of harvested hatchery steelhead ranged from 598 mm (± 13) for 1-ocean males to 731 mm (± 12) for 2-ocean males (Table 1). Age composition of harvested hatchery steelhead was 66.7% 1-ocean fish and 33.3% 2-ocean fish while the sex composition was 59.1% males and 40.9% females (Table 1). On the Imnaha River, we recovered four AdLV+CWT steelhead from our hatchery releases (Table 2). Ninety percent of the anglers were from Union or Willowa counties, 7% were from other Oregon counties and 3% were non-residents (Table 3).

DISCUSSION

We estimated that, during the 1991-92 run year, record high numbers of anglers fished in all the summer steelhead recreational fisheries in northeast Oregon except on the upper Wallowa and Imnaha rivers (Figure 8). Angler effort in the upper Wallowa and Imnaha river fisheries was the second highest since consumptive fisheries were re-opened in 1986 for the first time since 1974 (1976 on the Imnaha River). Angler effort on the lower Grande Ronde River was over 5 times higher than the previous year, and 27% higher than the previous record run year in 1989-90. On the upper Grande Ronde River, angler effort increased 84% from the previous record in 1991. Angler effort on the Wallowa River at Rondowa was 2.5 times higher than the previous record in 1988. Above average escapement of both 1-ocean and 2-ocean fish into both basins (Messmer et al. 1992, in preparation), together with favorable environmental conditions enabling anglers to fish throughout the winter on the lower Grande Ronde River (see Figure 2, Appendix A-1) and a substantial fishery at Rondowa (see Figure 2, Appendix A-4) contributed to the increased angler effort.

Anglers caught and harvested record numbers of steelhead in all fisheries in the Grande Ronde and Imnaha basins during the 1991-92 run year (Figure 9). Angler catch and harvest on the lower Grande Ronde were 62% and 66% higher than during the 1989-90 run year, respectively. Angling occurred throughout the winter months (late December, January, and early February), where in previous years little or no effort occurred due to frozen river conditions. Both catch and harvest on the upper Grande Ronde River were four times higher than in 1990, with the increase occurring primarily in February and March. Catch and harvest on the Wallowa River at Rondowa were 4.6 and 11.9 times higher than in 1988, respectively. This fishery is sporadic and depends on whether or not the two main roads into Rondowa are blocked by snow. Occasionally anglers will walk or snowmobile into Rondowa every year, however these anglers are not sampled. The increase in angling occurred mainly during February and early March when the roads are usually impassable. Catch on the upper Wallowa River was 6% higher and harvest was 90% higher than in 1990. Catch and harvest on the Imnaha River were 2.1 times and 5.7 times higher than in previous record years, respectively. This increase in catch and harvest in all fisheries since surveys began in 1986 may have been related to above average adult escapement and increased angler effort during the winter months.

The catch rate averaged 11.0 hours per fish or better in all summer steelhead sport fisheries in the Grande Ronde and Imnaha basins during the 1991-92 run year. The average catch rate of 11.0 hours per fish on the lower Grande Ronde River was 41% better than in the previous year. Catch rate on the upper Grande Ronde River averaged 9.6 hours per fish which was the best since this fishery re-opened in 1989. Catch rate on Catherine Creek averaged 3.0 hours per fish and this was the first year this creek was intensively surveyed. On the lower Wallowa River at Rondowa, catch rate averaged 5.8 hours per fish which was the best since surveys began in 1988. The upper Wallowa River had an average catch rate of 10.4 hours per fish which was 41% poorer than the previous year, but the third best since surveys began in 1986. Catch rate on the Imnaha River averaged 4.4 hours per fish which was also the best since we began surveys in 1986.

