LITTLE SALMON RIVER, IDAHO
SPRING CHINOOK SALMON
(Oncorhynchus tshawytscha)

1997

SPORT HARVEST REPORT

by

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Sharon W. Kiefer, Anadromous Fishery Coordinator

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ABSTRACT

A spring chinook salmon (*Oncorhynchus tshawytscha*) sport fishing season was held from May 17 through July 13, 1997 on the Little Salmon River, Idaho. The fishery targeted chinook salmon of hatchery origin. Hatchery spring chinook salmon were the product of the Rapid River Fish Hatchery, which is operated by Idaho Department of Fish and Game and owned and funded by Idaho Power Company. We conducted a roving creel survey using a stratified sampling design to estimate total angler effort and harvest. During the 58 day spring chinook salmon season, we estimated that 34,961 angler hours were spent to catch 3,787 salmon, of which 2,289 adipose fin-clipped spring chinook salmon were harvested and 1,498 were released, including marked and unmarked chinook salmon. We estimated that 166 naturally-produced chinook salmon were caught and released.

INTRODUCTION

A spring chinook salmon, *Oncorhynchus tshawytscha*, (spring chinook) sport harvest season was held from May 17 through July 13, 1997 on the Little Salmon River (LSR). The harvested salmon were the product of the Rapid River Fish Hatchery (FH), which is located on Rapid River, a tributary to the Little Salmon River. This hatchery is operated by Idaho Department of Fish and Game (IDFG) and it is owned and funded by Idaho Power Company (IPC). The Rapid River FH program is mitigation for the Brownlee, Oxbow, and Hells Canyon dams on the Snake River, which are owned and operated by IPC. A description of the hatchery program is given by Lowell et al. (1995a) and Hassemer (1991). In addition to funding hatchery operations, IPC provided funds to monitor and evaluate the sport fishery. The purpose of this report is to describe the 1997 sport fishery. Tribal harvest and hatchery return information is also included.

Salmon management in the Little Salmon River drainage emphasizes hatchery production to provide fish for sport and treaty harvest as the first priority. However, management actions must be consistent with the Endangered Species Act, because naturally produced salmon in the drainage are listed as threatened. An emphasis on hatchery produced salmon to provide harvest opportunity in the Little Salmon River is consistent with long-range goals, policies, and principles identified in the Anadromous Fish Management Plan, 1992-1996 (IDFG 1992) and the Fisheries Management Plan, 1996-2000 (IDFG 1996).

The 1997 sport fishery was limited to approximately 21.5 miles of the LSR from the mouth of Hazard Creek downstream to the Salmon River Road Bridge. Only adipose fin-clipped salmon, which were hatchery origin, could be retained in the fishery. Daily fishing hours were 0500 hrs. to 1800 hrs. MDT from May 17 through June 25. Only barbless hooks were allowed. The daily bag limit was two salmon and the possession limit was four salmon, including jacks. The season limit was initially four salmon. On June 26, fishing hours were extended to 2100 hrs. Also, the season limit was increased to 6 salmon and the season closure was extended from July 6 to July 13. On July 9, the season limit for the Little Salmon River was increased to 16 salmon, with a statewide season bag limit of 18.

A sport harvest quota of 400, adipose fin-clipped salmon was set prior to the season. The quota was based on the harvestable surplus of the predicted run of hatchery origin spring chinook to the Rapid River FH and harvest sharing with the Nez Perce Tribe. The sport quota was increased to 1,200 spring chinook on June 26 because of increased run size.

In addition to fishing on the spring chinook as they first ascended the LSR, anglers also had the opportunity to catch spring chinook transported back to the LSR from the Rapid River salmon trap during the 1997 sport season. The Rapid River FH exceeded mitigation broodstock needs and began hauling salmon back to the LSR on the 28th of June. Between June 28 and July 11, a total of 4,631 salmon were released downstream from the mouth of Rapid River near the Salmon River Road Bridge. And, between June 29 and July 11, a total of 1,779 salmon were released upstream from the mouth of Rapid River at the Boulder Hole, approximately 2 miles downstream from the mouth of Hazard Creek.

METHODS

Run Prediction

A number of runsize predictors were utilized to shape the sport fishing season. These included *simple and linear* regressions of adult return, cohort analyses, and damcount proportions. Predictors were produced by IDFG, the Nez Perce Tribe, and the *U.S. v. Oregon* Technical Advisory Committee (TAC).

