WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Fish Program: Science Division

Supplementation Research Team

3515 Chelan Hwy. 97A, Wenatchee, WA 98801 Phone (509) 664-3149 FAX (509) 662-6606

January 19, 2006

To: HCP Hatchery Committee

From: Todd Miller

Cc: Distribution List

Subject: 2005 Upper Columbia River Summer Chinook Spawning Ground Surveys

Summer Chinook salmon spawning ground surveys in the Methow and Okanogan river basins began in 1956. Spawning survey methodology has ranged from aerial peak counts to comprehensive total ground counts initiated in 1990. The Washington Department of Fish and Wildlife Supplementation Research Team (SRT) has been conducting spawning ground surveys in tributaries above Wells Dam and in the Chelan River since 1998. The objectives of the surveys were to 1) enumerate the total number of summer Chinook redds in the Okanogan and Methow River Basins; 2) collect biological data (e.g., scales, length, egg retention, location) from wild and hatchery summer Chinook carcasses; and 3) recover CWTs from hatchery carcasses.

Methods

Spawning ground surveys were conducted by raft or foot within historical spawning survey reaches (Appendix A). Weekly aerial surveys were conducted on the Okanogan and Similkameen rivers to delineate specific areas for subsequent ground surveys. In low density spawning areas, redds were individually flagged and numbered sequentially. Areas of localized mass spawning were mapped and redds were plotted and numbered sequentially.

All summer Chinook carcasses found during surveys were examined and sampled. Biological information collected from carcasses included recovery reach location, sex, fork length, post orbital to hypural plate (POH) length, scales, and number of eggs retained by females. Snouts were collected from all adipose fin-clipped and fish of unknown origin. Carcass surveys were conducted during and after spawning had ended to ensure a representative sample of the spawning population was collected. Efforts were made to ensure the number of carcasses sampled within a reach were in similar proportion to the number of redds within the reach with a target of sampling 20% of the estimated population. Stock structure (i.e., length at age and age composition) and coded wire tag information from carcasses will be reported in a future document when the data becomes available.

Spawning escapement estimates were calculated using the total ground redd counts multiplied by

the male-to-female ratio of all fish trapped (collected and released) during the collection of the Methow/Okanogan hatchery broodstock at the east ladder trap of Wells Dam. We assumed the male-to-female ratio was equal to that of the naturally spawning population and females only constructed one redd. During broodstock trapping at the East ladder of Wells Dam 581 male and 301 female summer Chinook were either collected for broodstock or passed upstream between July 5 and September 9, 2005. The sex ratio of the summer Chinook population (1.93 males: 1 female) or 2.93 fish per redd was used as the redd expansion factor the Methow and Okanogan populations (M. Tonseth, WDFW, personal communication).

Results and Discussion

Methow River

No spawning activity was observed the week of 25 September. However, the following week spawning activity was observed in all reaches (Figure 1). Redd construction peaked the week of 16 October. Historically, spawning begins in the upper reaches and proceeds to the lower reaches as the season progresses. This year spawning began at approximately the same time throughout the entire river. After spawning had ended in the middle and upper reaches (M3-M7) no further surveys were conducted. A total of 874 redds were enumerated during spawning ground surveys on the Methow River (Figure 2). The 2005 total redd count was 89.8% of the 2004 redd count (Table 1; Appendix B).



Figure 1. The number of summer Chinook redds found in the Methow River in 2005 and the seven-year average (1998-2004).

Table 1. The number of summer Chinook redds located during spawning ground surveys in the

Methow	River in	2005	
WIEUIO W	KIVEI III	2005.	



Figure 2. Methow summer Chinook redd distribution in 2005 and the seven-year average (1998-2004).

During spawning ground surveys, 669 salmon carcasses were sampled (Figure 3). Of all carcasses sampled, adipose fin-clipped fish comprised 32.7% (N = 219). In 2005, a greater proportion of the hatchery fish were recovered in the lower reaches compared to wild summer Chinook. After CWTs are decoded, an analysis of the spawning distribution of hatchery and wild Methow summer Chinook could be preformed using only Methow hatchery summer Chinook (i.e., just comparing the Carlton Program and removing the influence of the other hatchery fish).

