B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

John Day Basin Spring Chinook Salmon Escapement and Productivity Monitoring

Fish Research Project Oregon

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FISH RESEARCH PROJECT
OREGON

JOHN DAY BASIN SPRING CHINOOK SALMON ESCAPEMENT AND PRODUCTIVITY MONITORING

ANNUAL PROGRESS REPORT

Project Period: July 1, 1999 to June 30, 2000

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ABSTRACT

The John Day River basin supports one of the healthiest populations of spring chinook salmon (*Oncorhynchus tshawytscha*) in the entire Columbia River basin. Spring chinook salmon in this basin are therefore, used as an important index stock to measure the effects of future management actions on other salmon stocks in the Columbia basin. To meet the data requirements as an index stock, we estimated annual spawner escapement, age-structure, and smolt-to-adult survival. This information will allow us to estimate progeny-to-parent production for each brood year. To estimate smolt-to-adult survival rates, 1,852 chinook smolts were tagged with PIT tags from 3 March to 5 May, 2000. Length of captured smolts varied, ranging from 80 to 147 mm fork length (mean = 113 mm). These fish will be monitored for PIT tags as returning adults at dams and during future spawning ground surveys. During spawning ground surveys, a total of 351.3 km of stream were surveyed resulting in the observation of 478 redds. When expanded, we estimated total number of redds at 481 and total number of spawners at 1,583 fish in the John Day River basin. We estimated that 13% of the redds were in the mainstem John Day, 27% in the Middle Fork, 34% in the North Fork, and 26% were in the Granite Creek basin. Sampled carcasses had a sex ratio comprised of 53% females and 47% males with an age structure comprised of 0.5% age-2, 6.3% age-3, 88.7% age-4, and 4.5% age-5 fish. Five of the 405 carcasses examined had fin clips suggesting they were of hatchery origin. The 1999 index redd count total for the North Fork, Mainstem, and Granite Creek was lower than the 1999 average (535) but well within the range of annual redd counts during this period. The index redd count for the Middle Fork was higher than the 1990's average (92) but considerably lower than the average from 1978-1985 (401). Although quite variable over the past 40 years, the number of redds in the John Day River basin during 1999 was well within the range of redd counts since they were initiated in 1959.

EXECUTIVE SUMMARY

Objectives

1. Estimate the total number of adult spring chinook salmon redds and spawners in the John Day River basin in 1999.
2. Determine sex ratio, age composition, length-age relationship, and proportion of natural spawners that are hatchery origin strays.
3. Determine how adequately historic index surveys index spawner abundance and determine changes in spawner distribution through time.
4. Estimate smolt-to-adult survival rates for spring chinook salmon in the John Day River basin.

Accomplishments and Findings

During September 1999, spawning ground surveys were conducted in the four spawning areas (Mainstem, Middle Fork, and North Fork John Day River, and Granite Creek system) of the John Day River basin. These areas encompass 108.3 river miles (55 miles index and 53.3 miles extensive areas) of spawning habitat. A total of 478 redds were observed and 405 carcasses were sampled during the surveys. Redd and spawner estimates for the basin were 62 redds and 204 spawners in the Mainstem, 132 redds and 434 spawners in the Middle Fork, 163 redds and 536 spawners in the North Fork and 124 redds and 408 spawners in the Granite Creek system. Eighty percent of the redds in the John Day basin were within the index survey areas, and 96% of the spawning within the index areas was completed by the time index surveys were conducted. The age composition of the carcasses sampled for the entire basin was 0.5% age-2 (precocious males), 6.3% age-3 (jacks), 88.7% age-4, and 4.5% age-5. The sex ratio of the carcasses recovered was 53% females and 47% males. Five of 405 (1.2%) carcasses examined were of hatchery origin. To estimate smolt-to-adult survival rates, 1,852 chinook smolts were tagged with PIT tags during the spring of 2000 in the John Day basin.

Management Recommendations

1. Surveys of the index and extensive areas in the John Day basin should be continued because they provide our most accurate assessment of the size and composition of the spawning population. Surveying the index areas three times and the extensive areas once allows us to estimate natural spawning escapement and assess age composition and progeny-to-parent production values in the John Day basin.

2. Continue managing John Day River spring chinook salmon for wild fish only. The near- and long-term ecological and scientific importance of maintaining a totally wild population to compare with supplemented populations cannot be overemphasized. Spring chinook salmon in the John Day River basin can serve as a long-term control for other more manipulated populations in the Columbia River basin.

INTRODUCTION

The John Day River basin (Figure 1) supports one of the healthiest populations of spring chinook (*Oncorhynchus tshawytscha*) in the entire Columbia River basin. The study of life history and natural escapement conducted from 1978 to 1985 (Lindsay et al. 1986) provided valuable information on production and productivity of the John Day spring chinook. With the exception of two years since completion of the study in 1985 (1989 and 1995), spring chinook spawning surveys were conducted in index areas only and have not provided adequate information to assess age-structure, progeny-to-parent production values, and estimate natural spawning escapement. The PATH project (Marmorek and Peters 1996) identified the John Day basin spring chinook as an index population for assessing the effects of alternative future management actions on salmon stocks in the Columbia Basin. To meet the data requirements as an index stock, annual estimates of spawner escapement, age-structure, and smolt-to-adult survival are essential. This requires us to determine the annual spawner escapement and age-structure for the John Day basin spring chinook to estimate progeny-to-parent production for each brood year. This requirement can be met by expanding the annual chinook spawning surveys, estimating the annual escapement, and determining age composition by scale pattern analysis.

This project provides information as directed under two measures of the Columbia Basin Fish and Wildlife Program (NPPC 1994). Measure 4.3C specifies that the key indicator populations should be monitored to provide detailed stock status information. In addition, measure 7.1C identifies the need for collection of population status, life history, and other data on wild and naturally spawning populations. This project was developed in direct response to recommendations and needs of the PATH project, the Fish and Wildlife Program, and the Columbia Basin Fish and Wildlife Authority Multi-Year Implementation Plan.

STUDY AREA

The John Day River drains 20,300 sq km of east central Oregon, the third largest drainage area in the state (Figure 1). From its source in the Strawberry Mountains at an elevation near 1,800 m, the John Day River flows 457 km to its mouth at km 351 on the Columbia River at an elevation near 90 m. The basin is bounded by the Columbia River to the north, the Blue Mountains to the east, the Strawberry and Aldrich Mountains to the south, and the Ochoco Mountains to the west. Spring chinook salmon spawn in the John Day River (hereafter called Mainstem) above Prairie City (Figure 2), in the Middle Fork John Day River (hereafter called the Middle Fork) above Armstrong Creek (Figure 3), and in the North Fork John Day River (hereafter called the North Fork, Figure 4) above Camas Creek including Granite Creek and its tributaries (Clear and Bull Run creeks; hereafter called the Granite Creek system.