IDFG conducted regression analyses using jack return to predict adults by utilizing the SYSTAT statistical package (Wilkinson 1997). Criteria used to evaluate the fit of the model used were the coefficient of determination (R^2) and the F-statistic (ANOVA, $p \leq 0.05$). In addition, IDFG made a cohort prediction based on: 1) known returns of the cohort components from previous years, which provide an indication of year class survival; 2) age composition data; and 3) an estimate of the jack return based on migration conditions. This predictor relied on the "known" performance of the age classes of the cohort that had already returned. We assumed that jacks from broodyear (BY) 94 would return at the same rate as the BY93 jacks.

The TAC developed a prediction for the Biological Assessment of Impacts of Proposed 1997 Fisheries in the Snake River Basin on Snake River Salmon Listed Under the Endangered Species Act (TAC 1997). The prediction was based on preseason estimates of the upriver spring and summer chinook runs at the mouth of the Columbia River converted to Lower Granite Dam. For Rapid River FH, TAC used the mid-point of the estimate of the 1992-96 proportion of the Lower Granite Dam spring/summer chinook count and the 1980-96 average proportion of the spring/summer chinook count that was intercepted at Rapid River FH, which was 15.9%.

Each year, the Nez Perce Tribe typically uses a prediction regression that utilizes the May 1 adult count at Ice Harbor to predict the number of spring chinook adults at Rapid River. This year, the April 30 count was used because information was needed for coordination on May 1.

Creel Survey

We conducted a roving creel survey using a stratified sampling design to estimate daily angler effort and harvest (Neuhold and Lu, 1957). We divided the LSR into two sections. The lower section was from the Salmon River Road Bridge upstream to the mouth of Rapid River. The upper section extended from the mouth of Rapid River upstream to the mouth of Hazard Creek. The creel survey structure for each section was identical. Each of the two sections was treated as a separate water with total angler effort and harvest estimates being made for each.

From May 17 through June 26, 1997, we divided each day into three, 3-hour periods (strata) within which angler counts and interviews were conducted. The 3 hour periods were 0500 to 0800 hrs., 1000 to 1300 hrs., and 1500 to 1800 hrs. Counts and interviews were conducted during two of the three, strata each day. We made angler counts at the beginning and end of each stratum, with angler interviews conducted between the counts. All angler counts were completed within one hour and were considered to be instantaneous counts. The two strata sampled on the first day of the fishing season were randomly chosen. On the second and subsequent survey days, the one strata not sampled on the previous survey

day was automatically selected to be sampled on that survey day. The second strata to be sampled on a survey day was randomly selected from the other two remaining strata. All weekend days and three weekdays were sampled in a given week.

Beginning on June 27, we divided each day into two equal periods: AM, 0530-1330 hr; and PM, 1330 - 2100 hrs. Counts and interviews were conducted during one of the periods on each survey day. During AM periods we made angler counts at 0530, 0730, 1000, 1230 hrs. During PM periods we made angler counts at 1330, 1600, 1830, and 2030 hrs. Angler interviews were conducted between counts. The period to be sampled on the first day was randomly chosen and then periods were alternated for each survey day. Again, all weekend days, holidays and three weekdays were sampled in a given week.

Data collected from daily angler interviews included number of anglers in party, total fishing time, number of salmon harvested, number of adipose fin clipped salmon released and number of unmarked salmon released. Angler interview data were then used to estimate fishing effort, catch and harvest rates and total harvest. Due to increased angler effort on weekends, estimates of effort, catch rates, and harvest were stratified by weekend and weekday periods, with holidays considered as weekend days. Total effort and harvest for the season were obtained by summing the weekend and weekday effort and harvest estimates.

Angler interviews were conducted to contact a minimum of 25% of the anglers in each survey strata. Survey personnel interviewed a minimum of every fourth angler encountered during the survey. Using this interview scheme, the number of interviews conducted was proportional to the amount of effort expended in each survey strata (Neuhold and Lu, 1957).

Fish encountered during the survey were sexed using sexual dimorphic characteristics. Sex of fish not showing good sexual characteristics was determined with an incision on the belly of the fish to examine gonads. Spring chinook not sexed were listed as "unknown" in relation to sex. Creel clerks also examined salmon snouts for the presence of a coded wire tag (CWT) with a portable, electronic CWT detector. When a CWT was detected, the snout was removed, if the angler allowed. Snouts were preserved for future tag removal and reading.

