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Fall Chinook Salmon Spawning Ground Surveys in the Snake River Basin upriver of Lower Granite Dam

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Fall Chinook Salmon Spawning Ground Surveys in the Snake River Basin Upriver of Lower Granite Dam, 2004

Annual Report

November 2004 - October 2005

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Introduction

Redd counts were used to document the spawning distribution of fall Chinook salmon (*Oncorhynchus tshawytscha*) in the Snake River basin upriver of Lower Granite Dam. The first reported redd counts were from aerial searches conducted intermittently between 1959 and 1978 (Irving and Bjornn 1981, Witty 1988; Groves and Chandler 1996)(Appendix 1). In 1986, the Washington Department of Fish and Wildlife began an annual monitoring program that, in addition to the Snake River, included aerial searches of the Grande Ronde River the first year (Seidel and Bugert 1987), and the Imnaha River in subsequent years (Seidel et al. 1988; Bugert et al. 1989-1991; Mendel et al. 1992). The U. S. Fish and Wildlife Service and Idaho Power Company began contributing to this effort in 1991 by increasing the number of aerial searches conducted each year and adding underwater searches in areas of the Snake River that were too deep to be searched from the air (Connor et al. 1993; Garcia et al. 1994a, 1994b, 1996-2004; Groves 1993; Groves and Chandler 1996). The Nez Perce Tribe added aerial searches in the Clearwater River basin beginning in 1988 (Arnsberg et. al 1992), and the Salmon River beginning in 1992. Currently searches are conducted cooperatively by the Nez Perce Tribe, Idaho Power Company, and U. S. Fish and Wildlife Service.

Our objective for this report was to consolidate the findings from annual redd searches into a single document, containing detailed information about the searches from the most recent spawning season, and summary information from previous years. The work conducted in 2004 was funded by the Bonneville Power Administration, Idaho Power Company, and Bureau of Land Management.

Study Area

The study area included the free-flowing Snake River between Lower Granite and Hells Canyon dams and portions of the major tributaries that enter therein (Figure 1). We refer to locations using river miles (RM) and river kilometers (RK) based on navigation charts of the Snake River (USACE 1990) and U.S.

Geological Survey topographical maps. In 2004, searches focused on eight river reaches: (1) the Snake River from the head of Lower Granite Reservoir (RM 147; RK 237) to Hells Canyon Dam (RM 247; RK 397), (2) the Clearwater River to the North Fork Clearwater River (RM 41; RK 66), (3) the North Fork Clearwater River to Dworshak Dam (RM 2; RK 3), (4) the Clearwater River to the South Fork and Middle Fork Clearwater river confluence (RM 74; RK 119); (5) the South Fork Clearwater River to Butcher Creek (RM 12; RK 19), (6) the Grande Ronde River to Wildcat Creek (RM 53; RK 85), (7) the Salmon River to French Creek (RM 105; RK 169), and (8) the Imnaha River to the Cow Creek Bridge (RM 4; RK 6). The number of searches per reach varied between reaches and years. Searches were conducted in other portions of the aforementioned Snake River tributaries, and in the Potlatch River and Asotin Creek, though less consistently.

Methods

Redd searches were conducted from a helicopter flown at an altitude of about 700-ft. or less. At minimum, observations were made by a primary observer and the pilot, though typically at least one additional observer was present. Redd locations were determined by referencing navigation charts of the Snake River (USACE 1990), or U. S. Geological Survey topographical maps, or using the Global Positioning System (GPS) coupled with mapping software. From 1991 to 2004, searches in the Snake, Clearwater, Grande Ronde, and Imnaha rivers were scheduled to be conducted at 7-d intervals starting around mid-October and ending around mid-December. In previous years, and in the other rivers, searches were generally conducted less frequently. In most years some scheduled searches were canceled or shortened due to poor visibility or inclement weather. Redds observed in the Snake River that could not clearly be distinguished from the air were examined from the ground (hereafter referred to as ground truthing) beginning in 1991. Ground truthing was also performed in the other rivers though less consistently. Only the number of new redds observed on each search were recorded.

Redd searches in the Snake River were also conducted using underwater search methods in areas too

deep to be effectively searched from the air. In 1991 and 1992, deep-water redd searches were conducted using methods developed by Swan (1989) that involved direct observation of bottom substrates by scuba divers (Connor et al. 1993; Garcia et al. 1994a). From 1993-2004, deep-water redd searches were conducted using a submersible video camera connected to a 65-ft camera cable, viewing monitor(s), and a video-recording device. The search camera was either enclosed in an aluminum sheath mounted on a 90-lb lead weight, or attached to an aluminum frame mounted between two 30-lb lead weights, and could be adjusted 45 to 90 degrees down from horizontal (Groves and Garcia, 1998). The camera was suspended from a boat using a wire rope passed through a roller on the bow, and attached to a sounding-reel/depth-indicator mounted in the boat cabin.

Underwater searches were accomplished by passing the camera over the river bottom in parallel paths spaced roughly 30 ft. apart. Distance between paths was determined by sight estimation, measuring cord laid along the shore, or GPS. The distance between the camera and river bottom, and the angle of the camera, was adjusted to maximize the amount of viewable area without losing the ability to observe details of the bottom substrates. If a redd was observed, the distance between passes in the search pattern was reduced, and in most cases, the entire area was searched at least two times in the course of the spawning season.

Camera location was recorded using electronic surveying equipment or GPS. Searches were video taped when large groups of redds were found, and the numbers of redds were verified by reviewing recorded searches while referencing plots of redd coordinates. In areas where redds overlapped and could not be identified individually, the perimeter of the redd group (or patch) was surveyed and the overall area divided by 492.5 ft²-per-redd (45.8-m²-per-redd) based on measurements of fall Chinook salmon redds in the Snake and Columbia rivers (Groves and Chandler 2001). This produced an index count of the total number of redds in the group.

Underwater searches were limited to areas greater than about 10-ft deep with a dominant bottom

substrate particle size (Bovee 1982) ranging from 1- to 6-in. diameter (Raleigh et al. 1986). In 1991 and 1992, a few pilot searches were conducted at known spawning sites. From 1993 to 2002, search crews attempted to annually search about 90 areas that fit the substrate size and the depth criteria (based on Hells Canyon Dam discharged of about 9,000 cfs). In 2003 and 2004, search crews attempted to search all deep-water sites where redds were observed in previous years. However, additional searches (of new and old sites) were conducted whenever possible.

Results and Discussion

Snake River

In 2004, a total of 1,709 redds were observed in the Snake River (Table 1), of which 1,218 were observed during eight aerial searches (Table 2) and 491 during searches of 67 deep-water sites (Tables 3 and 4). Visibility ratings were reported as either “fair” or “good” during aerial searches (Table 5). The locations of all redds counted in the Snake River study area during aerial searches since 1986 are given in Appendix 2. The numbers of searches conducted in the Snake and other rivers are given in Table 6. The locations of all redds observed using submersible cameras are given in Table 7. The locations of all redds counted (aerial and underwater counts combined) in the Snake River study area since 1986 are given in Appendix 3. Redds counted in the Snake River amounted to roughly 67% of all redds observed upriver of Lower Granite Dam in 2004, compared to 68% in 2003, 60% in 2002, 54% in 2001, 65% in 2000, 64% in 1999, 61% in 1998, and 31% in 1997. The percentage of redds counted using submersible cameras from 1993 to 2004 averaged $28.5\% \pm 9.6\%$ for the Snake River, and $16.8\% \pm 6.3\%$ for all redds counted above Lower Granite Dam. In 2004, the greatest number of new redds were observed on November 8 (Table 2).

Clearwater River basin

A total of 631 redds were observed in the Clearwater River basin in 2004, 630 in the Clearwater and North

Fork Clearwater rivers (Tables 1 and 9) during 10 aerial searches for fall Chinook salmon redds (Table 6), and one in the Potlatch River during a ground search (on 2-Nov) for coho salmon redds (Table 1; Scott Everett, NPT, personal communication). Observation conditions were poor on each flight over the Clearwater River in 2004 (Table 9). The locations of all redds counted in the Clearwater River are given in Appendix 4. Redds counted in the Clearwater River basin amounted to 25% of all redds observed upriver of Lower Granite Dam in 2004, compared to 26% in 2003, 28% in 2002, 26% in 2001, 32% in 2000, 32% in 1999, and 26% in 1998. In 2004, the greatest numbers of new redds (RM 0–45) were observed on October 27 (Table 8).

Asotin Creek

A total of four redds were observed during two searches of Asotin Creek in 2004 (Tables 1 and 6). Asotin Creek was surveyed for fall Chinook salmon redds from 1989-1992, but no redds were found (Table 1). In 2003, redds were observed incidentally (Garcia et al. 2004). Searches in 2004 were conducted on November 15 and 29, and covered from the creek mouth to RM 13. Search conditions were reported as “Good” on the first flight, and “Fair” on the second. All four redds were observed on the first flight, one at RM 0.05, and three at RM 1.0.