A total of 215 female carcasses retained intact body cavities and were examined for egg voidance. The mean (SD) egg voidance was 99.7 (1.2)%. An additional 11 females (4.3%) were sampled that had died before spawning. Male carcass recoveries comprised 62.0% (N = 415) of the total carcasses sampled.

The estimated Methow River summer Chinook spawning escapement was 2,561 fish (874 redds x 2.93 fish/redd). The 2005 spawning escapement increased 115.9% compared to spawning escapement in 2004.



Figure 3. Methow River summer Chinook carcass and redd distribution in 2005.

Okanogan River

Spawning activity began the week of 2 October and peaked the week of 9 October (Figure 4). In 2005, peak spawning occurred in three reaches during the same week. The number of redds counted during spawning ground surveys was 1,611 (Table 2). Redd counts in 2005 increased 21.4% from the 2004 total count of 1,327 redds. The peak aerial count was 67.3% (N =1,084) of total ground counts (Appendix B). Only 6 redds (0.4%) were identified during aerial counts that were not verified and enumerated by ground crews. The majority of redds (83.8%) were found in the upper reaches (Figure 5).



Figure 4. The number of summer Chinook redds found in the Okanogan River in 2005 and the seven-year average (1998-2004).

a	Historical reach (river kilometer)						T 1
Survey Week	O1 (0.0-27.2)	O2 (27.2-41.9)	O3 (41.9-49.4)	O4 (49.4-65.4)	O5 (65.4-91.4)	O6 (91.4-129.6)	redds
10/02			3		69	156	228
10/09			89	37	461	402	989
10/16	0	10	38	12	91	120	271
10/23	0	2	42	6	44	4	98
10/30	0	1	11	3	2	0	17
11/06		0	2	0	0		2
*11/13			1	4	1		6
Total	0	13	186	62	668	682	1,611

Table 2. Number of summer Chinook redds located within historical reaches during ground surveys on the Okanogan River in 2005.

* Aerial surveys counts



Figure 5. Okanogan summer Chinook redd distribution in 2005 and the seven year average (1998-2004).

During spawning ground surveys 943 salmon carcasses were sampled. Of the carcasses sampled adipose-fin clipped fish comprised 24.5% (N = 231). A total of 330 female carcasses with intact body cavities were examined for egg voidance. Mean (SD) egg voidance was 99.8 (0.8)%. An

additional twelve females (2.4%) were recovered that had died before spawning. Male carcass recoveries comprised 47.3% (N = 446). A higher proportion of hatchery fish (compared to adipose-present fish) were recovered in the lower reaches, however the greatest majority of hatchery fish spawned in the same areas (O5 and O6) as adipose-present fish (Figure 6).

The estimated summer Chinook spawning escapement in the Okanogan River was 4,720 fish (1,611 redds x 2.93 fish/redd). The 2005 spawning escapement increased 156.7% compared to the spawning escapement in 2004.



Figure 6. Okanogan River summer Chinook carcass and redd distribution in 2005.

Similkameen River

Spawning activity began the week of 2 October with peak spawning occurring the week of 9 October (Figure 7). In 2005, the number of redds enumerated in the Similkameen River was 1,423. The 2005 total redd count was 14.3% less than the 1,660 redds counted in 2004 (Table 3). The peak aerial count was 78.1% (N = 1,111) of total ground counts (Appendix B). Aerial counts were very difficult to accurately enumerate due to water clarity and the high density of redds. The majority of redds (84.4%) were found in the lowest reach of the Similkameen River (Figure 8).



Figure 7. The number of summer Chinook redds found in the Similkameen River in 2005 and the seven year average (1998-2004).

	Historical reach (river kilometer)				
Survey week	S1 (0.0-2.9)	S2 (2.9-9.1)	Total redds		
10/02	282	62	344		
10/09	761	142	903		
10/16	151	18	169		
10/23	7	0	7		
10/30	0	0	0		
11/06					
11/13	0	0	0		
Total	1,201	222	1,423		

Table 3. The number of summer Chinook redds located within historical reaches during spawning ground surveys on the Similkameen River in 2005.



Figure 8. Similkameen River summer Chinook redd distribution in 2005 and the seven year average (1998-2004).