Each salmon encountered was measured to the nearest cm in fork length and then assigned an age according to the following classification system. Spring chinook <59 cm were classified as "jacks" or age 3 (one year in the ocean), 59 cm to 85 cm fish were age 4 (two years in the ocean), and those 86 cm and greater fish were age 5 (three years in the ocean)(R. Steiner, IDFG, pers. comm.).

Methods described in this report and the formulas used to calculate angler hours, mean catch rates, and harvest are the same as those described for the 1986 creel survey by Hassemer (1991).

Rapid River Fish Hatchery Rack Return

As described by Lowell et al. (1995a) and Hassemer (1991), spring chinook were trapped at a site on Rapid River approximately 1.5 miles downstream from the hatchery facility. Spring chinook were trapped from May 26 through August 29, 1997 (R. Lowell, IDFG, pers. comm.). Since 1994, presence of

an adipose fin with no other fin clip denotes a naturally produced chinook salmon, which were defined as a summer chinook salmon, regardless of run timing. Summer chinook salmon were released upstream of the hatchery to spawn. Chinook salmon with any finclip were defined as spring chinook regardless of run timing. They were retained at the hatchery for spawning, fishery use, or carcass distribution.

RESULTS

Run Prediction

Preseason predictions for the number of adult chinook salmon that would be intercepted at the Rapid River FH weir were as follows: 1) 7,172 total adults were estimated by linear regression (G. Mauser, IDFG, pers. comm.); 2) 6,948 hatchery adults were predicted by cohort analysis (IDFG 1997); 3) 4,062 total adults were estimated by damcount proportion (TAC 1997), and 3,251 total adults were estimated by the April 30, Ice Harbor Dam regression (J. Mauney, Nez Perce Tribe, pers. comm.).

Creel Survey

We estimated that 34,961 hours were spent in 1997 to catch 3,787 fish during the 58 day Little Salmon River spring chinook season. Of all fish caught, 2,289 adipose clipped fish were harvested (Table 1.). There were 514 salmon released that were not adipose fin clipped and 984 released that were adipose fin clipped.

Anglers spent 29,859 hours to catch 3,311 salmon on the lower section of the river of which 1,979 were harvested (Table 2.). Weekend anglers spent 13,777 hours to catch 1,352 salmon while weekday anglers spent 16,082 hours to catch 1,959 salmon.

Anglers spent 5,102 hours to catch 476 salmon on the upper section of the river of which 310 were harvested (Table 3.) Weekend anglers spent 2,301 hours to catch 166 salmon while weekday anglers spent 2,801 hours to catch 310 salmon.

Table 1. Season totals of estimated angling pressure, catch and harvest during the 1997 spring chinook season on the Little Salmon River, Idaho.

				TOTAL SALMON			
	# WEEK DAYS	# WEEKEND DAYS	TOTAL HOURS FISHED	# FISH CAUGHT	# FISH KEPT	# FISH RELEASED	
						UNCLIPPED	CLIPPED
SEASON TOTALS	38	20	34,961	3,787	2,289	514	984

Table 2. Total fishing pressure, catch and harvest estimates for the 1997, spring chinook fishery on the Little Salmon River, Idaho below Rapid River.

				TOTAL SALMON				
DATE	**# WEEK DAYS**	**# WEEKEND DAYS**	**TOTAL HOURS FISHED 95% CI (+/-)**	**# CAUGHT 95% CI(+/-)**	**# KEPT**	**# RELEASED**		**HOURS/FISH CAUGHT**
						UNCLIPPED	**CLIPPED**	
5/17-5/26	5	--	65(89)	0				
	--	5	273(160)	0				
TOTAL	**5**	**5**	**338(183)**	**0**				
5/27-6/1	4	--	176(91)	0				
	--	2	62(59)	0				
TOTAL	**4**	**2**	**238(108)**	**0**				
6/2-6/8	5	--	163(104)	0				
	--	2	182(91)	0				
TOTAL	**5**	**2**	**345(139)**	**0**				
6/9-6/15	5	--	293(135)	7(11)				42
	--	2	543(215)	16(20)				34
TOTAL	**5**	**2**	**836(254)**	**23(23)**	**21**	**0**	**2**	**35**
6/16-6/22	5	--	1430(645)	57(77)				25
	--	2	1817(670)	111(96)				16
TOTAL	**5**	**2**	**3247(930)**	**168(123)**	**126**	**12**	**30**	**19**
6/23-6/29	5	--	4355(1042)	722(734)				6
	--	2	3016(1984)	525(518)				6
TOTAL	**5**	**2**	**7371(2241)**	**1247(898)**	**742**	**193**	**312**	**6**