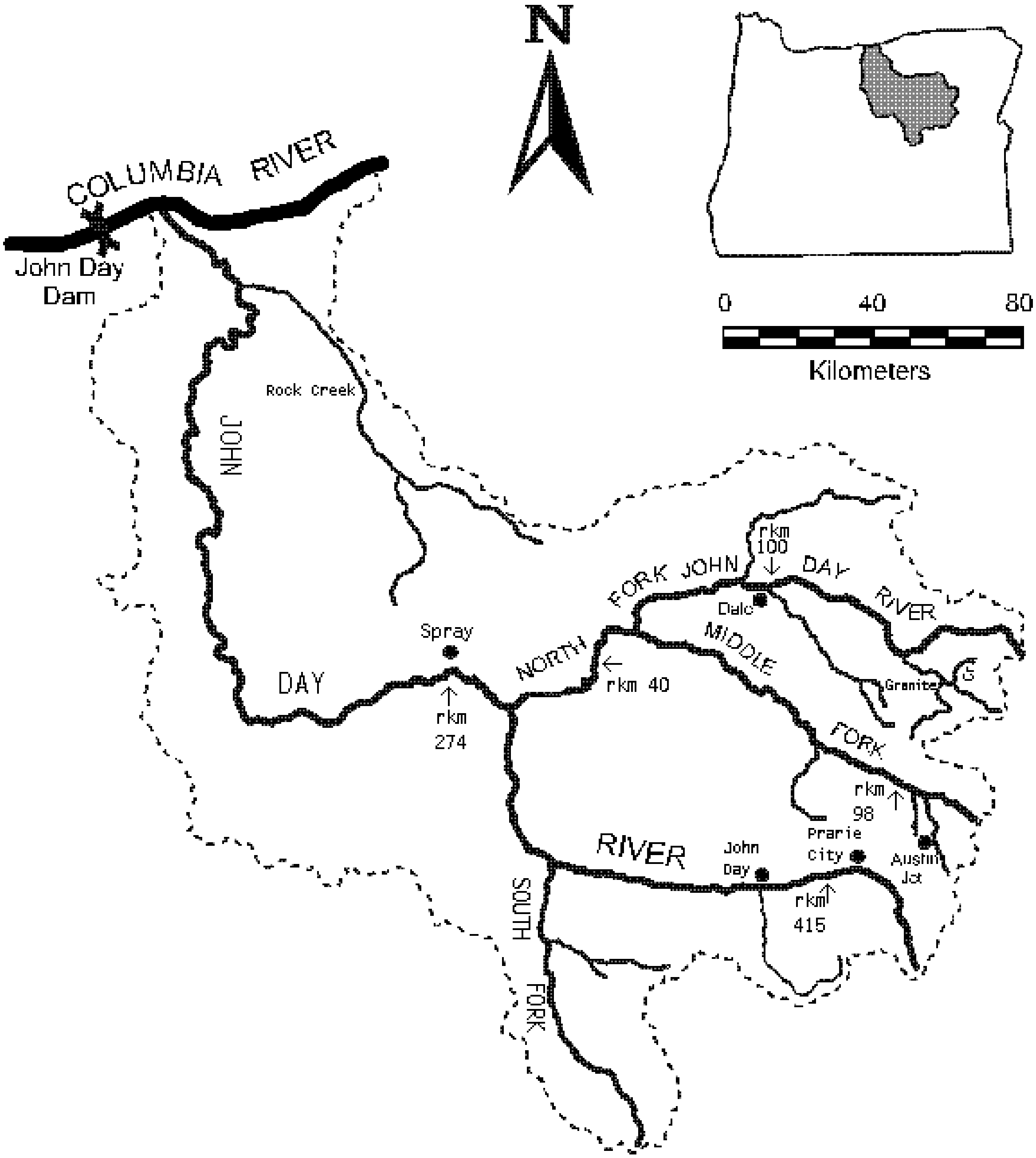

Figure 1. Map showing entire John Day River basin. Dashed lines denote boundaries of the basin.

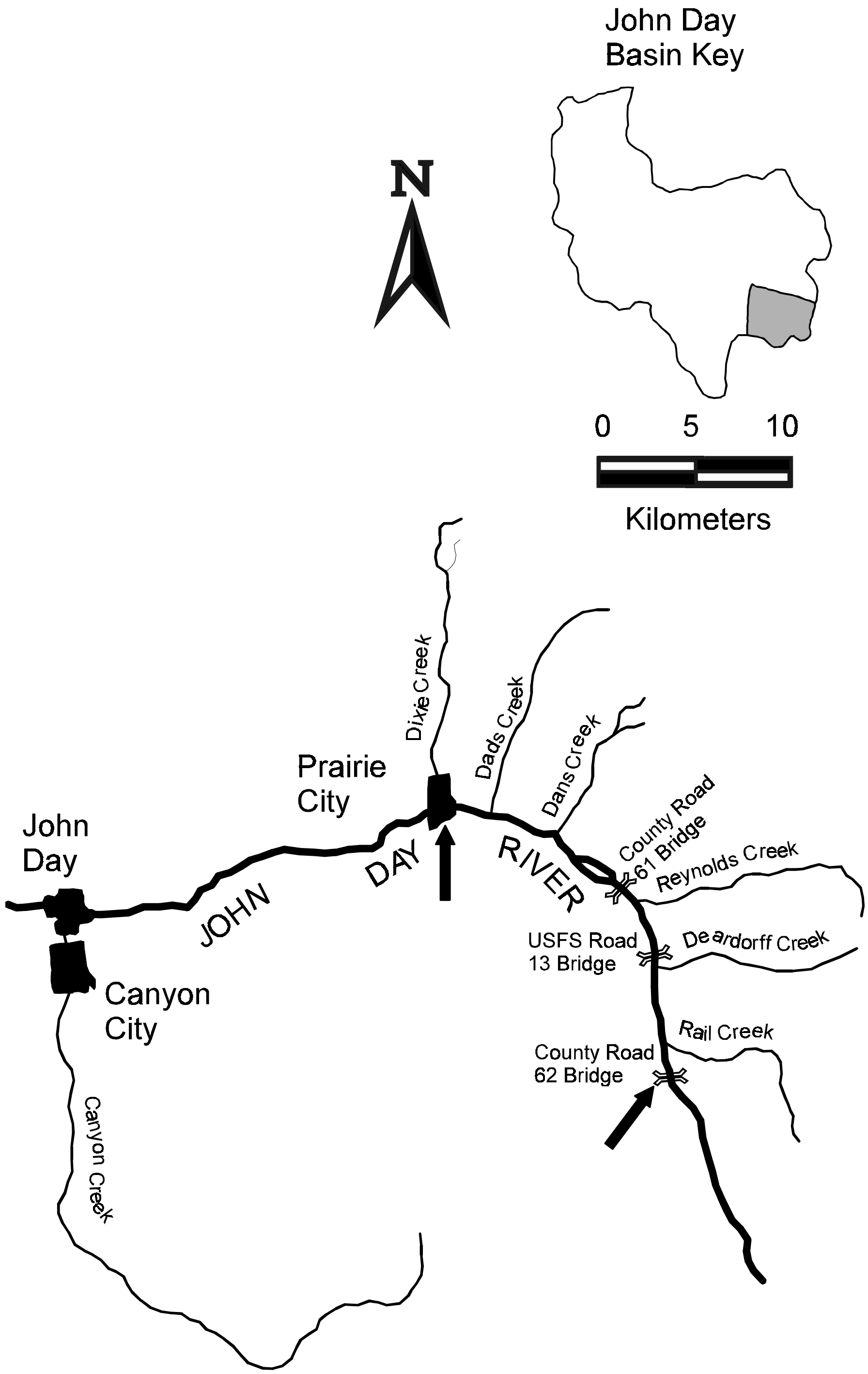

Figure 2. Map of the upper mainstem John Day River. Arrows indicate upstream and downstream limits of spawning ground surveys.

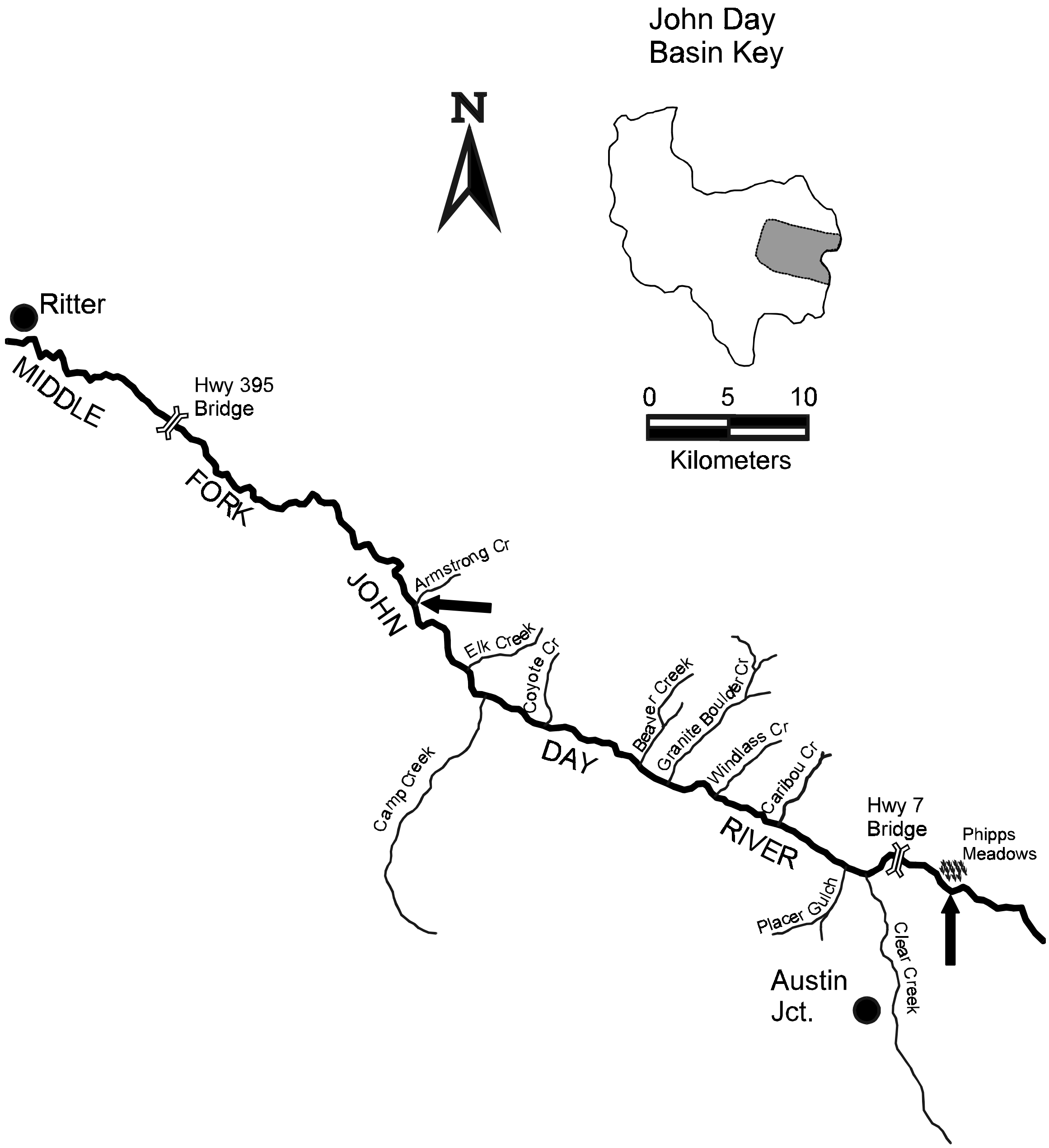

Figure 3. Map of the Middle Fork John Day River. Arrows indicate upstream and downstream limits of spawning ground surveys.