Grande Ronde River

A total of 162 redds were observed during eight searches of the Grande Ronde River in 2004 (Tables 1, 6, and 12). Observation conditions varied from “Fair” to “Excellent” (Table 11). Redds counted in the Grande Ronde River amounted to 6.3% of all redds observed upriver of Lower Granite Dam in 2004, compared to 4% in 2003, 6% in 2002, 15% in 2001, 1% in 2000, 2% in 1999, 8% in 1998, and 29% in 1997. The locations of all redds counted in the Grande Ronde River are given in Appendix 5. In 2004, the greatest numbers of new redds were observed on November 10 (Table 10).

Salmon River

A total of 21 redds were observed during three searches of the Salmon River in 2004 (Tables 1, 6, and 12). River discharge at RM 53.7 ranged from 3,650-4,680, and observation conditions were reported as "Fair". Redds counted in the Salmon River amounted to about 1% of all redds observed upriver of Lower Granite Dam in 2004, compared to 1% in 2003, 2% in 2001 and 2002, 0% in 2000, 0% in 1999, 1% in 1998, and 1% in 1997. The locations of all redds counted in the Salmon River are given in Appendix 6.

Imnaha River

A total of 35 redds were observed during eight searches of the Imnaha River in 2004 (Tables 1, 6, and 13). Observation conditions were reported as "Good" to "Excellent" (Table 14). Redds counted in the Imnaha River amounted to about 1% of all redds observed upriver of Lower Granite Dam in 2004, compared to 4% in 2003 and 2002, 3% in 2001, 2% in 2000, 2% in 1999, 4% in 1998, and 2% in 1997. The locations of all redds counted in the Imnaha River are given in Appendix 7. In 2004, the greatest number of new redds were observed on November 10.

Summary

A total of 2,562 fall Chinook salmon redds were observed upriver of Lower Granite Dam in 2004 (Figure 2). This was the greatest number of redds counted since annual searches began in 1986. The increase in the number of redds counted corresponded with an increase in the number of adult fall Chinook salmon counted in the Lower Granite Dam fish ladder (Table 15 and Figure 2). The number of adult fish counted passing Lower Granite Dam per redd counted upstream averaged 23.9 ± 38.1 from 1986 to 1992, 4.7 ± 0.9 from 1993 to 2004, and was 5.7 in 2004 (Table 15). Most of the redds were observed in the Snake River (67%) and the Clearwater River basin (25%).

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Figures and Tables

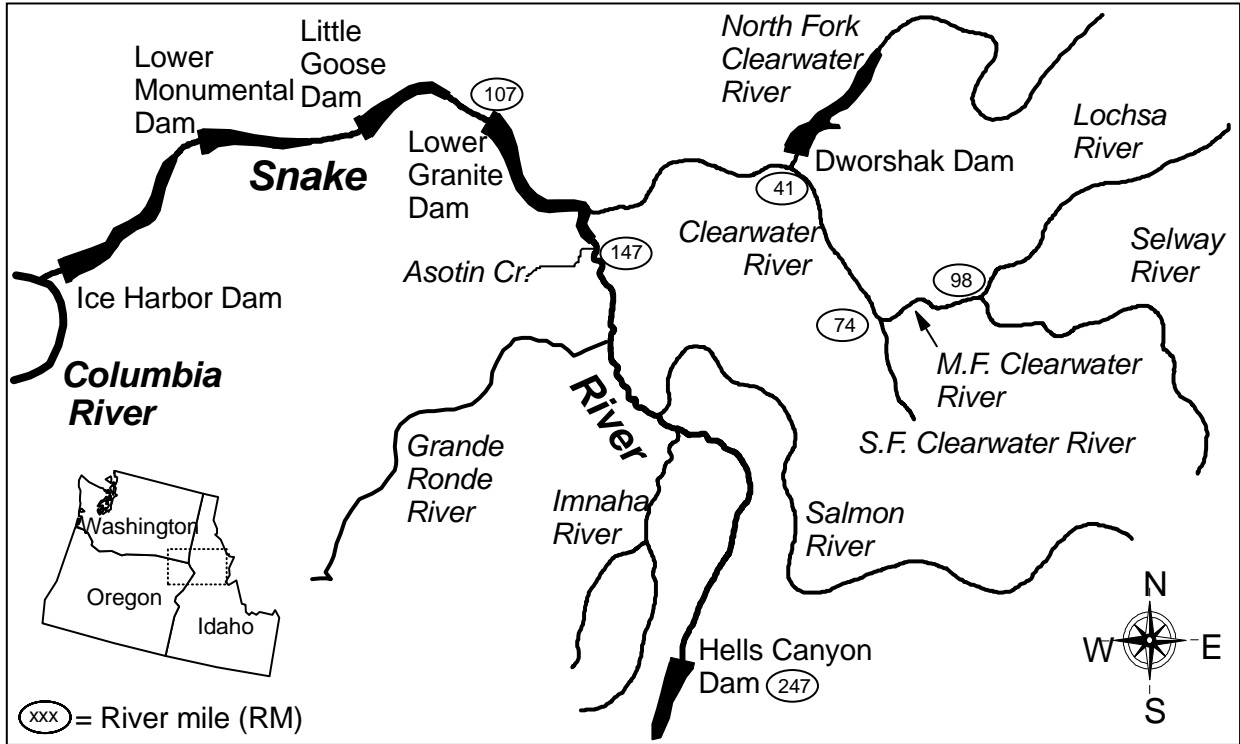


Figure 1. Map of the Snake River drainage in Oregon, Washington, and parts of Idaho.

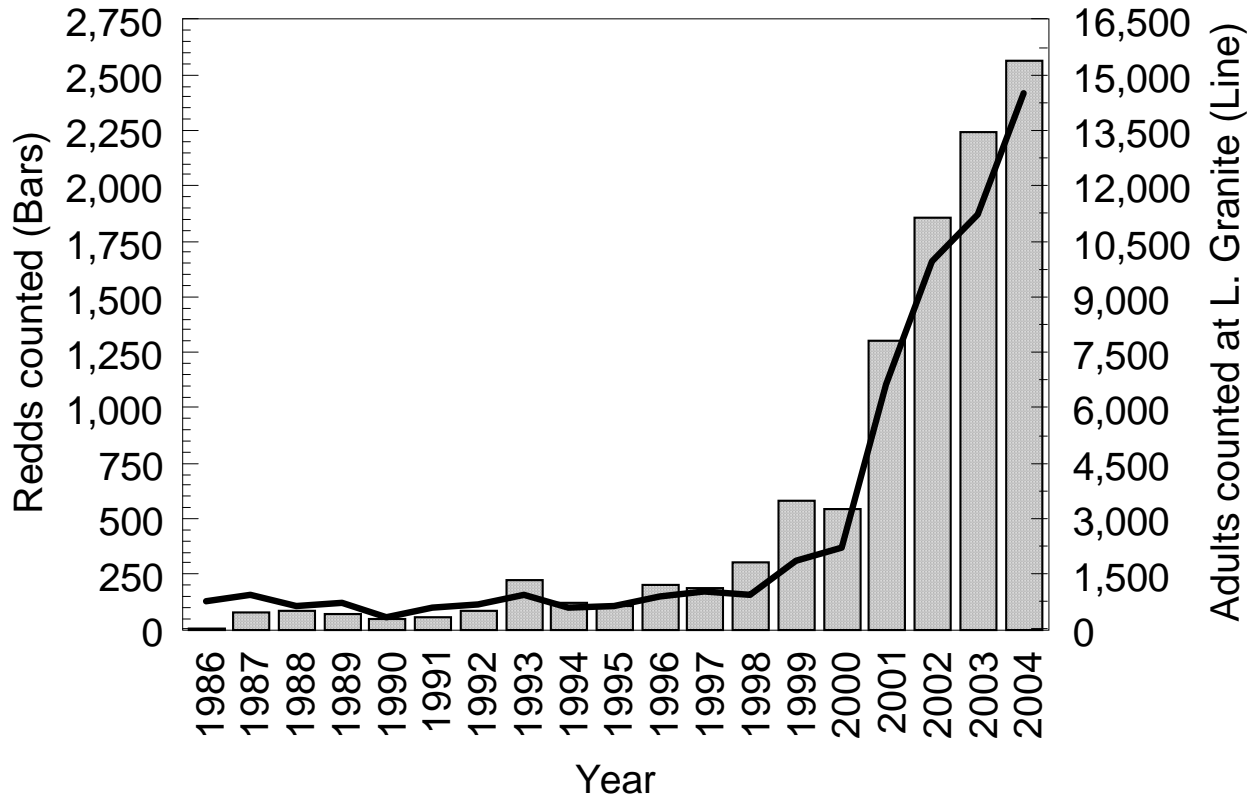


Figure 2. Number of adult fall Chinook salmon counted at Lower Granite Dam, and number of redds counted above the dam, 1986-2004 (Fish counts from USACE 1986-2004, and D. Milks, WDFW, unpublished data).

Table 1. Number of fall Chinook salmon redds counted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1986-2004. An empty cell indicates no searches were conducted in the corresponding river and year. Some of the data is broken down into method, and river mile (RM) sections. Data collected by the Washington Department of Fish and Wildlife, Nez Perce Tribe, Idaho Power Company, and the U.S. Fish and Wildlife Service. Abbreviations: SR=Snake River, LCR=Lower Clearwater River, NFCR=North Fork Clearwater River, UCR=Upper Clearwater River, SFCR=South Fork Clearwater River, MFCR=Middle Fork Clearwater River, GRR=Grande Ronde River.