table 2. (cont.)				TOTAL SALMON				
DATE	**# WEEK DAYS**	**# WEEKEND DAYS**	**TOTAL HOURS FISHED 95% CI(+/-)**	**# CAUGHT 95% CI(+/-)**	**# KEPT**	**# RELEASED**		**HOURS/FISH CAUGHT**
						UNCLIPPED	**CLIPPED**	
6/30-7/6	4	--	4400(320)	635(603)				7
	--	3	4320(1533)	560(403)				8
TOTAL	**4**	**3**	**8720(1566)**	**1195(725)**	**602**	**191**	**402**	**7**
7/7-7-13	5	--	5200(873)	538(344)				10
	--	2	3564(3704)	140(353)				25
TOTAL	**5**	**2**	**8764(3806)**	**678(493)**	**488**	**93**	**97**	**13**
WEEKDAY TOTALS	**38**		**16082**	**1959**				
WEEKEND TOTALS		**20**	**13777**	**1352**				
SEASON TOTALS BELOW RAPID RIVER	**38**	**20**	**29859**	**3311**	**1979**	**489**	**843**	

Table 3. Total fishing pressure, catch and harvest estimates for the 1997, spring chinook fishery on the Little Salmon River, Idaho between Rapid River and Hazard Creek.

				TOTAL SALMON				
DATE	# WEEK DAYS	# WEEKEND DAYS	TOTAL HOURS FISHED 95% CI(+/-)	# CAUGHT 95% CI(+/-)	# KEPT	# RELEASED		HOURS/FISH CAUGHT
						UNCLIPPED	CLIPPED	
5/17-5/26	5	--	0	0				
	--	5	20(32)	0				
TOTAL	**5**	**5**	**20(32)**	**0**				
5/27-6/1	4	--	0	0				
	--	2	13(26)	0				
TOTAL	**4**	**2**	**13(26)**	**0**				
6/2-6/8	5	--	0	0				
	--	2	20(0)	4				
TOTAL	**5**	**2**	**20(0)**	**4**	**0**	**4**		**5**
6/9-6/15	5	--	22(29)	0				
	--	2	10(7)	0				
TOTAL	**5**	**2**	**32(29)**	**0**				
6/16-6/22	5	--	27(39)	0				
	--	2	13(13)	0				
TOTAL	**5**	**2**	**40(41)**	**0**				
6/23-6/29	5	--	33(65)	5(10)				
	--	2	5(11)	0				
TOTAL	**5**	**2**	**38(66)**	**5(10)**	**5**	**0**		**8**

table 3. (cont.)				TOTAL SALMON				
DATE	# WEEK DAYS	# WEEKEND DAYS	TOTAL HOURS FISHED 95% CI(+/-)	# CAUGHT 95% CI(+/-)	# KEPT	# RELEASED		HOURS/FISH CAUGHT
						UNCLIPPED	CLIPPED	
6/30-7/6	4	--	704(1408)	61(132)				
	--	3	1372(236)	133(149)				
TOTAL	**4**	**3**	**2076(1428)**	**194(199)**	**138**	**0**	**56**	
7/7-7-13	5	--	2015(903)	244(250)				
	--	2	848(553)	29(107)				
TOTAL	**5**	**2**	**2863(1059)**	**273(272)**	**167**	**21**	**85**	
WEEKDAY TOTALS	**38**		**2801**	**310**				
WEEKEND TOTALS		**20**	**2301**	**166**				
SEASON TOTALS ABOVE RAPID RIVER	**38**	**20**	**5102**	**476**	**310**	**25**	**141**	

We found that 45% of all salmon sexed were males and 55% were females. A total of 593 salmon were measured during the creel survey. Age class breakdowns for those fish were: 0 (0%) "jacks" or age 3 fish, 568 (95.8%) age 4 adults, and 25 (4.2%) age 5 adults.

Creel clerks detected 12 CWTs in salmon snouts. Only six snouts were found to actually have CWTs. All six tags originated from the Rapid River FH and were progeny of the 1993 return (age 4).