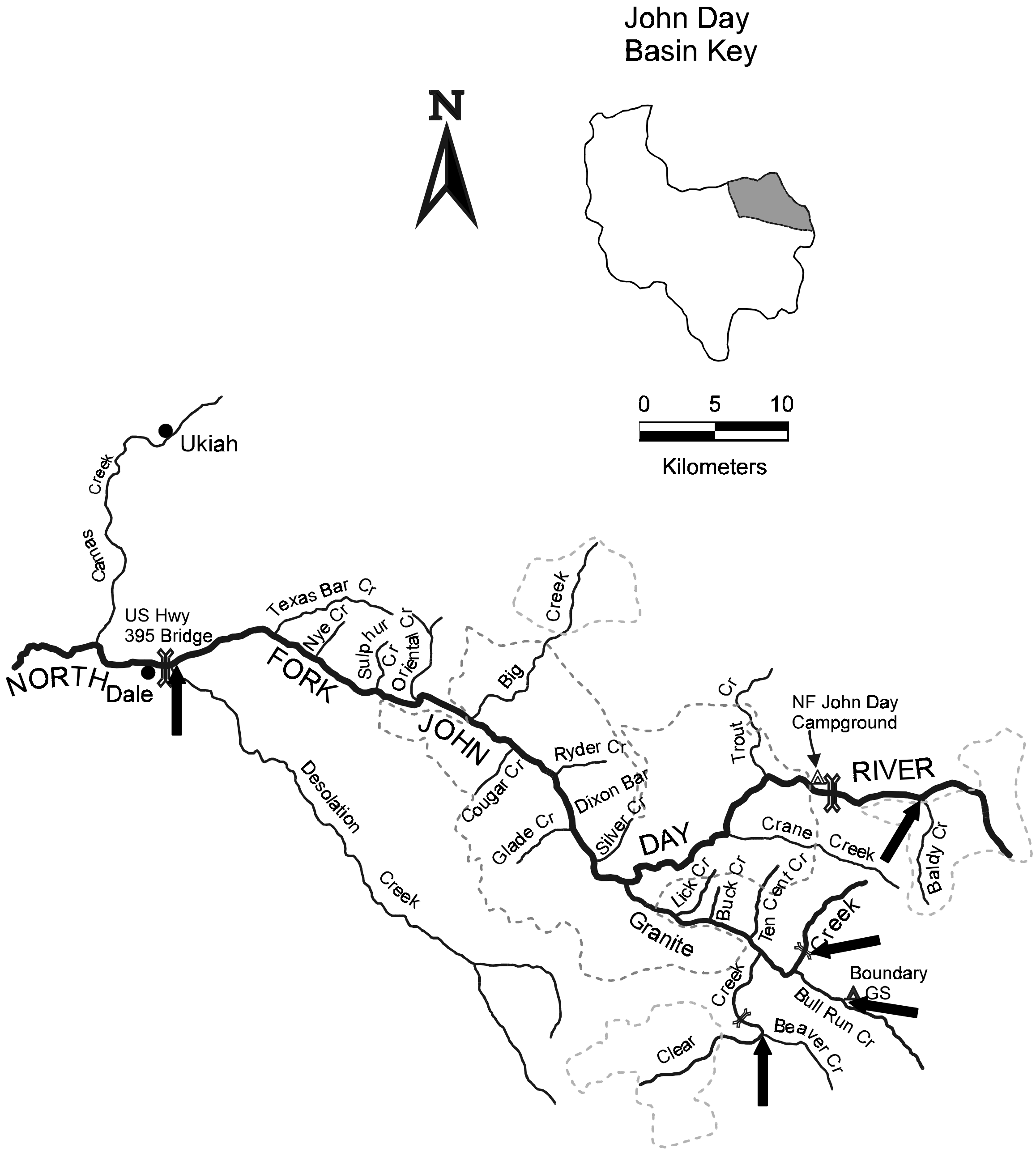

Figure 4. Map of the North Fork John Day River. Survey areas begin at the confluence with Desolation Creek and extend upstream to the confluence with Baldy Creek. Granite creek survey areas extend from the mouth to approximately two kilometers above the confluence with Bull Run Creek, Clear Creek to the confluence with Beaver Creek, and Bull Run Creek upstream to the USFS Boundary guard station. Arrows show limits of surveyed areas. Not all reaches of stream between arrows were surveyed. Dashed lines denote boundaries of North Fork John Day wilderness.

METHODS

Spawning Surveys

Chinook salmon spawning ground surveys were conducted each year during September in the John Day basin. Specific stream sections were surveyed at specific times (index surveys) to provide an index of the relative abundance of redds. Based on previous year's information, index surveys were scheduled to take place near the peak of spawning in each system. To account for temporal variation in spawn activity, surveys were conducted during three consecutive weeks. Surveys therefore included pre-index (one week prior to index surveys), index, and post index (one week after index surveys). Surveys are also conducted outside of the index areas where spawning is believed to occur (extensive). Extensive surveys were conducted at the same time as index surveys. The index and extensive survey sections and mean dates for the index surveys during 1989-98 are shown in Table 1 and Figures 2-4. In 1999, index surveys were completed within four days of the mean of index survey dates conducted during 1989-98.

Surveys were conducted by walking in an upstream direction on the Mainstem and Middle Fork systems and in a downstream direction on the North Fork and Granite Creek systems. Survey sections ranged from 3.2 to 8 kilometers in length, depending on accessibility and difficulty. Surveyors recorded the number of occupied and unoccupied redds, the number of live fish observed (on redds and off redds), and the number, sex, and origin (hatchery or wild) of carcasses recovered in each survey section. In index survey areas the redds were numbered and marked with colored flagging, so that the number of new redds could be determined during each additional survey. Flagging was removed on the last survey. Carcasses found during the survey were measured (middle of eye to posterior scale, MEPS, mm), sex was confirmed, and percent of eggs spawned was estimated to the nearest 25% for females. Any identifying marks or tags were noted, and the tags were removed for identification and returned to the appropriate agency. Scale samples were removed from the key scale area (Nicholas and Van Dyke 1982) for age determination. If any fin marks were observed, the snout of the fish was removed for subsequent analyses to determine the presence of a coded-wire tag. The tail was removed from each sampled carcass to prevent repeated sampling on subsequent surveys. All carcasses were returned to their original position in the stream.

Timing of the index surveys relative to the timing of spawning in each primary spawning area was assessed (i.e. Mainstem, Middle Fork, North Fork, and Granite Creek system) using the equation:

$$P_t = \frac{R_1 + R_2}{R_1 + R_2 + R_3}, \qquad (1)$$

where P_t is the proportion of redds in the index area that were completed at the time of the index survey, R_1 is the number of redds counted during the pre-index survey, R_2 is the number of new redds counted during the index survey, and R_3 is the number of new redds counted during the post-index survey. Spawning in index survey areas relative to the entire spawning area was also assessed using the equation:

$$P_a = \frac{R_1 + R_2}{R_1 + R_2 + R_4}, \qquad (2)$$

where P_a is the proportion of redds in the spawning area that were within the index survey area and R_4 is the number of redds counted in the extensive survey area.

Because extensive survey areas were surveyed only once at the time of the index survey, the total number of redds in each primary spawning area were estimated using the equation:

$$\hat{R}_{total} = \frac{R_1 + R_2 + R_3}{P_a}, \qquad (3)$$

where $\hat{R}_{total}$ is the estimated number of redds in the entire primary spawning area. The estimated number of spawners in each of the four primary spawning areas was calculated by multiplying the estimated number of redds by a fish per redd ratio of 3.29. The fish per redd ratio was calculated as the mean of fish per redd estimated above the Warm Springs River weir, Oregon (Department of Natural Resources, Confederated Tribes of the Warm Springs Reservation, Unpublished Data) and Imnaha River weir, Oregon (Oregon Department of Fish and Wildlife, Unpublished Data) during the period of 1995 - 1999.