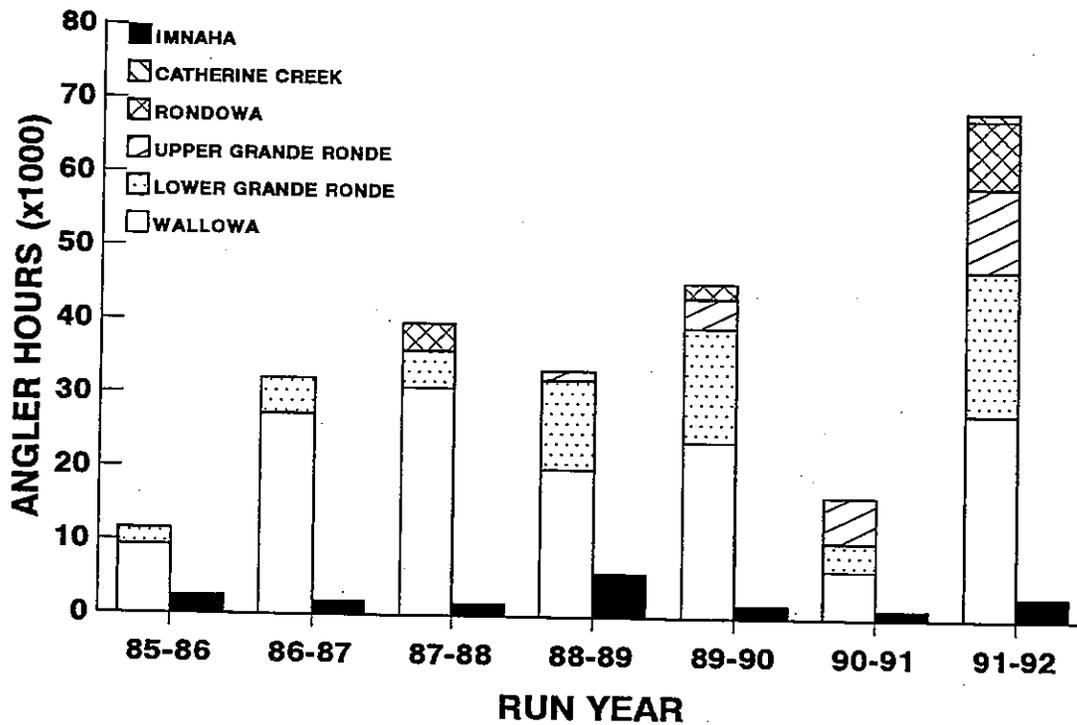


Figure 8. Angler effort for summer steelhead in the Grande Ronde and Imnaha basins from 1986-92.

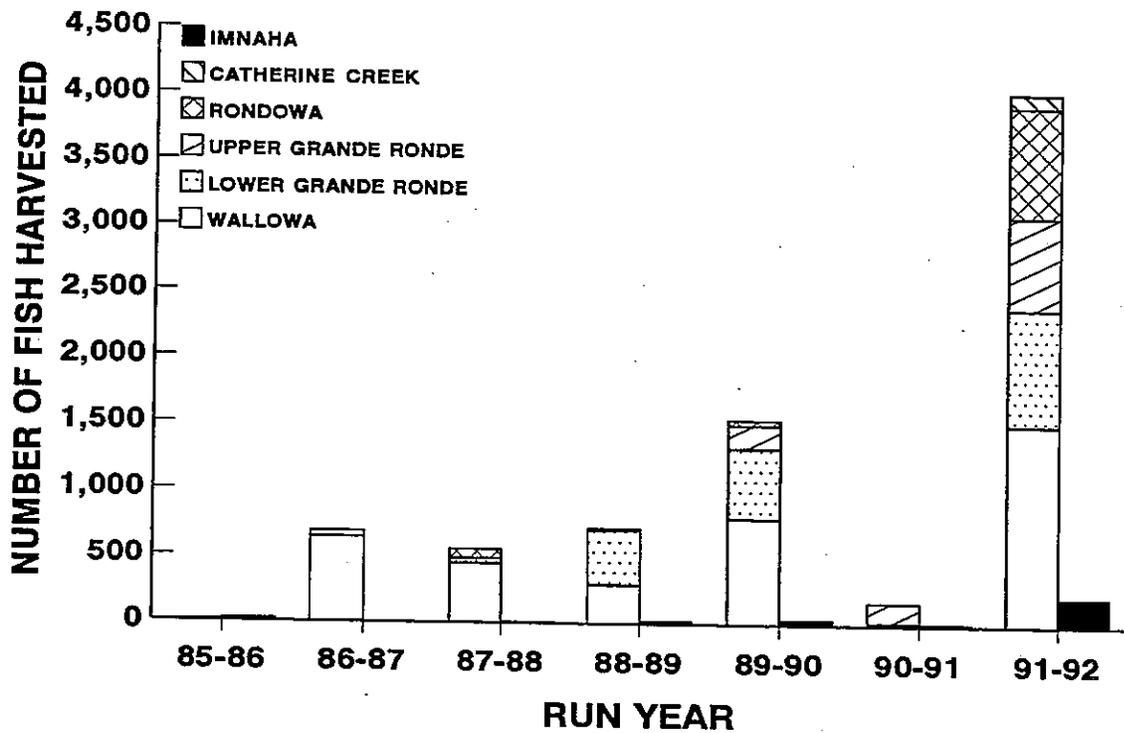


Figure 9. Number of hatchery summer steelhead harvested by recreational anglers in the Grande Ronde and Imnaha basins from 1986-92.