Rapid River Fish Hatchery Rack Return

The total chinook salmon run that could have arrived at the Rapid River FH was estimated to be at least 15,268 fish. This included 10,773 chinook salmon collected at the Rapid River FH trap, of which 253 were classified as naturally produced summer chinook because they lacked any fin-clips and 10,520 were classified as hatchery spring chinook due to fin-clips. An additional 2,289 hatchery spring chinook were harvested by sport anglers and 2,196 hatchery spring chinook were harvested by the Nez Perce Tribe (J. Mauney, Nez Perce Tribe, pers. comm..). It is unknown if any chinook salmon were harvested by members of the Shoshone-Bannock Tribes. The estimated return of hatchery origin spring chinook to the LSR was 15,015. An unknown number of naturally produced and straying hatchery salmon may have bypassed Rapid River and spawned somewhere in the LSR.

DISCUSSION

Run Predictions

All preseason predictions underestimated the 1997 spring chinook return to Rapid River FH, primarily because the age 4 adults (BY93) returned in greater number than anticipated. Survival during the 1995 smolt outmigration appeared to be good due to a combination of high flows, controlled spill, and a return to average ocean productivity. Our predictions based on jack return or cohort analysis underestimated the return because they were influenced by previous years of poor outmigration conditions and poor return. This was consistent with all of the upriver spring chinook predictions. The TAC preseason forecast for the upriver run of spring chinook was 67,800 adults, of which the Snake River component comprised 53.5% (TAC 1997). By late May, the upriver prediction was increased to 112,500. The final 1997 review showed that the upriver component of spring chinook was 114,100. The age 4 return was 77% greater than the preseason forecast (Pettit 1997). The estimated proportion of the upriver run that was Snake River spring chinook was 62%. The final number of hatchery spring chinook adults at Lower Granite Dam was estimated at 32,427, compared to the preseason prediction of 14,938 (TAC 1997). Based on our estimate, the Rapid River FH escapement to the Little Salmon River accounted for almost half of the adult hatchery spring chinook at Lower Granite Dam, a much larger than the 15.9% proportion that TAC used preseason. Compounding this error was a late run due to high, cold water. This caused the Nez Perce Tribe=s April 30 regression to also severely underestimate the runsize. The low hatchery escapement at the beginning of the season was cause for conservative quotas at the beginning of the fishery. By late June, it was apparent the runsize was much larger than predicted. The Nez Perce Tribe and IDFG agreed that hatchery escapement would be met and that both parties could fish liberally,

exceeding the quota of 1,200 fish each.

Creel Survey

The 1997 spring chinook sport fishery on the LSR was marked by high water conditions and large numbers of late arriving fish. Interest in the chance to catch a salmon was high and grew as the season progressed. On the last seven days of the 1997 season, there were 11,627 hours spent fishing for salmon on the Little Salmon River. This compares to a total of 9,690 angler hours in nine days and 7,073 angler hours in 31 days of the entire 1992 and 1993 spring chinook salmon seasons respectively (Janssen 1992, 1993).

Although the number of released, unclipped salmon was estimated to be 514 or 13.6% of the total salmon catch, the majority of these fish may have been of hatchery origin. Approximately 5% of the BY93 smolt release were missed by the fish marking crews (R. Lowell, IDFG, pers. comm.). Another 2-3% of the BY93 smolts had only partial clips of the adipose fin and we observed that a large portion of these fish were released by anglers as being unclipped fish. Another 3.8% of the BY93 smolts were only left pelvic fin-clipped and not adipose fin-clipped. Of the 3,273 adipose clipped salmon reported caught, approximately 3,136 or 95.8% (% of age 4 fish in the creel) were from BY93. Assuming, none of the released, clipped fish were caught again, the number of unclipped hatchery origin BY93 fish would equal 10.8 % (5%+2%+3.8%) of the 3,136 clipped, BY93 salmon caught. Therefore, 339 of the 514 unclipped fish are believed to be BY93 hatchery origin fish.

In addition to the BY93 unmarked hatchery fish, approximately 6.6% of the BY92 smolt release were missed by the fish marking crews (R. Lowell, IDFG, pers. comm.). There were no pelvic fin clips in BY92 and the number of partial clips was not recorded. If we apply this 6.6% to the number of five year old fish (BY92) caught (3,273*4.2%=137), as we did for the BY93 fish above, another 9 (137*0.066) of the 514 unclipped fish were also of hatchery origin. The total estimate of naturally produced salmon, caught and released during the 1997 season, was 166 (514-339-9=166).