Location	Year																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SR (helicopter) ^a	7	66	64	58	37	41	47	60	53	41	71	49	135	273	255	535	878	1,118	1,218
SR (video) ^b						5	0	67	14	24	33	9	50	100	91	174	235	394	491
LCR (RM0-41)			21	10	4	4	25	36	30	20	66	58	78	179	164	290	520	544	592
Potlatch River														7	0	24	3	1	1
NFCR ^c			0	0	0	0	0	0	7	0	2	14	0	1	0	1	0	8	2
UCR (RM 42-74)							1	0	0	0	0	0	0	2	8	16	4	19	36
SFCR							0	0	0	0	1	0	0	2	1	5	0	0	0
MFCR (RM 75- 98)									0	0	0	0	0	0	0	0	0	0	0
Selway River									0	0	0	0	0	0	0	0	0	0	0
Asotin Creek				0	0	0	0											3	4
GRR	0	7	1	0	1	0	5	49	15	18	20	55	24	13	8	197	111	93	162
Salmon River							1	3	1	2	1	1	3	0	0	22	31	18	21
Imnaha River		0	1	1	3	4	3	4	0	4	3	3	13	9	9	38	72	43	35
Totals	7	73	87	69	45	54	82	219	120	109	197	189	303	586	536	1,302	1,854	2,241	2,562

^a The targeted search area was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.

^b The targeted search areas were discrete sites composed mainly of 1-6 in. bottom substrates in water over 10 ft. deep. The number of sites searched varied. Searchers recorded a 170 m² patch of disturbed substrates in 1995, 238 m² in 1996, 1,226 m² in 2001, 1,282 m² in 2002, 1,122 m² in 2003, and 1,479 m² in 2004, at RM 179.6, 1,184 m² in 2003, and 1,257 m² in 2004 at RM 212.2, 1,259 m² at RM158.0 in 2004, and 981 m² at RM193.0 in 2004. In this report we used a conversion factor of 45.8 m² per redd to estimate the numbers of redds within these patches.

^c Searches covered from the mouth to the Ahsahka boat ramp in 2002. Searches covered from the mouth to Dworshak Dam in previous years.

Table 2. New fall Chinook salmon redds counted during aerial searches of the Snake River in 2004 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New Redds By Flight Date								Totals
		18-Oct	25-Oct	1-Nov	8-Nov	15-Nov	22-Nov	29-Nov	6-Dec	
148.5	238.9			17	14	23	5			59
149.4	240.4	1		4		4				9
149.6	240.7			2						2
151.5	243.8			1	1	1				3
151.9	244.4		10	5	9		2			26
152.3	245.1			7	11	6	11	11		46
152.4	245.2			2						2
152.8	245.9		1							1
153.2	246.5		1	1		3				5
155.0	249.4					9	4			13
155.9	250.8							2	9	11
156.4	251.6			3	5	2				10
157.6	253.6			1						1
158.0	254.2				12	3	5	5		25
159.7	257.0						1			1
161.0	259.0		3	7	3	2		1		16
162.4	261.3			2	15	5	5			27
163.7	263.4					3	2			5
164.7	265.0		5	5	10	7	1			28
165.3	266.0		5	3	3	6	7	3		27
165.8	266.8		7	20	21	2	6	4		60
166.2	267.4				1					1
168.7	271.4		4	20	20			4		48
169.7	273.0				2	3	1			6
171.9	276.6							1		1
172.5	277.6		1	1	4	3	1	1		11
173.9	279.8			2	4	3				9

Table 2 (Continued)

New fall Chinook salmon redds counted during aerial searches of the Snake River in 2004 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New Redds By Flight Date								Totals
		18-Oct	25-Oct	1-Nov	8-Nov	15-Nov	22-Nov	29-Nov	6-Dec	
175.9	283.0			1	3					4
176.7	284.3				3	4				7
177.9	286.2				1					1
178.3	286.9			2	2	2		4		10
178.5	287.2				1					1
178.9	287.9		3	5		2		1		11
179.5	288.8		2	3		1				6
179.6	289.0			3	7	7				17
181.7	292.4			5	2	3				10
183.2	294.8						1			1
183.4	295.1			1		6	1			8
187.7	302.0		1	2						3
188.2	302.8		1							1
190.0	305.7			1						1
190.2	306.0		1					1		2
190.8	307.0			3	1	7	3	1	2	17
191.0	307.3								2	2
191.1	307.5			1						1
191.7	308.4			2		2	2			6
193.6	311.5			1	2					3
193.7	311.7			1	1	7				9
193.8	311.8				1					1
194.0	312.1		2	15		4				21
194.2	312.5						1			1
196.0	315.4		2	18	9					29
198.2	318.9		3	10	1	2	1			17

Table 2 (Continued)

New fall Chinook salmon redds counted during aerial searches of the Snake River in 2004 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New Redds By Flight Date								Totals
		18-Oct	25-Oct	1-Nov	8-Nov	15-Nov	22-Nov	29-Nov	6-Dec	
198.8	319.9		2	10	9	9		1		31
201.0	323.4			2	2					4
205.3	330.3			2	9	1				12
205.4	330.5				5					5
206.5	332.3			2	11	2				15
206.6	332.4				1	1				2
207.5	333.9				1					1
207.8	334.4				4					4
208.0	334.7		3	28	13		1	1		46
211.9	340.9			19	4	3	2			28
212.3	341.6					3	1			4
213.6	343.7			3		2				5
213.7	343.8			6	1	4	2			13
213.9	344.2			1		1				2
214.5	345.1		2	2	2	1				7
215.4	346.6			3						3
216.1	347.7		1	2	4	2				9
216.9	349.0		2	4	22	2				30
217.3	349.6		1	11	11	8	1	4		36
218.5	351.6			2	5	3				10
218.7	351.9		2	4	6	1				13
219.0	352.4		2	4	4	2				12
219.3	352.9		4	3	6					13
220.7	355.1				1					1
222.7	358.3			2	8	4				14
222.9	358.6		2	10	9					21

Table 2 (Continued)

New fall Chinook salmon redds counted during aerial searches of the Snake River in 2004 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New Redds By Flight Date								Totals
		18-Oct	25-Oct	1-Nov	8-Nov	15-Nov	22-Nov	29-Nov	6-Dec	
224.7	361.5		1	6	3	2				12
225.0	362.0		1			-			-	1
231.3	372.2				2	-			-	2
235.0	378.1		3		6	-			-	9
235.7	379.2		5		18	-			-	23
236.0	379.7				2	-			-	2
236.1	379.9				2	-			-	2
237.0	381.3		2		22	-			-	24
238.1	383.1				1	-			-	1
238.6	383.9		2		12	-		2	-	16
240.4	386.8		2		13	-			-	15
240.6	387.1		3		29	-	4		-	36
241.0	387.8				5	-	3		-	8
242.8	390.7		3		6	-	1		-	10
243.5	391.8				10	-	2		-	12
243.8	392.3				1	-	1		-	2
244.0	392.6				8	-			-	8
244.5	393.4				25	-			-	25
244.7	393.7					-	1		-	1
245.2	394.5				1	-			-	1
245.3	394.7				7	-			-	7
245.7	395.3				6	-			-	6
245.8	395.5				7	-	2		-	9
247.5	398.2					-	1	1	-	2
		1	95	303	493	183	82	48	13	1,218

Table 3. Record of fall Chinook salmon redds counted in the Snake River using submersible cameras in 2004 (Data collected by the Idaho Power Company and U.S. Fish and Wildlife Service). Counts are presented by river mile (RM) and river kilometer (RK). In 2004, 49 individual redds were counted in deep water at RM 179.6, and three at RM 158.0. We measured 1,479 m² of disturbed bottom substrates at RM 179.6, 1,259 m² at RM 158.0, 981 m² at RM 193.0, and 1,257 m² at RM 212.2, equaling 33, 27, 22, and 27, redds, respectively, using a conversion factor of 45.8 m² -per-redd.

RM	RK	Redds
148.5	238.9	8
155.0	249.4	2
158.0	254.2	30
163.7	263.4	9
165.8	266.8	13
166.6	268.1	8
168.7	271.4	24
169.7	273.0	17
179.6	289.0	82
181.7	292.4	5
183.2	294.8	1
183.5	295.3	9
184.7	297.2	1
188.2	302.8	1
193.0	310.5	22
193.4	311.2	1
193.6	311.5	3
193.7	311.7	2
193.8	311.8	2
194.1	312.3	5
194.4	312.8	23
198.2	318.9	18
198.8	319.9	12
199.4	320.8	1
208.0	334.7	5
212.2	341.4	27
212.3	341.6	8
213.3	343.2	6
216.9	349.0	23
218.5	351.6	37
218.7	351.9	3
219.3	352.9	4
222.3	357.7	6
222.9	358.6	2
224.7	361.5	3
228.7	368.0	3
235.0	378.1	48
235.7	379.2	2
236.0	379.7	1
236.3	380.2	1
237.0	381.3	2
242.8	390.7	11
		491

Table 4. List of the 67 sites searched for fall Chinook salmon redds in the Snake River, 2004, by river mile (RM).