As in previous years (see Carmichael et al. 1990b), the difference in run timing of wild and hatchery fish entering the lower Grande Ronde River during the fall is of considerable concern. This difference in run timing is illustrated by the low percent of hatchery fish in the catch during September and October. We may be able to increase the early fall component of the run if we incorporate a percent of known early returning adults into the Wallowa broodstock, since run timing seems to be in part genetically based (Steward and Bjornn 1990, Siitonen and Gall 1989). This would likely increase angler effort, catch and harvest during the fall towards the historic levels of this fishery.

Angler effort for summer steelhead on the Imnaha River has been relatively low since consumptive fisheries re-opened in 1986. Low angler effort probably makes a significant contribution to the lower than expected harvest. Low harvest creates a surplus of hatchery fish at the Little Sheep Creek Facility. Options to increase angler effort and harvest on hatchery fish returning to the facility may include (1) increasing both public and private access to the river, (2) adopting a season extension, (3) expanding the fishing area and (4) increasing the daily harvest limit. Also of concern is that more effort seems to be occurring during the spring rather than during the fall when the fishery traditionally occurred (Carmichael et al. 1987). If the Little Sheep Creek stock returns later than other stocks within the Imnaha basin, then developing broodstocks from these other Imnaha stocks should increase numbers of earlier returning adults and may increase angler effort and harvest in the Imnaha basin during the fall.

Angler effort and catch estimates in most of the summer steelhead fisheries in the Grande Ronde and Imnaha basins during the 1991-92 run year were the highest measured since 1986, suggesting that most fisheries are increasing and that all fisheries have been reestablished. However, creel survey estimates in both basins indicate that most effort occurs during spring rather than fall which was when most effort occurred historically (Carmichael et al. 1988). Thus, the timing of these fisheries has changed and the need to restore fisheries in both time and place should be evaluated before restoration can be established.

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Appendix A-1. Catch statistics for summer steelhead on the lower Grande Ronde River during the 1991-92 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
	days	anglers					
September:							
Weekday	5	18	396 \pm 251	23 \pm 46	0	17 \pm 33	107 \pm 68
Weekend	6	69	595 \pm 194	15 \pm 24	6 \pm 10	40 \pm 64	207 \pm 67
Total	11	87	991 \pm 317	38 \pm 52	6 \pm 10	26 \pm 35	314 \pm 100
October:							
Weekday	7	86	1364 \pm 283	86 \pm 46	17 \pm 18	16 \pm 9	337 \pm 70
Weekend	4	109	1499 \pm 447	110 \pm 57	53 \pm 33	14 \pm 7	304 \pm 91
Total	11	195	2863 \pm 529	196 \pm 74	70 \pm 38	15 \pm 6	641 \pm 118
November:							
Weekday	7	80	845 \pm 173	94 \pm 52	50 \pm 32	9 \pm 5	231 \pm 47
Weekend	6	167	1592 \pm 351	90 \pm 28	60 \pm 23	18 \pm 6	291 \pm 64
Total	13	247	2437 \pm 391	184 \pm 59	110 \pm 39	13 \pm 4	522 \pm 84
December:							
Weekday	6	87	1061 \pm 155	214 \pm 87	125 \pm 58	5 \pm 2	269 \pm 39
Weekend	5	117	1108 \pm 437	152 \pm 116	102 \pm 80	7 \pm 5	236 \pm 93
Total	11	204	2169 \pm 464	366 \pm 145	227 \pm 99	6 \pm 2	505 \pm 108
January:							
Weekday	5	44	1120 \pm 543	31 \pm 57	31 \pm 57	36 \pm 67	192 \pm 93
Weekend	5	142	2450 \pm 623	199 \pm 149	101 \pm 80	12 \pm 9	431 \pm 110
Total	10	186	3570 \pm 826	230 \pm 160	132 \pm 99	16 \pm 11	623 \pm 144
February:							
Weekday	6	85	2177 \pm 815	202 \pm 85	135 \pm 64	11 \pm 5	346 \pm 130
Weekend	5	121	3749 \pm 964	314 \pm 199	139 \pm 100	12 \pm 8	912 \pm 235
Total	11	206	5926 \pm 1262	516 \pm 217	274 \pm 118	12 \pm 5	1258 \pm 268
March:							
Weekday	6	31	1000 \pm 470	143 \pm 205	28 \pm 44	7 \pm 10	556 \pm 261
Weekend	5	21	509 \pm 142	106 \pm 248	28 \pm 62	5 \pm 12	407 \pm 114
Total	11	52	1509 \pm 491	249 \pm 322	56 \pm 76	6 \pm 8	963 \pm 313
April:							
Weekday	5	8	103 \pm 62	4 \pm 7	4 \pm 7	26 \pm 45	24 \pm 14
Weekend	2	7	49 \pm 29	0	0	--	12 \pm 7
Total	7	15	152 \pm 69	4 \pm 7	4 \pm 7	38 \pm 66	36 \pm 16
Grand total	85	1192	19617 \pm 1808	1783 \pm 457	879 \pm 206	11 \pm 3	4862 \pm 448