Scales were mounted on gummed cards and impressions were made in acetate. Scale impressions were viewed using a microfiche reader. Freshwater and ocean annuli were counted to determine the age of the sampled carcasses. For carcasses with unreadable scales, age was assigned based on the length of the carcass, using a length/age relationship developed from carcasses which age could be determined. The freshwater portion of the scale was examined to determine the origin (wild or hatchery) of spawners. We estimated age-structure for spawning populations separately for the Mainstem, Middle Fork, North Fork, and Granite Creek systems.

Table 1. Description of index and extensive spawning survey sections in the John Day River basin, and mean index survey dates during 1989-98.

Stream, survey type	Survey boundaries	Distance		Index survey dates
		Km	Miles	
Mainstem:				
Index	62 Road Culvert to Dad's Creek	20.9	13.0	12 Sep
Extensive	Dad's Creek to Depot Park Bridge in Prairie City	3.7	2.3	
Middle Fork:				
Index	Hwy 7 to Beaver Creek	19.3	12.0	23 Sep
Extensive	Phipps Meadows to Hwy 7, Beaver Creek to Armstrong Creek, and lower 1 mile of Clear Creek	29.0	18.0	
North Fork:				
Upper index	Granite Creek to Cougar Creek	12.9	8.0	20-21 Sep
Lower index	Big Creek to Nye Creek	16.1	10.0	22 Sep
Extensive	Baldy Creek to Granite Creek, Cougar Creek to Big Creek, and Nye Creek to Desolation Creek	44.1	27.5	
Granite Creek:				
Index	73 Road to Buck Creek	8.9	5.5	13 Sep
Extensive	Buck Creek to Mouth	7.2	4.5	
Clear Creek:[a]				
Index	13 Road Crossing to Mouth	6.4	4.0	13 Sep
Extensive	Beaver Creek to 13 Road Crossing	1.6	1.0	
Bull Run Creek:[a]				
Index	Boundary Guard Station to Mouth	4.0	2.5	13 Sep
Extensive	No additional area	0.0	0.0	

[a] *Tributary of Granite Creek.*

Smolt Capture and Tagging

We collected chinook smolts from March 10 to May 24, 2000 primarily using beach-seining techniques. Beach seining and beach seining with the aid of a jet-boat was used to capture smolts in the lower Mainstem between river kilometers (RKM) 274 - 298 and the lower North Fork upstream from the mouth to RKM 40 (Figure 1). Eddies and river margins were sampled with 15, 30, and 61 m long by 2.4 m deep seines that had a mesh size of 12.5 mm. During the last week of March, snorkeling and beach seining was also used to capture smolts in the upper Mainstem RKM 387 - 442, upper North Fork RKM 85 - 110, Middle Fork RKM 98 and Granite Creek RKM 11 (Figure 1).

A sampling plan using standard sites for seining was not followed. Instead, the location for sampling within our river kilometer reaches varied on a daily basis depending on river level and success during previous sampling days. Total and mean weekly catch per seine set was determined to assess smolt migration timing past the lower Mainstem (RKM 274 - 298) during the months of April and May. Weekly catch per seine set was not assessed for the month of March because we had yet to determine the locations of the most productive seining sites. Mean weekly catch per seine set was also determined to assess migration timing through the lower North Fork system (RKM 00 - 40) during the month of May.

Captured smolts were anesthetized with tricaine methane sulfonate and passive integrated transponder (PIT) tags were implanted into the peritoneal cavity following the PIT Tag Marking Procedures Manual, 1999. Smolts were measured for fork length (FL) to the nearest millimeter and weighed to the nearest 0.1 gram. We performed a PIT tag retention and tagging mortality trial during the second and third weeks of May. Each of three taggers tagged at minimum of 25 smolts. Smolts were then held overnight in a net pen and checked for mortality, anesthetized and interrogated for the presence of a PIT tag the following morning.

To calculate smolt-to-adult survival we are relying on tagged smolts being detected and recorded at the John Day Dam, Bonneville Dam, and the Columbia River Estuary as they migrate to the Pacific Ocean. Adult chinook will be detected at Bonneville Dam, the John Day Dam and within the spawning areas of the John Day basin when they return as adults in 2001, 2002 and 2003. Smolt-to-adult survival rates will be reported in future annual reports.

We recorded daily incidental fish species catch from seining efforts as the total catch by species in the areas sampled. Incidental fish species catch information will be used to assess the need to obtain threatened and endangered species take permits and promote interagency and intra-agency cooperation in collecting fish data from the John Day basin.

Results and Discussion

Redds and Escapement

A total of 351.3 km were surveyed in the John Day basin (88.5 km of index area surveyed three times and 85.8 km of extensive area) with a total of 478 redds counted. Of the four areas the North Fork had the greatest redd count with 34% of the total redds observed (Table 2). For the entire John Day basin we estimated 481 redds and 1,583 spawners in 1999 (Table 3). Redd and fish count data collected during each survey are shown in **Appendix B**.

Index redd counts for the four primary spawning areas in 1999 were 58 in the Mainstem, 105 in the Middle Fork, 120 in the North Fork, and 87 in the Granite Creek system, for a basin total of 370. The 1999 index counts for the Mainstem, North Fork and Granite Creek system were lower than the average for the 1990's (535 redds), but were within the range of the annual redd counts during this period. The index count for the Middle Fork (120 redds) was higher than the average for the 1990's (92 redds) but considerably lower than the average from 1978-1985 (401 redds; Lindsay et al. 1986). Historic index redd count data for the John Day basin is reported in **Appendix A**.

Table 2. Summary of redds observed during spring chinook salmon spawning surveys in the John Day River basin, 1999.

	Kilometers surveyed		Total	New redds observed			
Stream	Index	Extensive	redds	Pre-index	Index	Post-index	Extensive
Mainstem	20.9	3.7	62	27	31	4	0
Middle Fork	19.3	29.0	132	97	8	1	26
North Fork	29.0	44.3	162	100	20	3	39
Granite Creek System	19.3	9.7	122	56	31	8	27
Basin Total	**88.5**	**86.6**	**478**	**280**	**90**	**16**	**92**

Table 3. Estimated spring chinook salmon redds and spawners in the John Day River basin, 1999.

	Estimated total	
Stream	Redds	Spawners
Mainstem	62	204
Middle Fork	132	434
North Fork	163	536
Granite Creek System	124	408
Basin Total	**481**	**1,583**

Adequacy Of Historic Index Surveys and Spawner Distribution

In the John Day River basin, 80% of the redds were counted in the index areas and 96% were completed by the time index surveys were conducted. Jonasson et al. (1998), reported 90% of the redds counted in 1998 were within the index area and 91% were complete when index surveys were conducted. Percent of redds counted in the index areas and completed by the time of the index counts in each of the four primary spawning areas is shown in Table 4.

Percent of redds counted in index areas at the time of the index surveys of the Mainstem, North Fork, and Granite Creek system were within the range counted during 1978-85 (Lindsay et al. 1986). Percent of redds in the index area of the Middle fork was slightly higher than reported for 1978-85 (Table 5). Percent of redds counted in the index survey of the Mainstem was similar to that reported by Jonasson et al. (1998). North Fork and Granite Creek system index area redd counts were slightly lower than reported in 1998 (Jonasson et al. 1998). Because the index survey area of the Middle Fork was expanded in 1986, data collected since 1998 is not directly comparable to the data collected during 1978-85 (Jonasson et al. 1998).

The distribution of redds among the four primary spawning areas during 1999 were similar to the distribution reported from 1978 - 1985 (Table 6). Jonasson et al. (1998) reported a trend over the last 20 years of a shift in spawning from the Granite Creek system to the North Fork, with a concomitant increase in spawning the Mainstem. Spawning distribution data from 1999 supports the claim of a shift in spawning from the Granite Creek system to the North Fork. However, the relatively low count of redds on the Mainstem during 1999 data does not support the claim of an increase in spawning there as noted by Jonasson et al. (1998).

Table 4. Percent of redds counted in the index survey areas and completed at the time of the index surveys in the John Day River basin, 1999.

Stream	Percent of redds	
	In index survey area	At time of index survey
Mainstem	100	94
Middle Fork	80	99
North Fork	76	98
Granite Creek system	76	92

Table 5. Percent of redds counted during the index and extensive surveys that were in index survey areas in the John Day River basin, 1978-85 (Lindsay et al. 1986),1998 (Jonasson et al.1998) and 1999. The index area of the Middle Fork was expanded in 1986. Therefore, Middle Fork data collected in 1998 and 1999 is not directly comparable to 1978-85.