RM	RM
148.5	199.4
150.5	202.3
151.4	203.1
155.0	206.6
156.4	208.0
158.0	208.3
162.4	209.9
163.5	211.9
164.4	212.2
165.7	212.3
166.2	213.3
166.6	215.3
168.8	216.9
169.7	218.4
171.0	218.5
178.5	218.7
179.6	219.0
181.1	219.3
181.7	221.0
183.2	221.3
183.6	222.3
184.7	222.8
185.6	223.1
188.2	224.7
192.9	228.1
193.4	228.7
193.5	229.1
193.7	235.1
193.8	235.7
194.1	236.0
194.4	236.3
194.5	237.0
198.2	242.8
198.8	

Table 5. Flight information, river flow, and visibility rating for aerial surveys of the Snake River in 2004. Flights on 1-Nov, 15-Nov, and 6-Dec, were terminated prior to reaching Hells Canyon Dam (RM 247) due to high winds.

Category	Flight Date							
	18-Oct	25-Oct	1-Nov	8-Nov	15-Nov	22-Nov	29-Nov	6-Dec
River Mile Start	147	147	147	147	147	147	147	147
River Mile End	247	247	227	247	224.8	247	247	224.8
Aircraft	H. Soloy	H. Soloy	H. Soloy	H. Soloy	H. Soloy	H. Soloy	H. Soloy	H. Soloy
Pilot	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.
Primary Observer	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves
Secondary Observer	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury
Weather	Ptly Cldy	Ptly Cldy	Mstly Cldy	Clear	Mstly Cldy	Cloudy	Ptly Cldy	Mstly Cldy
Flow (cfs) at RM 67.5	13,800	14,500	14,700	14,400	14,400	13,700	14,600	13,400
Flow (cfs) at RM 247.0	8,790	8,687	8,535	8,693	8,643	8,720	9,519	9,345
Visibility Rating (VR): Asotin to Grande Ronde River	Fair	Fair	Good	Good	Good	Good	Good	Good
VR: G.R. River to Salmon River	Fair	Fair	Good	Good	Good	Good	Good	Good
VR: Salmon River to H.C. Dam	Fair	Fair	Good	Good	Good	Good	Good	Good

Table 6. Number of redd searches conducted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1986-2004. Data for underwater searches indicates the number of discrete patches of gravels searched, whereas all other data indicates the number of helicopter flights over portions of the corresponding river.

Location	Year																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Snake (helicopter)	1	2	2	2	3	9	8	8	8	7	7	8	8	9	9	10	7	7	8
Snake (video)						1	3	50	73	42	32	63	48	73	60	67	60	47	67
Lower Clearwater (RM 0-41)			1	2	2	2	2	5	5	3	4	9	5	10	11	8	9	9	10
Potlatch River ^a														1	5	3	3	2	3
N.F. Clearwater							2	4	5	3	5	9	5	7	11	4	9	9	10
Clearwater River (RM 42-74)									5	2	1	7	5	8	11	4	3	9	2
S.F. Clearwater							2	4	4	1	3	7	5	8	6	7	3	3	2
M.F. Clearwater (RM 75-98)									1	2	2	2	5	3	4	5	1	1	0
Selway River									1	2	2	2	5	3	5	6	1	1	0
Asotin Creek			1	1	2	1												2	2
Grande Ronde	1	3	2	1	1	3	6	8	7	3	4	8	6	7	7	9	7	8	8
Salmon River							2	3	3	1	4	3	3	3	2	1	2	3	3
Imnaha River		1	2	2	1	9	6	8	8	6	5	7	6	9	9	9	7	8	8

^a Fall Chinook salmon redds were observed in the Potlatch River in 2002-2004 during air and (or) ground searches for coho redds and carcasses.

Table 7. Numbers of fall Chinook salmon redds counted using submersible cameras in the Snake River, 1991-2004. Counts are presented by river mile (RM) and river kilometer (RK). A zero indicates the site was searched but no redds were observed. An empty cell indicates the site was not searched in the corresponding year.

RM	RK	Year													
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
148.5	238.9			0	0		0	0		0	0	1	3		8
155.0	249.4														2
156.4	251.6											18	0		
158.0	254.2			0	0		0	0	0	0	0	1	4	30	
162.4	261.3	5	0	0	0		2	0	0	0	0	6	1	0	
163.7	263.4				0		0	0		0	0	0	0	10	9
165.3	266.0			0	0						4	0			
165.7	266.6			28	0		0	0	0	0	0	6	8	48	13
166.2	267.4			11	0		0	0	0	0	0	1	0		
166.6	268.1			21	0		0	0	6	0	1	0	9	1	8
168.7	271.4													28	24
169.7	273.0			0	0		0	0						10	17
178.5	287.2													25	
179.6	289.0			2	8	19	24	5	16	30	48	67	75	94	82
181.8	292.5			0	0			0		1		0	0		5
183.1	294.6			0	0			0	0	2	0	0	4		1
183.5	295.3			0											9
184.7	297.2			0	0			0		0	0	0	0	6	1
188.2	302.8									0	0	2	0	3	1
193.0	310.5												21	16	22
193.4	311.2			0											1
193.6	311.5			0	0	0	0	0	0	0	0	4	2		3
193.7	311.7		0		0	0	0	0	0	0	0	1	1		2
193.8	311.8			1	0	0	0	0	0	0	0	0	1		2
194.1	312.3				5	0	0	0	0			0	0		5
194.4	312.8				0	0		0		0	0	0	1	5	23
198.2	318.9				0	0	2	0	0	6	5	19	11	13	18
198.8	319.9				0	0	0	0	0	4	4	2	2	4	12
199.4	320.8			1	0	0	5	0	0	2	1	2	0	0	1
203.1	326.8			0	0	0	0	0	10	0	0	0	0	2	
208.0	334.7			0	0	0	0	4	0	11	0	0	1	14	5
208.3	335.2			0	0	0	0	0	0	4	0	4	0	0	
211.9	340.9			0						1				0	
212.2	341.4			0	0	2	0	0	17	24	28	37	37	33	27
212.3	341.6						0		0	2	3	8	5	2	8
213.3	343.2			0	0	0		0	0	0	0	4	8	8	6
216.9	349.0									4	0	1		2	23
218.5	351.6									0	1	0	11	1	37
218.7	351.9					3		0	0	1		4	2	0	3
219.0	352.4									1			0		
219.3	352.9														4
221.0	355.6									0	0	0	1	0	
222.3	357.7			0	0	0		0	0	0	0	0	0	0	6
222.8	358.5			3	0	0				0	0			0	2
223.1	359.0									3	0	0			
228.0	366.9				0	0	0	0	0	2	0	0	0	1	
224.7	361.5														3
228.7	368.0				0	0		0		0					3

235.0	378.1			0	0			0		0		9	56	48	
235.7	379.2	0		0	0	0	0	0					0	2	
236.0	379.7	0	0											1	
236.3	380.2		0											1	
236.9	381.2	0	1	0	0	0	0					0			
237.0	381.3	0	0	0	0	0	0					0		2	
239.4	385.2												6		
242.9	390.8							1	2		1	2	2	11	
245.8	395.5			0					0		1				
		5	0	67	14	24	33	9	50	100	91	174	235	394	491

Note: Searchers reported a 170 m² patch of disturbed substrates in 1995, 238 m² in 1996, 1,226 m² in 2001, 1,282 m² in 2002, 1,122 m² in 2003, and 1,479 m² in 2004, at RM 179.6, 1,184 m² in 2003, and 1,257 m² in 2004 at RM 212.2, 1,259 m² at RM158.0 in 2004, and 981 m² at RM193.0 in 2004. A conversion factor of 45.8 m² per-redd was used to estimate the numbers of redds within these patches. In addition, RM 211.9 and 219 are not deep-water sites. Cameras were used in for ground truthing due to poor observation conditions.

Table 8. New fall Chinook salmon redds counted in the Clearwater River and North Fork Clearwater River in 2004. Counts are presented by river mile (RM) and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile (Data collected by the Nez Perce Tribe).

RM	RKM	New Redds Counted by Flight Date										Totals
		28-Sep	4-Oct	11-Oct	27-Oct	1-Nov	4-Nov	10-Nov	15-Nov	22-Nov	6-Dec	
Clearwater River												
14.0	22.5							4	3			7
18.0	29	1	3	1	15		14	9	2			45
19.1	30.7				7							7
19.3	31.1		1	1	12		13	4				31
20.0	32.2		1									1
21.8	35				3							3
22.0	35.4		4	12	67		23	13				119
22.2	35.7				9		11	2				22
23.3	37.5				7		11					18
23.9	38.5			2	4		1					7
26.5	42.7				18							18
27.5	44.2				6							6
28.4	45.7	1	1	9	9							20
30.0	48.3		1	20	5			9				35
31.5	50.7			7	26			4				37
32.5	52.3				7		13					20
34.0	54.7				10			5				15
35.4	56.9	1	1	3	16		9	20				50
36.2	58.2	1			1		3	4				9
36.2	58.2	3		1	4			2				10
36.2	58.2			3	35		57	10	6			111
37.9	61				1							1
45.0	72.4				7		3					10
49.3	79.3	-	-	-	-	3	-			-	-	3
49.8	80.1	-	-	-	-	1	-			-	-	1
51.2	82.4	-	-	-	-	3	-			-	-	3
51.5	82.9	-	-	-	-	5	-			-	-	5
52.9	85.1	-	-	-	-			2		-	-	2
53.8	86.6	-	-	-	-	12	-			-	-	12
North Fork Clearwater River												
0.2	0.3						2					2
		7	12	59	269	24	158	88	11	0	0	630

Table 9. Flight information, river flow, and visibility rating for aerial redd surveys of the Clearwater River in 2004 (Data provided by the Nez Perce Tribe).