Appendix A-2. Catch statistics for summer steelhead on the upper Grande Ronde River during the 1991-92 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
	days	anglers					
February:							
Weekday	3	53	866 \pm 884	11 \pm 20	6 \pm 11	79 \pm 134	362 \pm 370
Weekend	3	89	535 \pm 331	19 \pm 13	7 \pm 8	28 \pm 19	187 \pm 116
Total	6	142	1401 \pm 944	30 \pm 24	13 \pm 14	47 \pm 36	549 \pm 370
March:							
Weekday	7	203	4536 \pm 677	664 \pm 301	446 \pm 218	7 \pm 3	1765 \pm 263
Weekend	5	240	3744 \pm 575	292 \pm 122	129 \pm 69	13 \pm 5	1204 \pm 185
Total	12	443	8280 \pm 889	956 \pm 325	575 \pm 228	9 \pm 3	2969 \pm 319
April:							
Weekday	4	92	1029 \pm 181	138 \pm 105	59 \pm 51	8 \pm 6	425 \pm 75
Weekend	2	49	664 \pm 45	64 \pm 49	61 \pm 48	10 \pm 8	423 \pm 29
Total	6	141	1693 \pm 186	202 \pm 116	120 \pm 70	8 \pm 5	848 \pm 93
Grand total	24	726	11374 \pm 1310	1188 \pm 346	708 \pm 239	10 \pm 3	4366 \pm 503

Appendix A-3. Catch statistics for summer steelhead on Catherine Creek during the 1991-92 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
	days	anglers					
March:							
Weekday	6	22	378 \pm 222	249 \pm 365	51 \pm 81	2 \pm 3	135 \pm 79
Weekend	5	24	239 \pm 56	25 \pm 24	25 \pm 24	10 \pm 9	85 \pm 20
Total	11	46	617 \pm 229	274 \pm 366	76 \pm 85	2 \pm 3	220 \pm 82
April:							
Weekday	4	14	216 \pm 254	38 \pm 67	19 \pm 36	6 \pm 11	77 \pm 91
Weekend	2	11	122 \pm 100	8 \pm 12	8 \pm 12	15 \pm 23	44 \pm 36
Total	6	25	338 \pm 272	46 \pm 68	27 \pm 38	7 \pm 10	121 \pm 97
Grand total	17	71	955 \pm 365	320 \pm 373	103 \pm 93	3 \pm 3	341 \pm 130