Stream	Year									
	1978	1979	1980	1981	1982	1983	1984	1985	1998	1999
Mainstem	100.0	91.9	100.0	96.2	96.1	96.4	91.3	96.7	97.3	100
Middle Fork	49.5	69.0	59.8	55.3	47.3	63.0	44.7	50.0	----	80.2
North Fork	64.9	80.0	75.0	77.1	60.7	66.7	76.8	70.5	85.8	75.5
Granite Creek system	81.6	89.0	87.6	90.2	85.3	82.1	76.2	82.5	82.4	76.3

Table 6. Percent distribution of redds counted on index surveys among the primary spawning areas of the John Day River basin, 1978-85, 1998 and 1999. Data for 1978-85 is from Lindsay et al. (1986). Data for 1998 is from Jonasson et al. (1998).

Stream	Year									
	1978	1979	1980	1981	1982	1983	1984	1985	1998	1999
Mainstem	13.4	13.2	7.0	15.7	14.5	43.5	29.1	29.1	30.3	15.7
Middle Fork	24.3	22.9	25.2	8.0	18.3	16.7	26.7	10.1	22.1	28.4
North Fork	24.8	38.8	33.9	42.5	31.1	24.8	25.1	27.6	30.5	32.4
Granite Creek system	37.5	25.2	33.9	33.8	36.1	15.0	19.1	33.2	17.1	23.5

Sex Ratio, Age-structure, Length-age Relationship and Hatchery Origin Strays

We sampled 405 spawner carcasses during surveys in the John Day River basin (Table 7). Jonasson et al. (1986) reported that inclusion of post-index surveys increased the recovery of carcasses. The 1999 post-index surveys allowed recovery of 144 more carcasses than would have been recovered during index surveys alone. Jonasson et al. (1986) also reported that conducting pre-index surveys would increase the number of carcasses sampled. Our data supports this contention, because during both 1998 (242) and 1999 (261) more carcasses were sampled in the index area than were observed in the previous two years despite higher redd counts during 1996-1997 (Jonasson et al. 1998).

We were able to determine the sex and age of 399 of the 405 carcasses sampled. Sampled carcasses had a sex ratio comprised of 53% females and 47% males. With few exceptions, the age distribution of recovered carcasses was similar to the age distribution reported in 1978-85 (Lindsay et al. 1986) and 1998 (Jonasson et al. 1998). Of the carcasses examined, 0.5 % were age-2 (precocious males), 6.3% age-3 (jacks), 88.7% age-4, and 4.5% age-5 (Table 8 A greater proportion of age-3 carcasses were recovered in the Mainstem (21.9%) than were reported during 1978-85 and 1998 (Lindsay et al. 1986, Jonasson et al. 1998). The proportion of age-3 spawners for all major spawning areas was higher while the proportion of age-5 spawners was lower than reported in 1998 (Jonasson et al. 1998). We determined the MEPS length for 396 carcasses (Table 9).

Five of 405 (1.2%) carcasses examined were of hatchery origin as identified by fin clips. One jack with an adipose fin clip was found in the Mainstem on 9/15/99. One female age-4 with a right pectoral and right ventral fin clip was found in the Middle Fork on 9/13/99. Two age-4 females were found in the North Fork. One had a left ventral fin clip (9/14/99) and the other had a left pectoral fin clip (9/22/99). One male age-4 was found in the North Fork on 9/22/99 with adipose and right ventral fin clips. Only the jack found on the Mainstem could be verified as hatchery origin by reading scales. None of the carcasses had coded wire tags. As reported by Jonasson et al. (1998), hatchery influence on the spawning population remains low. Of 32 Mainstem carcasses one (3%) was of hatchery origin. Of 105 Middle Fork spawners one (1%) was of hatchery origin. There were 171 spawners in the North Fork with three fish (1.8%) of hatchery origin. No hatchery fish were detected in the Granite Creek system. Jonasson et al. (1998) reported one hatchery fish in the Granite Creek system in 1998.

Table 7. Number of carcasses sampled during each phase of the spring chinook salmon spawning surveys in the John Day River basin, 1999.

	Number of carcasses sampled				
Stream	Total	Pre-index	Index	Post-index	Extensive
Mainstem	33	9	17	6	1
Middle Fork	110	4	57	24	25
North Fork	171	41	75	23	32
Granite Creek System	91	24	34	26	7
Basin Total	**405**	**78**	**183**	**79**	**65**

Table 8. Percent age and sex composition of spring chinook salmon carcasses sampled in the four primary spawning areas of the John Day River basin, 1999.

		Age							
		2		3		4		5	
Stream	*N*	M	F	M	F	M	F	M	F
Mainstem	32	0	0	21.9	0	28.1	46.9	3.1	0.0
Middle Fork	105	0	0	4.8	0	36.2	52.4	3.8	2.9
North Fork	171	.6	0	5.3	0	38.6	50.3	2.9	2.3
Granite Creek	91	1.1	0	4.4	0	40.7	52.7	1.1	0.0

Table 9. Number of spring chinook salmon carcasses examined, and mean and standard error (SE) of MEPS length (mm) by age and sex of sampled carcasses on spawning ground surveys in the four primary spawning areas of the John Day River basin, 1999.

	Age							
	2		3		4		5	
Stream, item	M	F	M	F	M	F	M	F
Mainstem								
number	0	0	7	0	9	14	1	0
mean	--	--	392.1	--	623.4	628.2	720.0	--
SE	--	--	13.18	--	12.76	14.75	--	--
Middle Fork								
number	0	0	5	0	37	55	4	3
mean	--	--	416.0	--	600.5	616.5	729.3	741.7
SE	--	--	18.67	--	7.56	6.01	16.95	10.14
North Fork								
number	1	0	9	0	66	85	5	4
mean	137.0	--	423.7	--	643.3	632.5	804.0	761.3
SE	--	--	28.67	--	9.52	5.45	16.84	34.18
Granite Creek								
number	1	0	4	0	37	48	1	0
mean	108.0	--	385.5	--	606.6	627.1	820	--
SE	--	--	17.33	--	9.68	6.22	--	--

Smolt Capture and Tagging

We captured and PIT tagged a total of 1,852 chinook smolts and one steelhead smolt. These PIT tagged fish were subsequently submitted to the PIT Tag Information System (PTAGIS). Most smolts (88%) were caught by seining in the lower Mainstem between RKM 274 and 298 and the lower North Fork (5%) between the mouth and RKM 40 (Table 10). Beach seining and snorkeling in the upper Mainstem (RKM 387 - 442) and upper North Fork (RKM 85 - 110) was largely unsuccessful because of high flow and poor snorkling visibility. No smolts were caught in the upper Middle Fork or Granite Creek. Future seining and snorkeling in the upper areas of the Mainstem, North Fork, Middle Fork, and Granite Creek should take place prior to high flow and major movement of smolts downstream to the winter rearing areas. Lindsay et al. (1986) reported that catch rates from scoop traps placed in the upper regions of the North Fork, Middle Fork, and Mainstem peaked in late February to mid-April during the years 1980 - 1984.

Short-term mortality of PIT tagged smolts was low. Of the 78 smolts that were tagged and held overnight in a net pen, none died during the trial and all fish had PIT tags when they were interrogated the following morning. However, of the 65 chinook smolts that were recaptured by seining after they were initially PIT tagged, one had a tag scar and was missing the PIT tag. A new tag was inserted. Three chinook smolts died after capture in beach seines. None of the smolts tagged in the upper Mainstem (RKM 387 - 442) and North Fork (RKM 85 - 110) were recaptured in the lower river areas.

Although we captured smolts over nearly a three-month period (3/10/00 to 5/24/00) 72% of these were captured during the month of April (Figure 5). During April, we had our highest catch/seine haul on the lower Mainstem (RKM 274 - 298), and highest weekly catch rate of 59 smolts/seine haul (Figure 6). Our weekly catch per seine haul cannot be compared to that reported in 1979 - 1984 because we did not use standard sites as did Lindsay et al. (1986). During the month of May, mean weekly catches of smolts/seine haul were generally higher in the lower North Fork (RKM 00 - 40) than in the lower mainstem (Figures 6 and 7).

Length of captured smolts varied, ranging from 80 to 147 mm FL (mean = 113 mm; Table 10). Mean FL of fish captured in the lower Mainstem (RKM 274 - 298) was also 113 mm (± .2 SE) and was within the range reported for 1979 - 1984 (Lindsay et al. 1986). Mean weight of smolts captured in the lower Mainstem (RKM 274 - 298) was 17.7g +/- .1 SE (Table 11).

Table 10. Location and mean fork length of chinook smolt captured in the John Day River basin during the period of 3/10/00 to 5/24/00 by seining and snorkling.