Category	Flight date									
	28-Sep	4-Oct	11-Oct	27-Oct	1-Nov	4-Nov	10-Nov	15-Nov	22-Nov	6-Dec
Start (RM)	4	4	4	4	45	4	4	4	4	4
End (RM)	45	45	45	45	75	45	54	54	45	75
Flow (cfs) at RM 11.6	5,520	4,630	4,400	4,630	4,710	5,660	4,790	4,500	4,160	4,790
Flow (cfs) at RM 37.4	1,700	1,700	1,700	1,700	1,700	1,700	1,500	1,500	1,500	1,500
Flow (cfs) at RM 44.6	3,680	2,820	2,580	2,860	2,860	3,880	3,050	2,910	2,420	3,040
Visibility rating	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor

Table 10. New fall Chinook salmon redds counted during aerial searches of the Grande Ronde River in 2004 (Data collected by the Nez Perce Tribe). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redd were observed on the corresponding location. A dash indicates no survey was conducted over the corresponding river mile.

RM	RK	New Redds Counted by Flight Date								Totals
		12-Oct	19-Oct	26-Oct	2-Nov	10-Nov	16-Nov	23-Nov	30-Nov	
0.1	0.2							1		1
1	1.6					1			1	2
2	3.2				7	7	9	7		30
2.4	3.9				2					2
3.2	5.1				3					3
3.3	5.3				1					1
3.7	6.0					15	14	2		31
4.3	6.9			3			1			4
4.4	7.1		1		1					2
4.6	7.4			1						1
5.6	9.0				1					1
9.1	14.6				1					1
10	16.1		3							3
10.5	16.9			3	1	4	1	4		13
11.4	18.3				1					1
11.7	18.8		1				1			2
12.5	20.1			2	1					3
12.6	20.3			1		1				2
13.4	21.6			2	1					3
13.8	22.2		3	2		2		1		8
14.2	22.8		1				1			2
14.3	23.0								4	4
16.2	26.1					2				2
17.7	28.5	1			3	2				6
22.1	35.6						1			1
22.2	35.7								1	1
24.0	38.6	1						1		2
24.4	39.3				1					1
26.7	43.0	1								1
27.9	44.9		1							1
29.1	46.8		2	2					1	5
31.1	50.0						1			1
37.7	60.7	2	2							4
43.2	69.5			1						1
44.5	71.6			2	1			1		4
44.9	72.2	1			4					5
45.7	73.5	2	2							4
48.7	78.4						1	1		2
49.2	79.2			1						1
		8	16	20	29	34	30	17	7	162

Table 11. Flight information, river discharge, and visibility rating for aerial redd surveys of the Grande Ronde River in 2004. All surveys were conducted from a Jet Ranger helicopter. Flights conducted by NPT.

Category	Flight date							
	12-Oct	19-Oct	26-Oct	2-Nov	10-Nov	16-Nov	23-Nov	30-Nov
Start (RM)	0	0	0	0	0	0	0	0
End (RM)	52.7	52.7	52.7	52.7	52.7	52.7	52.7	52.7
Flow (cfs) at RM 45.2	738	866	846	806	826	836	806	856
Visibility rating	Excel	Good	Fair	Good	Good	Fair	Good	Good

Table 12. Fall Chinook aerial spawning ground surveys conducted in the Salmon River, 2004 (Data collected by the Nez Perce Tribe). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redd were found on the corresponding location and date. A dash (-) indicates the site was not searched on the corresponding date.

RM	RK	New redds counted by flight date			Totals
		27-Oct	11-Oct	24-Nov	
4.0	6.4		2	4	6
4.8	7.7	1			1
24.4	39.3			1	1
30.9	49.7	3	2	3	8
31.0	49.9	1			1
35.7	57.4		1		1
82.2	132.3			1	1
110.0	177.0	-	-	2	2
		5	5	11	21

Table 13. New fall Chinook salmon redds counted during aerial searches of the Imnaha River in 2004 (Data collected by the Nez Perce Tribe). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no survey was conducted over the corresponding river mile, and a dash (-) indicates no redd were observed on the corresponding location and date.

RM	RKM	New Redds Counted by Flight Date								Totals
		12-Oct	19-Oct	26-Oct	2-Nov	10-Nov	16-Nov	23-Nov	30-Nov	
0.4	0.6							3		3
0.5	0.8			1	2	1				4
1.0	1.6						2			2
1.2	1.9							1		1
1.3	2.1							1		1
2.4	3.9			1				1		2
2.7	4.3			1				1		2
2.8	4.5					1				1
3.8	6.1	1								1
4.4	7.1							1		1
6.0	9.7					1				1
5.6	9.0			1		1				2
7.0	11.3			1						1
7.8	12.6			1	2	5	1			9
8.2	13.2					1				1
8.9	14.3						1			1
9.3	15.0				1					1
14.3	23.0							1		1
Totals		1	0	6	5	10	5	8	0	35

Table 14. Flight information, river flow, and visibility rating for aerial redd surveys of the Imnaha River in 2004.

RM	RKM	Flight date							
		10/12	10/19	10/26	11/2	11/10	11/16	11/23	11/30
Start (RM)		0	0	0	0	0	0	0	0
End (RM)		4.2	19.2	19.2	18.3	19.2	34.9	19.2	19.2
Flow (cfs) at RM 19.3		131	168	157	155	153	148	153	112
Visibility rating		Excellent	Good	Good	Good	Good	Good	Excellent	Good

Table 15. Annual count of adult fall Chinook salmon in the Lower Granite Dam fish ladder (Raw count), the number removed (Adult take), the number estimated to have passed the dam (Adults passed), the number of redds counted upstream of the dam, and number of adult fall Chinook salmon counted per redd counted upstream, 1986-2004. Raw counts are from USACE annual fish passage reports (USACE 1986-2004), and values for adult take are from the Washington Department of Fish and Wildlife (D. Milks, personal communication).

Year	Raw count	Adult take	Adults passed	Redds counted upstream	No. of adults passed per redd counted upstream
1986	784	13	771	7	110.1
1987	951	3	948	73	13.0
1988	627	2	625	87	7.2
1989	706	0	706	69	10.2
1990	385	50	335	45	7.4
1991	630	40	590	54	10.9
1992	855	187	668	82	8.1
1993	1,170	218	952	219	4.3
1994	791	185	606	120	5.1
1995	1,067	432	635	109	5.8
1996	1,308	389	919	197	4.7
1997	1,451	444	1,007	189	5.3
1998	1,909	947	962	303	3.2
1999	3,381	1,519	1,862	579	3.2
2000	3,696	1,470	2,226	543	4.1
2001	8,915	2,286	6,629	1,302	5.1
2002	12,351	2,404	9,947	1,854	5.4
2003	11,732	489	11,243	2,241	5.0
2004	14,960	466	14,494	2,562	5.7

Appendices

Appendix 1

Redd counts recorded from 1959 to 1978 in the Snake River between Lewiston, Idaho, and the Hells Canyon Dam site.