Appendix A-4. Catch statistics for summer steelhead on the lower Wallowa River at Rondowa during the 1991-92 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
February:							
Weekday	4	52	1340 \pm 765	290 \pm 219	166 \pm 130	5 \pm 2	247 \pm 141
Weekend	4	125	1736 \pm 1231	165 \pm 145	88 \pm 79	10 \pm 3	312 \pm 221
Total	8	177	3076 \pm 1449	455 \pm 263	254 \pm 152	7 \pm 2	559 \pm 263
March:							
Weekday	5	114	2869 \pm 587	748 \pm 256	378 \pm 141	4 \pm 1	502 \pm 103
Weekend	4	144	2215 \pm 445	261 \pm 103	146 \pm 62	8 \pm 3	324 \pm 65
Total	9	258	5084 \pm 737	1009 \pm 276	524 \pm 154	5 \pm 1	826 \pm 120
April:							
Weekday	3	35	693 \pm 593	110 \pm 108	44 \pm 47	6 \pm 3	128 \pm 110
Weekend	2	40	356 \pm 373	24 \pm 28	10 \pm 13	15 \pm 5	81 \pm 85
Total	5	75	1049 \pm 701	134 \pm 112	54 \pm 48	8 \pm 4	209 \pm 140
Grand total	22	510	9209 \pm 1770	1598 \pm 397	832 \pm 222	6 \pm 1	1594 \pm 306

Appendix A-5. Catch statistics for summer steelhead on the upper Wallowa River during the 1991-92 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	<u>Sample size</u> days anglers		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
February:							
Weekday	6	183	4141 \pm 2134	407 \pm 330	294 \pm 243	10 \pm 8	1141 \pm 588
Weekend	5	201	3516 \pm 2880	132 \pm 149	88 \pm 102	27 \pm 31	751 \pm 615
Total	11	384	7657 \pm 3584	539 \pm 362	382 \pm 264	14 \pm 9	1892 \pm 886
March:							
Weekday	7	352	8730 \pm 2117	859 \pm 285	507 \pm 182	10 \pm 3	1505 \pm 365
Weekend	5	388	6685 \pm 834	508 \pm 139	300 \pm 94	13 \pm 4	1024 \pm 128
Total	12	740	15415 \pm 2276	1367 \pm 317	807 \pm 205	11 \pm 3	2529 \pm 373
April:							
Weekday	4	137	2814 \pm 292	512 \pm 198	224 \pm 102	6 \pm 2	584 \pm 61
Weekend	2	120	1921 \pm 224	250 \pm 108	101 \pm 53	8 \pm 3	299 \pm 35
Total	6	257	4735 \pm 368	762 \pm 226	325 \pm 115	6 \pm 2	883 \pm 69
Grand total	29	1381	27807 \pm 4262	2668 \pm 532	1514 \pm 353	10 \pm 2	5304 \pm 813

Appendix A-6. Catch statistics for summer steelhead on the Imnaha River during the 1991-92 run year. Total catch and harvest includes $\pm 95\%$ confidence interval. Only adipose-marked fish were harvested.

Month, day type	Sample size		Total hours	Total catch	Total harvest	Catch rate (hour/fish)	Angler days
March:							
Weekday	7	105	1182 \pm 343	283 \pm 132	104 \pm 56	4 \pm 1	309 \pm 90
Weekend	6	159	1049 \pm 161	168 \pm 45	61 \pm 22	6 \pm 1	249 \pm 38
Total	13	264	2231 \pm 379	451 \pm 140	165 \pm 60	5 \pm 1	558 \pm 95
April:							
Weekday	4	38	364 \pm 227	176 \pm 105	33 \pm 26	2 \pm 0	97 \pm 60
Weekend	2	54	533 \pm 58	86 \pm 20	14 \pm 10	6 \pm 2	107 \pm 12
Total	6	92	897 \pm 234	262 \pm 106	47 \pm 28	3 \pm 0	204 \pm 53
Grand total	19	356	3128 \pm 446	713 \pm 176	212 \pm 66	4 \pm 1	762 \pm 109

Appendix B. Percent of the summer steelhead caught that were hatchery fish in the Grande Ronde and Imnaha basins during the 1991-92 run year. Sample size is shown in parentheses.

Creeel survey area	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Lower Grande Ronde	21(38) 6	65(196) 127	76(184) 140	86(366) 315	93(230) 214	76(516) 392	70(249) 174	100(4) 4
Upper Grande Ronde	--	--	--	--	--	73(30) 22	91(956) 870	89(202) 180
Catherine Creek	--	--	--	--	--	--	89(274) 244	100(46) 46
Lower Wallowa @ Rondowa	--	--	--	--	--	84(455) 382	88(1009) 888	72(134) 96
Upper Wallowa	--	--	--	--	--	85(539) 458	88(1367) 1203	89(762) 678
Imnaha	--	--	--	--	--	--	59(451)	48(262)

Grande basin

TOT
HAT

7557
6441
90
65



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