Catch Site	Number	Mean Fork length (mm)	SE	Range
Mainstem RKM (387 - 442)	3	98	2.9	94 - 104
Mainstem RKM (274 - 298)	1622	113	0.2	89 - 146
North Fork RKM (85 - 110)	33	91	1.2	80 - 114
North Fork RKM (21 - 00)	179	119	0.6	97 - 142
North Fork RKM (32 - 40)	15	119	2.4	105 - 147
All sites	1852	113	0.2	80 - 147

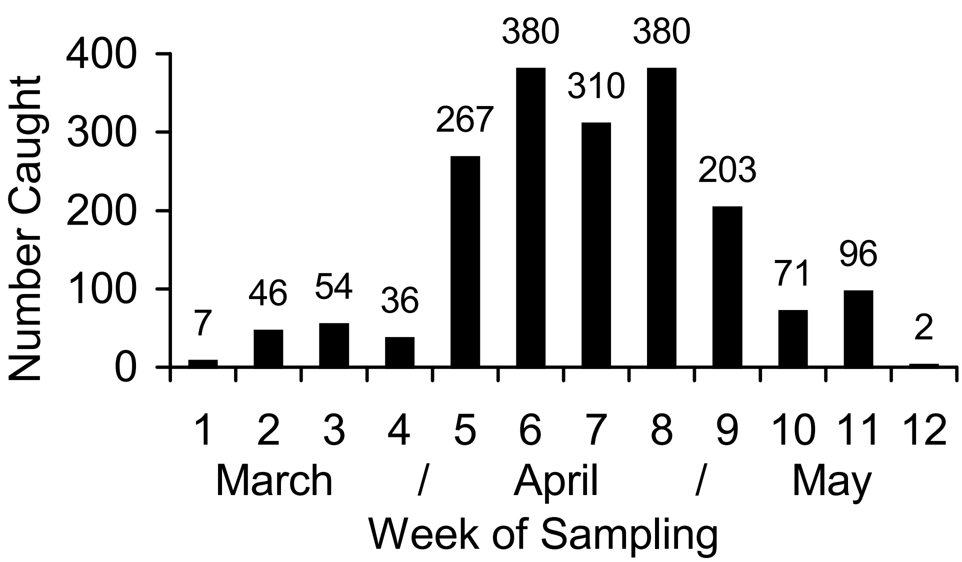

Figure 5. Weekly catch of chinook smolts by seining in the John Day basin during the period of 3/10/00 to 5/24/00.

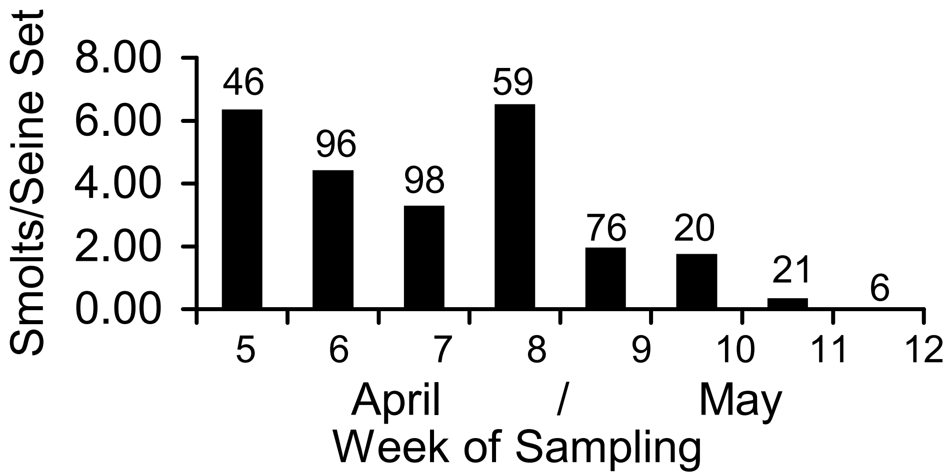

Figure 6. Number of chinook smolts caught per seine haul in the lower mainstem John Day River (RKM 274 - 278) during the months of April and May. Numbers over bars indicate total number of seines performed during the week.

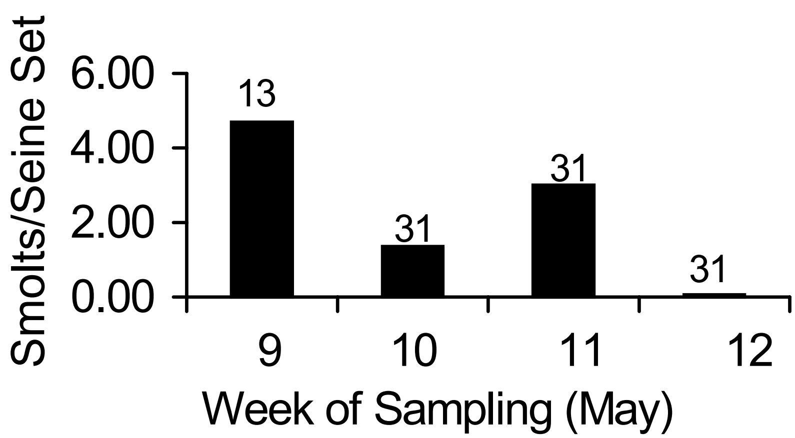

Figure 7. Number of chinook smolts caught per seine haul in the lower North Fork John Day River (RKM 00 - 40) during the month of May. Numbers over bars indicate total number of seines performed during the week.

Table 11. Location, mean weight, and standard error (SE) of chinook smolts captured in the John Day River basin during the period of 3/10/00 to 5/24/00 by seining and snorkling.

Catch Site	Number	Mean weight (g)	SE	Range
Mainstem RKM (387 - 442)	3	9.4	0.7	8.3 - 10.6
Mainstem RKM (274 - 298)	1620	17.4	0.1	7.5 - 50.1
North Fork RKM (85 - 110)	33	8.3	0.3	5.7 - 14.6
North Fork RKM (00 - 21)	179	20.9	0.4	8.8 - 36.5
North Fork RKM (32 - 40)	15	23.3	2.1	13.8 - 50.3
All sites	1850	17.6	0.1	5.7 - 50.3

Detection of PIT tagged Smolts

PIT tagged smolts were detected at the John Day and Bonneville Dams during the months of April and May. Tagged smolts were detected in the Columbia River estuary in May. Of the 1,852 chinook smolts PIT tagged in the John Day Basin, 559 (30%) were detected at the John Day Dam, 310 (17%) were detected at the Bonneville Dam and 8 (0.4%) were detected in the Columbia River Estuary. We are currently verifying the reporting of these tags and some tags may have been detected at more than one site.

Travel time from the PIT tag site near Spray, Oregon (RKM 274-298) to detection sites in the Columbia River ranged widely. Travel time for smolts detected at the John Day Dam ranged between 3.1 and 52.2 days. Travel time to the Bonneville Dam ranged between 6 and 52.9 days. For the 8 detected smolts, travel time from Spray, Oregon to the Columbia River Estuary ranged from 10.8 to 29.1 days. Lindsay et al (1986) reported a tendency for travel time to decrease as the migration season progressed. A complete summary of PIT tag detection will be developed as data becomes available.

Incidental Catch

In addition to chinook salmon, we captured approximately 1258 fish representing at least 10 species in our seining effort (Tables 12,13). Most of this incidental catch (665; 53%) was steelhead smolts (Table 12). Also of note were 9 adult steelhead, one adult hatchery steelhead, and 11 bull trout. Two bull trout were radio tagged for further study by the Oregon Department of Fish and Wildlife Native Trout Program. Two adult male steelhead carcasses were also observed and recorded. In addition to sex, and fork length, scale samples were taken from these steelhead carcasses and given to the John Day District Fish Biologist, Tim Unterwegner. One steelhead carcass recovered in the lower North Fork had been floy tagged the previous year in the Deschutes River, OR.

Table 12. Location and number of salmonids caught incidentally in seines from the John Day River basin from 3/10/00 to 5/24/00.

Seining Area	StS [a] smolt	StS adult	Bull Trout [b]	RT[c]	Wf [d]
Granite Creek RKM (11)	1				
North Fork RKM (85-110)	32			4	3
North Fork RKM (00-21)	34				5
Mainstem RKM (387-442)	1			3	1
Mainstem RKM (32-40)	597	9 [e]	11	9	2
Total	665	9	11	16	11

[a] *Summer steelhead (Oncorhynchus mykiss)*
[b] *Salvelinus confluentus*
[c] *Redband trout (Oncorhynchus mykiss gairdneri)*
[d] *Mountain whitefish (Prosopium williamsoni)*
[e] *One of these adults was of hatchery origin*

Table 13. Location and number of non-salmonid fish caught incidentally in seines from the John Day River basin from 3/10/00 to 5/24/00.