River section	Citation	Year											
		1959	1960	-	1967	-	1969	-	1974	1975	1976	-	1978
Hells Canyon Dam to Pleasant Valley Dam Site	Irving and Bjornn 1981	19	2		144		294						
Pleasant Valley Dam Site to Imnaha River	Irving and Bjornn 1981	7	2		11		94						
Imnaha River to Lewiston, ID	Irving and Bjornn 1981	2	0		33		180						
		28	4		188		568						
Hells Canyon Dam to Johnson Bar	Witty 1988						170	1	N.D.	8			
Johnson Bar to Pleasant Valley	Witty 1988						124	10	N.D.	1			
Pleasant Valley to Appaloosa	Witty 1988						61	3	N.D.	0			
Appaloosa to Mountain Sheep	Witty 1988						33	2	N.D.	4			
Mountain Sheep to State Line	Witty 1988						0	0	N.D.	0			
							388	16	10	13			
Hells Canyon Dam to Asotin, Washington	Groves and Chandler 1996												132
Maximum annual count		28	4	-	188	-	568	-	16	10	13	-	132

Appendix 2

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
148.0	238.1																	5		
148.3	238.6					1													1	
148.5	238.9														5	4	37	22	59	
148.8	239.4				1															
148.9	239.6																2	4		
149.1	239.9				1		2		1				2	1			2			
149.2	240.1																4	13	15	
149.4	240.4																		1	9
149.6	240.7																			2
150.0	241.4																	1		
151.5	243.8								2								5		4	3
151.9	244.4			1						3	4	8		1				7	31	26
152.1	244.7																1		6	
152.3	245.1		13	15	23	16		7	3	5		3	12	3	20	21	52	23	19	46
152.4	245.2																			2
152.8	245.9																			1
153.2	246.5																	4	1	5
155.0	249.4																			13
155.2	249.7																	1		
155.9	250.8																			11
156.4	251.6																	18		10
156.6	252.0																	28		
156.8	252.3														1	3				
156.9	252.5				1															
157.2	252.9					1														
157.4	253.3	2																		
157.6	253.6												1	3				1	2	1
158.0	254.2																1	2	13	25
159.3	256.3																1		1	

Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
159.5	256.6																1		2	
159.7	257.0							3										3	1	1
160.5	258.2																1		2	
160.8	258.7															1				
161.0	259.0							7	11		3		7	9	1	7	12	11	20	16
161.8	260.3																1			
162.4	261.3			2	1	2	20	11	1			2			1	4	56	33	2	27
163.0	262.3		3																	
163.3	262.7					2														
163.7	263.4																		24	5
164.4	264.5		2																	
164.7	265.0				2	1				1		1					19	12	25	28
165.2	265.8			5						2	3						5			
165.3	266.0									2				1				7	19	27
165.5	266.3		4																	
165.7	266.6									28							38	52	117	60
165.9	266.9		2	14			1	3	9			3		2	5					
166.2	267.4									17								1		1
166.4	267.7																	9		
166.6	268.1						6		21					6		1			1	
167.9	270.2																	1		
168.1	270.5																	1		
168.6	271.3																	1	8	
168.7	271.4								5	6	3						7	47	90	48
169.7	273.0				1						1	1						11	31	6
169.9	273.4																		1	
171.9	276.6																			1
172.5	277.6		1									3		4	1	1	18	11	1	11
173.9	279.8		1													1	1		2	9
175.2	281.9																2			

Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
175.7	282.7																	1	1	
175.9	283.0																			4
176.5	284.0									1					2	1		2		
176.7	284.3																		7	
177.9	286.2																		1	
178.3	286.9								1							3			10	
178.5	287.2														2			38	1	
178.9	287.9				1				1				2	7	13		18	10	11	
179.5	288.8																		6	
179.6	289.0								6	13	21	32	5	16	40	56	72	92	110	17
181.7	292.4														1	1	1	3	9	10
182.3	293.3																		8	
183.1	294.6														2			4		1
183.4	295.1																		1	8
183.5	295.3																		11	
184.7	297.2																		6	
186.7	300.4																	3		
187.5	301.7																1	1		
187.7	302.0																1		7	3
188.2	302.8														1	2	7	1	3	1
190.0	305.7										1								1	1
190.1	305.9									1							2	5	3	
190.2	306.0																			2
190.7	306.8																		3	
190.8	307.0		1	5		2	5	1				1		4	2	5	18	28	6	17
191.0	307.3																		2	2
191.1	307.5																			1
191.7	308.4	2	2	4											1		3	10	11	6
193.0	310.5																	28	18	
193.2	310.9																		1	

Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
193.4	311.2				5	2				2		2	1	4				5	3	
193.6	311.5																6	1	9	3
193.7	311.7		4					6	1	2	1		2	3		5	8	8		9
193.8	311.8								1	1	1				1	2	1	1		1
194.0	312.1		2			3			1	2	4	2	6	14	11	11	22	26	20	21
194.1	312.3			2		2					5						1		1	1
194.4	312.8																	1	5	
196.0	315.4			3						2				1	6	10	20	23	34	29
196.2	315.7		1																25	
198.2	318.9											2		1	17	14	36	33	13	17
198.8	319.9		5		3	2	7	3		6	1	6		4	15	17	21	25	39	31
199.4	320.8								1			5			2	1	2			
201.0	323.4																			4
201.1	323.6														1	1	2	3	6	
203.1	326.8													10				1	10	
204.1	328.4		1																	
205.3	330.3							3			1			3	6	2		11	17	12
205.4	330.5		1									2				4		2	4	5
205.7	331.0																		2	
206.4	332.1		1	4			1	2	1		2			2	4		2	2	10	15
206.6	332.4														2	1		1	5	2
207.5	333.9																			1
207.7	334.2														2			3	3	
207.8	334.4			1								3	2		5			1	3	4
207.9	334.5			2																
208.0	334.7				1						2	9	5	13	36	17	26	37	62	46
208.1	334.8																	1		
208.3	335.2														4					
209.1	336.4														1			1		
209.7	337.4		1												1			2		

Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
210.8	339.2																		1	
211.9	340.9								2				11	10	6	14	25	30	28	
212.2	341.4									2			17	24	28	37	37	34		
212.3	341.6													2	3	9	9	4	4	
213.3	343.2				2							1			1	6	9	12		
213.5	343.5											1			2	1	2	4	6	5
213.7	343.8					1		2					4	1	1	6	7	1	13	
213.9	344.2																			2
214.5	345.1								1							1	4	3	7	
214.7	345.5		2																	
215.4	346.6												1	2				3	3	
216.1	347.7									1			3	1	2	6	4	6	9	
216.9	349.0													4	5	7	21	23	30	
217.3	349.6							1	3		1		4	24	6	13	22	42	36	
217.8	350.4				1													2		
218.2	351.1		1																	
218.5	351.6													3	3		16	11	10	
218.6	351.7													1						
218.7	351.9										4	7	4	12	5	15	17	20	13	
219.0	352.4										3	2	4	5	6	3	11	7	12	
219.3	352.9			2				1		3		2	3	6	8	5	7	13	12	13
220.7	355.1																	4	1	
221.0	355.6																			
221.5	356.4																1			
222.3	357.7																	2		
222.7	358.3				1									6		1		8	14	
222.8	358.5	2	3												5					
222.9	358.6				3				3	1				9		4	20	19	21	
223.2	359.1									3	3			3			1			
223.7	359.9			1																

Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
224.7	361.5												3					12	12	
225.0	362.0													2			2		1	
225.1	362.2													3			1	3		
226.7	364.8													2						
228.0	366.9													2				1		
231.3	372.2																1	1	2	
235.0	378.1																		9	
235.1	378.3									1			1	2	3	8	21	66		
235.7	379.2		4		3				5	2	7	1	4	11	16	16	22	16	23	
236.0	379.7	1	1	2	1									2	1			2	2	
236.1	379.9														1	1	1		2	
236.7	380.9		1																	
237.0	381.3							5	3	1		2	8	6	13	14	26	20	24	
238.1	383.1																		1	
238.3	383.4													1	1		2	1		
238.6	383.9		2		2					1				4	4	8	13	23	16	
239.4	385.2																	6		
240.4	386.8																		15	
240.5	387.0		6								1		2	8	1	3	11	11	36	
240.7	387.3				3						1	1	4	7	11	13	21	24		
241.0	387.8								6								4	5	8	
242.8	390.7												1			4	4	9	13	
243.0	391.0													2					10	
243.3	391.5		1		1											4				
243.5	391.8											2		1			5		13	
243.8	392.3																	2	2	
244.0	392.6													2			12		8	
244.3	393.1																2			
244.5	393.4																		25	
244.6	393.6				1	2								1	2	9	13	31		

Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
244.7	393.7																		2	1	
245.2	394.5																				1
245.3	394.7														1		1		9	7	
245.7	395.3									2									2	6	
245.8	395.5													2		1	4	6	9		
246.5	396.6			1																	
247.5	398.2																	4	2		
		7	66	64	58	37	51	47	127	67	65	104	58	185	373	346	709	1,113	1,512	1,218	

Appendix 3

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
148.0	238.1																	5			
148.3	238.6					1													1		
148.5	238.9															5	4	37	22	67	
148.8	239.4				1																
148.9	239.6																	2	4		
149.1	239.9				1		2		1				2	1			2				
149.2	240.1																4	13	15		
149.4	240.4																		1	9	
149.6	240.7																			2	
150.0	241.4																	1			
151.5	243.8								2								5		4	3	
151.9	244.4			1						3	4	8		1			7	31	26		
152.1	244.7															1		6			
152.3	245.1	13	15	23	16			7	3	5		3	12	3	20	21	52	23	19	46	
152.4	245.2																			2	
152.8	245.9																			1	
153.2	246.5																	4	1	5	
155.0	249.4																			15	
155.2	249.7																	1			
155.9	250.8																			11	
156.4	251.6																	18		10	
156.6	252.0																	28			
156.8	252.3															1	3				
156.9	252.5				1																
157.2	252.9					1															
157.4	253.3	2																			
157.6	253.6												1	3					1	2	1
158.0	254.2																1	2	13	55	
159.3	256.3																1		1		

Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
159.5	256.6																1		2	
159.7	257.0							3										3	1	1
160.5	258.2																1		2	
160.8	258.7															1				
161.0	259.0							7	11		3		7	9	1	7	12	11	20	16
161.8	260.3																1			
162.4	261.3			2	1	2	20	11	1			2			1	4	56	33	2	27
163.0	262.3		3																	
163.3	262.7					2														
163.7	263.4																		24	14
164.4	264.5		2																	
164.7	265.0				2	1				1			1				19	12	25	28
165.2	265.8			5						2	3						5			
165.3	266.0									2				1				7	19	27
165.5	266.3		4																	
165.7	266.6																38	52	117	73
165.9	266.9		2	14			1	3	9			3		2	5					
166.2	267.4																		1	1
166.4	267.7																		9	
166.6	268.1						6		21					6		1			1	8
167.9	270.2																		1	
168.1	270.5																		1	
168.6	271.3																		1	8
168.7	271.4							5	6	3						7	47	90	72	
169.7	273.0				1						1	1						11	31	23
169.9	273.4																		1	
171.9	276.6																			1
172.5	277.6		1									3		4	1	1	18	11	1	11

Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
173.9	279.8		1												1	1		2	9	
175.2	281.9															2				
175.7	282.7																1	1		
175.9	283.0																		4	
176.5	284.0									1					2	1		2		
176.7	284.3																		7	
177.9	286.2																		1	
178.3	286.9								1							3			10	
178.5	287.2														2			38	1	
178.9	287.9				1				1				2	7	13		18	10	11	
179.5	288.8																		6	
179.6	289.0							6	13	21	32	5	16	40	56	72	92	110	99	
181.7	292.4													1	1	1	3	9	15	
182.3	293.3																	8		
183.1	294.6													2			4		2	
183.4	295.1																	1	8	
183.5	295.3																	11	9	
184.7	297.2																	6	1	
186.7	300.4																3			
187.5	301.7															1	1			
187.7	302.0															1		7	3	
188.2	302.8													1	2	7	1	3	2	
190.0	305.7									1								1	1	
190.1	305.9								1							2	5	3		
190.2	306.0																		2	
190.7	306.8																	3		
190.8	307.0		1	5		2	5	1			1		4	2	5	18	28	6	17	
191.0	307.3																	2	2	

Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
191.1	307.5																			1
191.7	308.4	2	2	4										1		3	10	11	6	
193.0	310.5																28	18	22	
193.2	310.9																	1		
193.4	311.2				5	2			2		2	1	4				5	3	1	
193.6	311.5															6	1	9	6	
193.7	311.7		4					6	1	2	1		2	3		5	8	8		11
193.8	311.8								1	1	1				1	2	1	1		3
194.0	312.1		2			3			1	2	4	2	6	14	11	11	22	26	20	21
194.1	312.3			2		2				5							1		1	6
194.4	312.8																	1	5	23
196.0	315.4			3						2				1	6	10	20	23	34	29
196.2	315.7		1																25	
198.2	318.9										2		1	17	14	36	33	13	35	
198.8	319.9		5		3	2	7	3		6	1	6	4	15	17	21	25	39	43	
199.4	320.8								1		5				2	1	2			1
201.0	323.4																			4
201.1	323.6														1	1	2	3	6	
203.1	326.8												10					1	10	
204.1	328.4		1																	
205.3	330.3							3			1			3	6	2		11	17	12
205.4	330.5		1									2				4		2	4	5
205.7	331.0																		2	
206.4	332.1		1	4			1	2	1		2			2	4		2	2	10	15
206.6	332.4														2	1		1	5	2
207.5	333.9																			1
207.7	334.2														2			3	3	
207.8	334.4			1							3	2			5			1	3	4

Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
207.9	334.5			2																
208.0	334.7				1					2	9	5	13	36	17	26	37	62	51	
208.1	334.8																1			
208.3	335.2													4						
209.1	336.4													1			1			
209.7	337.4		1											1			2			
210.8	339.2																		1	
211.9	340.9								2				11	10	6	14	25	30	28	
212.2	341.4									2			17	24	28	37	37	34	27	
212.3	341.6													2	3	9	9	4	12	
213.3	343.2				2						1				1	6	9	12	6	
213.5	343.5										1			2	1	2	4	6	5	
213.7	343.8					1		2					4	1	1	6	7	1	13	
213.9	344.2																		2	
214.5	345.1								1							1	4	3	7	
214.7	345.5		2																	
215.4	346.6												1	2				3	3	
216.1	347.7								1				3	1	2	6	4	6	9	
216.9	349.0													4	5	7	21	23	53	
217.3	349.6							1	3		1		4	24	6	13	22	42	36	
217.8	350.4				1													2		
218.2	351.1		1																	
218.5	351.6													3	3		16	11	47	
218.6	351.7													1						
218.7	351.9									4	7		4	12	5	15	17	20	16	
219.0	352.4									3	2		4	5	6	3	11	7	12	
219.3	352.9			2				1		3		2	3	6	8	5	7	13	12	17
220.7	355.1																		4	1

Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
221.0	355.6																	1		
221.5	356.4																1			
222.3	357.7																	2		6
222.7	358.3				1									6		1		8	14	
222.8	358.5	2	3												5				2	
222.9	358.6				3			3	1					9		4	20	19	21	
223.2	359.1								3	3				3			1			
223.7	359.9			1																
224.7	361.5												3					12	15	
225.0	362.0													2			2		1	
225.1	362.2													3			1	3		
226.7	364.8													2						
228.0	366.9													2				1		
228.7	368.0																			3
231.3	372.2																	1	1	2
235.0	378.1																			57
235.1	378.3									1			1	2	3	8	21	66		
235.7	379.2		4		3				5	2	7	1	4	11	16	16	22	16	25	
236.0	379.7	1	1	2	1									2	1			2	3	
236.1	379.9														1	1	1		2	
236.3	380.2																			1
236.7	380.9		1																	
237.0	381.3							5	3	1		2	8	6	13	14	26	20	26	
238.1	383.1																			1
238.3	383.4													1	1		2	1		
238.6	383.9		2		2					1				4	4	8	13	23	16	
239.4	385.2																	6		
240.4	386.8																			15

Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2004). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																		
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
240.5	387.0		6								1		2	8	1	3	11	11	36	
240.7	387.3				3		6				1	1	4	7	11	13	21	24		
241.0	387.8											1				4	5	8	8	
242.8	390.7												1		4	4	9	13	21	
243.0	391.0													2						
243.3	391.5		1		1										4					
243.5	391.8										2		1			5		13	12	
243.8	392.3																	2	2	
244.0	392.6													2			12		8	
244.3	393.1																2			
244.5	393.4																		25	
244.6	393.6				1	2								1	2	9	13	31		
244.7	393.7																	2	1	
245.2	394.5																		1	
245.3	394.7													1		1		9	7	
245.7	395.3									2								2	6	
245.8	395.5													2		1	4	6	9	
246.5	396.6			1																
247.5	398.2																	4	2	
		7	66	64	58	37	51	47	127	67	65	104	58	185	373	346	709	1,113	1,512	1,709

Appendix 4

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988-2004). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2004.

RM	RK	Year																
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
4.0	6.4		1						1									
6.2	10.0								5									
6.7	10.8														2			
7.2	11.6														2			
7.8	12.6														7	6		
8.0	12.8											1						
8.1	13.0	9				1	2	6	6			1						
8.8	14.2														1	5		
10.6	17.1			1														
11.8	19.0						1											
13.9	22.4		4	3							1		2	8	12			7
16.2	26.1															1		
17.4	28.0										1	2	1			2		
18.0	29.0	4	3		1						1	2	15	2	18	22	36	45
18.6	29.9										1						6	
18.9	30.4												1					
19.0	30.6						2											
19.1	30.7												3		6	17	8	7
19.4	31.2										1	4	5					31
19.5	31.4													7	14	1	11	1
20.0	32.2		2						4	6	1							
21.7	34.9														2	1	7	3
21.8	35.0																	
22.0	35.4	8				21	9	18	5	24	16	25	62	77	60	110	107	119
22.2	35.7																49	22
23.0	37.0				3										29			
23.3	37.5															9	3	18
23.4	37.7										1							
24.0	38.6														1			7
25.5	41.0															1	5	
26.3	42.3																2	

Appendix 4 (Continued)

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988-2004). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2004.

RM	RK	Year																
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
26.5	42.6													3	2	20	4	18
26.8	43.1											1						
27.6	44.4										2					15	7	6
28.0	45.1							1								48	20	
28.4	45.7									11	1	26	1					20
30.1	48.4															3	5	35
31.5	50.7													3	28	3	37	
31.7	51.0								4		6						37	
32.5	52.3											23	13	19	11			20
32.8	52.8														4			
33.6	54.0							13										
33.8	54.4												6					
34.0	54.7									9	4	9	2	13	42	20	15	
34.2	55.0									10								
35.0	56.3								3	6	7							
35.4	56.9											2	9	47	41	53	50	
35.7	57.5											3		1	7	7		
36.2	58.2									6	11	3	11		7	4	10	
36.7	59.0							1										
37.9	61.0													1	8	1	1	
39.1	62.9															1	9	
39.5	63.6									1	9	1		4	2	1		
40.3	64.8					1	11	4	1	11	1	10	21	22	46	109	147	111
40.6	65.3													3				
43.2	69.5														1	1		
45.0	72.4												3	9	2	2	10	
49.2	79.2												1				3	
49.4	79.5															1		
49.8	80.1																	1
51.2	82.4																	3
51.5	82.9																	5

Appendix 4 (Continued)

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988-2004). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2004.