We expected more coded wire tags than were recovered in the creel survey. Approximately 14.7 % of the BY93 smolts were coded wire tagged. We examined 593 salmon during the creel survey of which 95.8% or 568 were BY93. Therefore we expected 83 (568*.147) of those fish to have CWTs but detected only 12 (2.1%). The detection rate of CWTs in trapped fish at Rapid River FH was 6% (R. Lowell, IDFG, pers. comm.). Reasons for the missing the tags are unclear. Previous return information for Idaho hatcheries indicates that salmon with a CWT and an adipose fin-clip return at a lesser rate than unmarked salmon. The difference between adipose fin-clipped salmon and adipose fin-clipped salmon with a CWT has not been fully evaluated at Rapid River FH. Also, this is the first year that portable CWT wand detectors were utilized in the chinook creel survey and operator inexperience may have contributed to the low detection rate, although the wand detectors have been used with a high rate of detection in the steelhead creel survey and in hatchery tests (K. Ball, IDFG, pers. comm.).

Rapid River Fish Hatchery Rack Return

The 1996 jack (age 3) return of 751 spring chinook salmon to Rapid River FH was the highest since 1976 and the sixth highest jack return since the hatchery began releasing spring chinook in 1966. Thus, we expected a large return of age 4 fish in 1997, but as discussed, the return exceeded our expectation. The total number of spring chinook intercepted at the Rapid River FH weir was the fourth highest in the history of the hatchery. All of the higher returns occurred during the 1970s and were the result of smolts released prior to the closing of Lower Granite Dam in 1975. The estimate of age 4 fish in the run was slightly lower for spring chinook examined in the creel (95.8%) than at the hatchery weir (98.2%). It is possible that larger age 5 fish were more vulnerable to the fishing gear, or that anglers were retaining age 5 fish from the run at a higher rate. Applying the age 4 composition from the hatchery to the spring chinook run at the hatchery and adding the 1996 jack return (10520*0.982+751) indicates that the smolt to adult survival for BY93 spring chinook, through the age 4 return, was 0.40% for fish intercepted at the weir. Adding the 1997 sport and tribal harvest of age 4 fish ((2289+2196)*.958) would increase the survival to 0.55% for BY93 spring chinook entering the LSR drainage. For comparison, the smolt to adult survival of spring chinook intercepted at the Rapid River FH weir for the 1964-68 total broodyears averaged 0.64% (Lowell et al. 1995b). The smolt to adult survival of spring chinook intercepted at the weir for the 1987-92 total broodyears averaged 0.06%. The average smolt to adult survival of total broodyears of spring chinook salmon intercepted at the weir over 29 years of operation was 0.24%.

LITERATURE CITED

Hassemer, P. 1991. Little Salmon River spring chinook *Onchorhynchus tshawytscha* sport harvest, 1986-1990. Idaho Dept of Fish and Game and Idaho Power Company, Boise, Idaho.

Idaho Department of Fish and Game. 1992. Anadromous Fish Management Plan, 1992-1996. Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Fish and Game. 1996. Fisheries Management Plan, 1996-2000. Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Fish and Game. 1997. Permit modification request to allow a sport fishery for spring chinook salmon in Idaho in 1997 pursuant to the Endangered Species Act of 1973. Idaho Department of Fish and Game, Boise, Idaho.

Janssen, P. 1992. Little Salmon River spring chinook *Onchorhynchus tshawytscha* sport harvest, 1992. Idaho Dept of Fish and Game, Boise, Idaho.

Janssen, P. 1993. Little Salmon River spring chinook *Onchorhynchus tshawytscha* sport harvest, 1993. Idaho Dept of Fish and Game, Boise, Idaho.

Lowell, R. L., R.E. Steiner and M.B. Baer. 1995a. Rapid River Hatchery, 1992 chinook brood year report. Project 95-2. Idaho Department of Fish and Game and Idaho Power Company, Boise, Idaho

Lowell, R. L., R.E. Steiner and M.B. Baer. 1995b. Rapid River Hatchery, 1993 chinook brood year report. Project 95-45. Idaho Department of Fish and Game and Idaho Power Company, Boise, Idaho

Neuhold, J.M. and K.H. Lu. 1957. Creel census methods. Utah State Dept. of Fish and Game, Publication 8, Salt Lake City, Utah

Pettit, R. 1997. Run size forecast for Columbia River upriver adult spring chinook, 1998. Columbia River Progress Report 97-18. Washington Department of Fish and Wildlife, Vancouver, Washington.

U.S. v Oregon Technical Advisory Committee (TAC). 1997. Biological assessment of impacts of proposed 1997 fisheries in the Snake River Basin on Snake River salmon listed under the Endangered Species Act.

Wilkinson, L. 1997. Systat 7.0 for Windows. SPSS, Inc., Chicago, Illinois.

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