Seining Area	Cot [a]	LSSu [b]	Bsu [c]	NPM [d]	Clm [e]	RsS [f]	BrB [g]	SB [h]	D [i]	Cp [j]	Lam [k]
Granite Creek RKM (11)	1										
North Fork RKM (85-110)	15	4		1		80			3		10 [l]
North Fork RKM (00-21)		9		22	4			34		11	1
Middle Fork RKM (98)		1		1		30					
Mainstem RKM (387-442)		1		1		30					
Mainstem RKM (274-298)		218	155	64	39	21	2	69		8	1
Total	16	233	155	89	43	161	2	103	3	19	12

[a] *Cottus sp.*
[b] *Large scale sucker (Catostomus macrocheilus)*
[c] *Bridgelip sucker (Catostomus columbianus)*
[d] *Northern pike minnow (Ptychocheilus oregonensis)*
[e] *Chiselmouth (Acrocheilus alutaceus)*
[f] *Redside shiner (Richardsonius balteatus)*
[g] *Brown bullhead (Ameiurus nebulosus)*
[h] *Smallmouth bass (Micropterus dolomieui)*
[i] *Dace (Rhinichthys sp.)*
[j] *Common carp (Cyprinus carpio)*
[k] *Pacific lamprey (Lampetra tridentata*)
[l] *unidentified lamprey ammocoetes*

Conclusion

With the exception of the Middle Fork, index redd counts of spring chinook salmon in 1999 were lower than the last several years, but were within the range of counts since 1978 (Jonasson et al. 1998). The 1999 index redd count distribution data for the John Day basin continues to support the observation of Jonasson et al. (1998). Over the last 20 years, spawning has tended to shift from the Granite Creek system to the North Fork.

The additional carcass information from conducting pre-index, post-index, and extensive surveys of the John Day spring chinook index stock continues to provide more information than index surveys alone. Pre-index, post-index, and extensive surveys should be continued to better assess the effects of future alternative management actions on chinook salmon stocks of the Columbia Basin. The John Day spring chinook stock continues to remain without significant influence of hatchery stocks since only five of 405 (1.2%) carcasses examined were potentially of hatchery origin.

A total of 1,852 chinook smolts were PIT tagged during the 2000 migration year tagging effort. To increase the number of smolts tagged, smolt tagging efforts by jet-boat assisted beach seining should start in February similar to Lindsay et al. (1986). To better assess smolt migration timing and relative contributions from the four primary spawning areas, PIT tagging should also take place in the upper John Day basin during late-fall or winter prior to high water conditions. Due to over-winter mortality, only parr tagged and subsequently recaptured as smolts in the lower mainstem would be used to estimate smolt-to-adult survival.

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APPENDIX A

Historic Index Redd Counts

Appendix Table A-1. Index redd counts for spring chinook salmon in the John Day basin, by primary spawning area, 1959-99.

Year	Mainstem[a]	Middle Fork[b]	North Fork[c]	Granite Creek[d]	Basin total
1959	4	0	--	50	54
1960	9	32	--	120	161
1961	39	11	--	42	92
1962	159	28	--	447	634
1963	10	4	--	280	294
1964	17	36	140	415	608
1965	75	37	146	220	478
1966	121	65	185	345	716
1967	96	17	99	276	488
1968	9	4	158	534	705
1969	121	48	369	186	724
1970	108	76	302	326	812
1971	91	41	212	276	620
1972	51	51	189	458	749
1973	116	43	349	324	832
1974	33	81	130	191	435
1975	92	89	211	229	621
1976	60	66	111	162	399
1977	64	58	295	207	624
1978	59	107	109	165	440
1979	68	118	200	130	516
1980	16	58	78	78	230
1981	51	26	138	110	325
1982	49	62	105	122	338
1983	133	51	76	46	306
1984	73	67	63	48	251
1985	116	40	110	132	398
1986	159	76	257	163	655
1987	247	340	375	141	1,103
1988	82	241	245	116	684
1989	165	113	196	149	623
1990	124	47	257	78	506
1991	61	35	115	55	266
1992	142	108	339	138	727
1993	135	155	379	268	937
1994	169	93	201	96	559
1995	29	15	27	23	94
1996	227	136	291	128	782
1997	125	163	197	102	587
1998	108	79	109	61	357
1999	58	105	120	87	370

[a] *Index survey is 13 miles.*
[b] *Index survey was 10 miles during 1959-85 and 12 miles during 1986-99.*
[c] *Index survey is 18 miles.*
[d] *Index survey is 12 miles. In 1993, 12.5 miles were surveyed.*

APPENDIX B

Survey Data

Appendix Table B-1. Spring chinook salmon spawning ground survey data from the John Day basin, 1999.

				New redds		On dig		Off dig		Dead fish, unmarked				Dead fish, marked				Dead	Live	Unmarked	Marked
Stream, section	Survey type	Date	Miles	Occupied	Unoccupied	A	J	A	J	M	F	J	U	M	F	J	U	Fish	Fish	Dead	Dead
John Day River, mainstem																					
Dad's Creek to Dan's Creek	Pre-index	1-Sep	2.2	1	0	2	0	4	0	0	0	0	0	0	0	0	0	0	6	0	0
Dan's Creek to French Lane	Pre-index	1-Sep	4.2	6	2	7	1	0	0	2	0	0	0	0	0	0	0	2	8	2	0
French Lane to Deardorff Creek	Pre-index	1-Sep	2.2	4	2	10	2	1	0	1	1	2	0	0	0	0	0	4	13	4	0
Deardorff Creek to 62 Road culvert	Pre-index	1-Sep	4.4	5	7	7	0	1	0	0	2	0	0	0	0	0	0	2	8	2	0
Prairie City to Dad's Creek	Extensive	9-Sep	2.3	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0
Dad's Creek to Dan's Creek	Index	9-Sep	2.2	0	2	2	0	2	0	2	1	1	0	0	0	0	0	4	4	4	0
Dan's Creek to French Lane	Index	9-Sep	4.2	5	4	2	0	1	0	2	0	0	0	0	0	0	0	2	3	2	0
French Lane to Deardorff Creek	Index	9-Sep	2.2	3	7	5	1	3	1	1	1	0	0	0	0	0	0	2	10	2	0
Deardorff Creek to 62 Road culvert	Index	9-Sep	4.4	1	9	2	0	0	0	0	5	0	0	0	0	0	0	5	2	5	0
Dad's Creek to Dan's Creek	Post-index	15-Sep	2.2	0	2	0	0	1	1	1	0	0	0	0	0	0	0	1	2	1	0
Dan's Creek to French Lane	Post-index	15-Sep	4.2	0	0	0	0	0	0	0	2	0	1	0	0	0	0	3	0	3	0
French Lane to Deardorff Creek	Post-index	15-Sep	2.2	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Deardorff Creek to 62 Road culvert	Post-index	15-Sep	4.4	0	1	0	0	0	0	0	2	0	0	0	0	1	1	4	0	2	2
Mainstem Total			41.3	26	36	39	4	13	3	10	14	3	1	0	0	1	1	30	59	28	2
Middle Fork John Day River																					
Beaver Creek to Windlass Creek	Pre-index	13-Sep	3.0	9	6	16	2	1	1	1	1	0	0	0	0	0	0	2	20	2	0
Windlass Creek to Caribou Creek	Pre-index	13-Sep	3.5	16	1	10	1	14	0	0	0	0	0	0	0	0	0	0	25	0	0
Caribou Creek to Placer Gulch	Pre-index	13-Sep	3.5	40	6	61	10	7	0	0	0	0	0	0	1	0	0	1	78	0	1
Placer Gulch to Hwy 7	Pre-index	13-Sep	2.0	16	3	18	3	8	1	0	1	0	0	0	0	0	0	1	30	1	0
Armstrong Creek to Beaver Creek	Extensive	22-Sep	14.0	3	11	2	1	5	0	12	6	2	0	0	0	0	0	20	8	20	0
Beaver Creek to Windlass Creek	Index	21-Sep	3.0	2	0	4	0	0	0	5	5	0	0	0	0	0	0	10	4	10	0
Windlass Creek to Caribou Creek	Index	21-Sep	3.5	0	0	5	0	1	0	8	8	1	2	0	0	0	0	19	6	19	0
Caribou Creek to Placer Gulch	Index	21-Sep	3.5	1	1	14	0	2	0	8	13	1	0	0	0	0	0	22	16	22	0
Placer Gulch to Hwy 7	Index	21-Sep	2.0	0	4	2	0	0	0	0	11	0	0	0	0	0	0	11	2	11	0
Hwy 7 to Phipps Meadows	Extensive	22-Sep	3.0	0	12	0	0	0	0	2	1	2	0	0	0	0	0	5	0	5	0
Lower mile of Clear Creek	Extensive	22-Sep	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaver Creek to Windlass Creek	Post-index	27-Sep	3.0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0
Windlass Creek to Caribou Creek	Post-index	27-Sep	3.5	0	1	0	0	0	0	3	4	0	2	0	0	0	0	9	0	9	0
Caribou Creek to Placer Gulch	Post-index	27-Sep	3.5	0	0	0	0	0	0	6	6	0	0	0	0	0	0	12	0	12	0
Placer Gulch to Hwy 7	Post-index	27-Sep	2.0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	2	0
Middle Fork Total			54.0	87	45	132	17	38	2	45	59	6	4	0	1	0	0	115	189	114	1

Table B-1. Continued.