RM	RK	Year																
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
51.7	83.2												3					
52.0	83.7					1									3			
52.8	85.0																3	2
53.4	85.9											2						
53.8	86.6																	12
57.2	92.0																9	
61.0	98.1												1					
62.4	100.4																	1
66.0	106.2														4	1		
70.2	113.0																	2
		21	10	4	4	26	36	30	20	66	58	78	181	172	306	524	563	628

Appendix 5

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2004). An empty cell indicates no redds were observed at the corresponding site and year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2004.

RM	RK	Year												
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
0.1	0.2										12		2	1
0.5	0.8												2	
0.7	1.1									22				
0.8	1.3										2			
1.0	1.6									2		4		2
1.2	1.9									2				
1.9	3.1									3	8			
2.0	3.2									2				30
2.1	3.4		2										2	
2.2	3.5									4				
2.4	3.9													2
3.0	4.8							1		1	1			
3.2	5.1	1	1				1	1		7	5	2		3
3.3	5.3													1
3.5	5.6											1		
3.6	5.8				2	2				1	14	3	4	31
4.3	6.9													4
4.4	7.1	2	4				1	3	1	1	1	9	6	2
4.5	7.2									2	1	3		
4.6	7.4		2			1				7		1		1
5.5	8.8									8				1
6.2	10.0									4				
6.5	10.5											1		
6.8	10.9									1				
7.9	12.7									1				
8.2	13.2										1	1		
8.5	13.7									7				
8.9	14.3											1		
9.2	14.8									6				1
9.6	15.4						1							
10.0	16.1											2		3
10.4	16.7											6		
10.5	16.9		5	1		6	7	2		9	6			13
11.0	17.7												1	
11.4	18.3													1
11.6	18.7		2									1		
11.7	18.8									3		2		2
12.0	19.3									2				
12.5	20.1									12	4	4		3
12.6	20.3		2				6	5		6				2

Appendix 5 (Continued)

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2004). An empty cell indicates no redds were observed at the site in the corresponding year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2004.

RM	RK	Year												
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
12.7	20.4		2							3				
13.2	21.2		3			1								
13.4	21.6													3
13.8	22.2		7		4					1	2	3		8
13.9	22.4										2			
14.2	22.8													2
14.3	23.0													4
15.0	24.1												1	
16.3	26.2												1	2
16.8	27.0										1			
17.0	27.4			1										
17.6	28.3		2	3	5		9			10	13	5		6
18.0	29.0						4						6	
18.6	29.9	1												
19.1	30.7									1	3			
19.2	30.9						3				2	2		
19.5	31.4							2						
20.0	32.2						4	5		2			1	
21.0	33.8									3			1	
21.5	34.6												2	
22.0	35.4									1				
22.1	35.6													1
22.2	35.7													1
24.0	38.6													2
24.4	39.3													1
25.6	41.2		4											
26.4	42.5			7						1			1	
26.7	43.0													1
26.9	43.3												5	
27.1	43.6									2				
27.3	43.9									2			2	
27.9	44.9					3			6					1
29.1	46.8											2	1	5
29.3	47.1											1		
29.7	47.8											3		
29.8	47.9											1		
31.1	50.0											3		1
32.2	51.8			1			1							

Appendix 5 (Continued)

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2004). An empty cell indicates no redds were observed at the site in the corresponding year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2004.

RM	RK	Year												
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
32.7	52.6						4							
33.1	53.3										1			
33.3	53.6	1		1		1	2	3		10	7	3		
34.0	54.7		2											
36.4	58.6						1							
37.5	60.3									2				
37.6	60.5		2		1			2	2	2	4	4	4	
37.8	60.8		7	1			3					2		
39.0	62.8									3				
39.1	62.9						1							
41.3	66.5						2							
41.7	67.1		1											
41.8	67.3					1								
42.5	68.4											1		
43.2	69.5		1		3			2		11	8	1	1	
44.5	71.6										2		4	
44.9	72.2								4		2	4	5	
45.7	73.5										4		4	
45.9	73.9					4								
46.5	74.8				2									
47.5	76.4						1	4						
47.8	76.9									2		10		
48.7	78.4													2
49.3	79.3									3	1			1
50.5	81.3						4							
51.5	82.9				1	1								
		5	49	15	18	20	55	24	13	8	197	111	93	162

Appendix 6

Fall Chinook salmon redds counted in the Salmon River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2004). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 87 in 1992, 97 in 1993, 134 in 1994, 105 in 1995, 87 in 1996, 134 in 1997, 105 in 1998, 96 in 1999 and 2000, and 105 from 2001 to 2004.

RM	RK	Year												
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
4.0	6.4											1	6	
4.8	7.7									1			1	
5.5	8.8											1		
5.6	9.0											1		
14.2	22.8									1				
15.0	24.1	1						1						
15.3	24.6									2				
15.7	25.3									1				
16.0	25.7				1	1								
20.3	32.7											1		
20.6	33.1											2		
24.4	39.3												1	
26.1	42.0				1									
26.5	42.6									1				
30.9	49.7											5	8	
31.1	50.0		1					1				1	1	
31.4	50.5									1				
35.0	56.3							1						
35.7	57.4										11		1	
45.2	72.7										3			
48.8	78.5									3				
56.7	91.2									1				
62.0	99.8									3	8			
63.9	102.8										2	2		
65.0	104.6									2				
65.4	105.2							1			2			
65.7	105.7									2	3			
65.8	105.9									1				
68.5	110.2											2		
70.5	113.4									1				
70.6	113.6									1				
82.2	132.3												1	
85.0	136.8									1				
87.0	140.0			1										
91.0	146.4											1		
88.0	141.6										2			
90.7	146.0		2											
100.7	162.0											1		
110.0	177.0												2	
		1	3	1	2	1	1	3	0	0	22	31	18	21

Appendix 7

Fall Chinook salmon redds counted in the Imnaha River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2004). An empty cell indicates no redds were observed at the corresponding site and year. A dash indicates no searches were conducted in the corresponding site and year. Redd searches were also conducted from 1987 to 1991, and in 1999, 2001, and 2003, however, no ground locations were recorded. Redd counts totaled 0 in 1987, one in 1988 and 1989, three in 1990, four in 1991, three in 1992, nine in 1999, 38 in 2001, and 43 in 2003. The maximum upstream RM searched was 4.1, 19, 9.8, 3.8, 3.8, 14, 35, 35, and 19 respectively.

RM	RK	Year											
		1993	1994	1995	1996	1997	1998	-----	2000	-----	2002	-----	2004
0.2	0.3										3		
0.3	0.5										7		
0.4	0.6										3		3
0.5	0.8	1		1	2	1	1		1				4
0.6	1.0										2		
0.6	1.0	1			1		2		2				
0.9	1.4										2		
1.0	1.6					2	1						2
1.2	1.9						1						1
1.3	2.1										1		1
1.4	2.3						1						
1.5	2.4										3		
1.6	2.6										3		
1.7	2.7										2		
1.8	2.9			2							1		
2.0	3.2										2		
2.3	3.7										1		
2.4	3.9						2		2		7		2
2.5	4.0										9		
2.7	4.3										2		2
2.8	4.5												1
2.9	4.7										1		
3.0	4.8								2				
3.4	5.5						1				2		
3.7	6.0	2									1		
3.8	6.1												1
4.1	6.6			1							1		
4.4	7.1												1
5.4	8.7	-	-		-						1		
6.0	9.7	-	-		-								1
6.5	10.5	-	-		-				1				2
7.0	11.3	-	-		-								1

Appendix 7 (Continued)

Fall Chinook salmon redds counted in the Imnaha River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2004). An empty cell indicates no redds were observed at the corresponding site and year. A dash indicates no searches were conducted in the corresponding site and year. Redd searches were also conducted from 1987 to 1991, and in 1999, 2001, and 2003, however, no ground locations were recorded. Redd counts totaled 0 in 1987, one in 1988 and 1989, three in 1990, four in 1991, three in 1992, nine in 1999, 38 in 2001, and 43 in 2003. The maximum upstream RM searched was 4.1, 19, 9.8, 3.8, 3.8, 14, 35, 35, and 19 respectively.

RM	RK	Year											
		1993	1994	1995	1996	1997	1998	-----	2000	-----	2002	-----	2004
7.1	11.4	-	-		-						10		
7.8	12.6	-	-		-								9
8.2	13.2	-	-		-								1
8.9	14.3	-	-		-								1
9.3	15.0	-	-		-								1
9.9	15.9	-	-		-					1			
10.0	16.1	-	-		-		2		1				
12.0	19.3	-	-		-		1						
12.8	20.6	-	-		-					1			
13.0	20.9	-	-		-		1			1			
13.4	21.6	-	-		-					2			
13.5	21.7	-	-		-					1			
14.3	23.0	-	-		-								1
18.2	29.3	-	-		-					1			
20.7	33.3	-	-		-					1			
		4	0	4	3	3	13		9		72		35