Stream, section	Survey type	Date	Miles	New redds Occupied	New redds Unoccupied	On dig A	On dig J	Off dig A	Off dig J	Dead fish, unmarked M	Dead fish, unmarked F	Dead fish, unmarked J	Dead fish, unmarked U	Dead fish, marked M	Dead fish, marked F	Dead fish, marked J	Dead fish, marked U	Dead Fish	Live Fish	Unmarked Dead	Marked Dead
North Fork John Day River																					
Granite Creek to Silver Creek	Pre-index	14-Sep	2.0	4	10	5	0	2	0	3	4	1	0	0	0	0	0	8	7	8	0
Silver Creek to Dixon Bar	Pre-index	14-Sep	2.0	11	6	14	0	3	0	4	4	0	0	0	0	0	0	8	17	8	0
Dixon Bar to Ryder Creek	Pre-index	15-Sep	2.0	9	16	13	0	1	0	9	6	0	0	0	1	0	0	16	14	15	1
Ryder Creek to Cougar Creek	Pre-index	15-Sep	2.0	7	3	7	0	0	0	1	0	0	0	0	0	0	0	1	7	1	0
Big Creek to Oriental Creek	Pre-index	16-Sep	3.3	7	9	12	1	1	2	1	1	0	0	0	0	0	0	2	16	2	0
Oriental Creek to Sulphur Creek	Pre-index	16-Sep	2.3	3	3	3	0	0	0	3	1	0	0	0	0	0	0	4	3	4	0
Sulphur Creek to Nye Creek	Pre-index	16-Sep	4.4	9	3	14	0	6	0	1	1	0	0	0	0	0	0	2	20	2	0
Baldy Creek to N. F. Campground	Extensive	23-Sep	5.7	0	3	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0
N. F. Campground to Granite Creek	Extensive	20-21-Sep	12.7	0	28	0	0	0	0	9	15	2	0	0	0	0	0	26	0	26	0
Granite Creek to Silver Creek	Index	22-Sep	2.0	1	6	1	0	0	0	2	6	1	0	0	0	0	0	9	1	9	0
Silver Creek to Dixon Bar	Index	22-Sep	2.0	0	4	0	0	0	0	2	14	0	0	0	0	0	0	16	0	16	0
Dixon Bar to Ryder Creek	Index	22-23-Sep	2.0	0	2	0	0	0	0	6	7	0	0	0	0	0	0	13	0	13	0
Ryder Creek to Cougar Creek	Index	24-Sep	2.0	0	2	0	0	0	0	1	3	0	0	0	0	0	0	4	0	4	0
Cougar Creek to Big Creek	Extensive	24-Sep	2.5	0	4	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0
Big Creek to Oriental Creek	Index	22-Sep	3.3	0	2	0	0	1	0	3	4	0	0	0	0	0	0	7	1	7	0
Oriental Creek to Sulphur Creek	Index	22-Sep	2.3	0	0	0	0	0	0	2	2	1	0	0	1	0	0	6	0	5	1
Sulphur Creek to Nye Creek	Index	22-Sep	4.4	2	1	7	0	1	0	12	7	2	0	0	0	0	0	21	8	21	0
Nye Creek to Desolation	Extensive	22-Sep	6.6	1	3	1	0	0	0	2	2	0	0	0	0	0	0	4	1	4	0
Granite Creek to Silver Creek	Post-index	27-Sep	2.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
Silver Creek to Dixon Bar	Post-index	27-Sep	2.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
Dixon Bar to Ryder Creek	Post-index	28-Sep	2.0	0	0	0	0	0	0	4	5	0	0	0	0	0	0	9	0	9	0
Ryder Creek to Cougar Creek	Post-index	28-Sep	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Big Creek to Oriental Creek	Post-index	29-Sep	3.3	0	1	0	0	0	1	3	1	1	0	0	0	0	0	5	1	5	0
Oriental Creek to Sulphur Creek	Post-index	29-Sep	2.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulphur Creek to Nye Creek	Post-index	29-Sep	4.4	0	2	3	0	2	0	2	4	1	0	0	0	0	0	7	5	7	0
North Fork Total			81.5	54	108	80	1	17	3	72	89	9	0	0	2	0	0	172	101	170	2

Appendix Table B-1. Continued.

				New redds		On dig		Off dig		Dead fish, unmarked				Dead fish, marked				Dead	Live	Unmarked	Marked
Stream, section	Survey type	Date	Miles	Occupied	Unoccupied	A	J	A	J	M	F	J	U	M	F	J	U	Fish	Fish	Dead	Dead
Granite Creek System																					
Granite Creek																					
Buck Creek to Tencent Creek	Pre-index	2-Sep	2.0	5	14	11	0	7	0	5	4	0	0	0	0	0	0	9	18	9	0
Tencent Creek to 1 mile above Clear Creek	Pre-index	2-Sep	2.0	7	8	12	0	2	0	3	2	0	0	0	0	0	0	5	14	5	0
1mile above Clear Creek to 73 Rd Crossing	Pre-index	2-Sep	1.5	4	8	5	0	4	1	2	1	0	0	0	0	0	0	3	10	3	0
Mouth to Indian Creek	Extensive	9-Sep	2	5	4	8	0	4	0	3	1	0	0	0	0	0	0	4	12	4	0
Indian Creek to Buck Creek	Extensive	9-Sep	2.5	7	5	7	0	2	0	1	1	0	0	0	0	0	0	2	9	2	0
Buck Creek to Tencent Creek	Index	9-Sep	2.0	5	4	18	1	1	2	7	3	1	0	0	0	0	0	11	22	11	0
Tencent Creek to 1 mile above Clear Creek	Index	9-Sep	2.0	3	6	6	0	0	0	3	8	1	0	0	0	0	0	12	6	12	0
1mile above Clear Creek to 73 Rd Crossing	Index	9-Sep	1.5	0	0	3	1	5	0	1	2	0	0	0	0	0	0	3	9	3	0
Buck Creek to Tencent Creek	Post-index	16-Sep	2.0	1	3	2	0	1	0	6	9	1	0	0	0	0	0	16	3	16	0
Tencent Creek to 1 mile above Clear Creek	Post-index	16-Sep	2.0	1	2	2	0	0	0	1	3	1	0	0	0	0	0	5	2	5	0
1 mile above Clear Creek to 73 Rd Crossing	Post-index	16-Sep	1.5	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3	0	3	0
Granite Creek Total			21.0	38	54	74	2	26	3	33	35	5	0	0	0	0	0	73	105	73	0
Clear Creek																					
Mouth to road crossing	Pre-index	2-Sep	4.0	2	3	3	0	5	1	1	4	0	0	0	0	0	0	5	9	5	0
Mouth to road crossing	Index	9-Sep	4.0	4	6	5	0	0	0	4	3	0	0	0	0	0	0	7	5	7	0
Road Crossing to Beaver Creek	Extensive	9-Sep	1.0	1	5	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Mouth to road crossing	Post-index	16-Sep	4.0	0	1	0	0	0	0	0	4	0	0	0	0	0	0	4	0	4	0
Clear Creek Total			13.0	7	15	9	0	5	1	5	11	0	0	0	0	0	0	16	15	16	0
Bull Run Creek																					
Mouth to Guard Station	Pre-index	2-Sep	2.5	1	4	3	0	0	0	0	3	0	0	0	0	0	0	3	3	3	0
Mouth to Guard Station	Index	9-Sep	2.5	1	2	1	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0
1/2 mile above GS to Guard Station	Extensive	9-Sep	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mouth to Guard Station	Post-index	16-Sep	2.5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0
Bull Run Total			8.0	2	6	4	0	0	0	0	5	0	0	0	0	0	0	5	4	5	0
Granite Creek System Total			42.0	47	75	87	2	31	4	38	51	5	0	0	0	0	0	94	124	94	0

Appendix Table B-2. Summary of data collected during spring chinook salmon spawning ground surveys in the John Day basin, 1999.

				Pre-index			Index			Post-index			Extensive		
					Fish			Fish			Fish			Fish	
Stream	Miles index survey	Miles extensive survey	Total Redds	New Redds	Live	Dead	New Redds	Live	Dead	New Redds	Live	Dead	New Redds	Live	Dead
John Day River, mainstem	13.0	2.3	62	27	35	8	31	19	13	4	4	8	0	1	1
Middle Fork John Day River	12.0	18.0	132	97	153	4	8	28	62	1	0	24	26	8	25
North Fork John Day River	18.0	27.5	162	100	84	41	20	10	76	3	6	23	39	1	32
Granite Creek System	12.0	6	122	56	54	25	31	43	34	8	5	29	27	22	6