During spawning ground surveys, 1,005 salmon carcasses were sampled (Figure 9). Of the carcasses sampled, adipose-fin clipped fish comprised 28.1% (N = 282). A total of 508 female carcasses with intact body cavities were examined for egg voidance. Mean (SD) egg voidance was 99.6 (1.1)%. An additional eleven females (1.8%) were recovered that had died before spawning. Male carcass recoveries comprised 37.7% (N = 379) of the total carcasses sampled. No difference in the spatial distribution of hatchery and adipose present fish was found.

The estimated summer Chinook spawning escapement in the Similkameen River was 4,169 fish (1,423 redds x 2.93 fish/redd). The 2005 estimated spawning escapement increased 110.6% from 2004.



Figure 9. Similkameen River summer Chinook carcass and redd distribution in 2005.

Columbia River

No redds were counted during aerial surveys conducted above Wells Dam to the mouth of the Okanogan. No aerial surveys were conducted upstream of the Okanogan River to Chief Joseph Dam in 2005. A peak aerial count of 27 redds were observed on the west bank immediately below Wells Dam during the second week of November. Many redds were constructed in deep water and difficult to enumerate. The actual number of redds is unknown and thought to be higher. No attempt was made to recover carcasses.

A total of 179 redds were found during spawning ground surveys in the lower 0.5 km of the Chelan River and the Columbia River in the vicinity of confluence of the Chelan River. The peak aerial count was 24.6% (44 redds) of the total ground count.

During spawning ground surveys 103 salmon carcasses were sampled in the Chelan River. Of the carcasses sampled, adipose fin-clipped fish comprised 57.3% (N = 59). Based on historical coded wire tag recoveries, it is likely that most adipose fin-clipped fish are from Wells and Turtle Rock Fish Hatchery releases. A total of 38 female carcasses with intact body cavities were examined for egg voidance. Mean (SD) egg voidance was 98.5 (2.2)%. An additional 30 females (40.5%) were recovered that had died prior to spawning. Male carcass recoveries comprised 28.2% (N = 29) of the total carcasses sampled.

The estimated summer Chinook spawning escapement for the Chelan River and vicinity was 524 fish (179 redds x 2.93 fish/redd). The 2005 estimated spawning escapement was similar as that calculated in 2004 (N = 420).

River/Reach	Code	River Mile
Methow River		
Mouth to Methow Bridge	M1	0.0 - 14.8
Methow Bridge to Carlton Bridge	M2	14.8 - 27.2
Carlton Bridge to Twisp Bridge	M3	27.2 - 39.6
Twisp Bridge to MVID	M 4	39.6 - 44.9
MVID to Winthrop Bridge	M5	44.9 - 49.8
Winthrop bridge to Hatchery Diversion	M6	49.8 - 51.6
Okanogan River		
Mouth to Mallot Bridge	O1	0.0 - 16.9
Mallot Bridge to Okanogan Bridge	O2	16.9 - 26.1
Okanogan Bridge to Omak Bridge	O3	26.1 - 30.7
Omak Bridge to Riverside Bridge	O4	30.7 - 40.7
River side Bridge to Tonasket Bridge	O5	40.7 - 56.8
Tonasket Bridge to Zoesel Dam	O6	56.8 - 77.4
Similkameen River		
Mouth to Oroville Bridge	S 1	0.0 - 5.0
Oroville Bridge to Enloe Dam	S 2	5.0 - 8.9

Appendix A. Historical river reach descriptions used during summer Chinook spawning ground surveys.

Vear	Methow		Okanogan		Similkameen	
	Aerial	Ground	Aerial	Ground	Aerial	Ground
1956	109		37		30	
1957	451		53		30	
1958	335		94		31	
1959	130		50		23	
1960	194		29			
1961	120					
1962	678				17	
1963	298		9		51	
1964	795		112		67	
1965	562		109		154	
1966	1,275		389		77	
1967	733		149		107	
1968	659		232		83	
1969	329		103		357	
1970	705		656		210	
1971	562		310		55	
1972	325		182		64	
1973	366		138		130	
1974	223		112		201	
1975	432		273		184	
1976	191		107		139	
1977	365		276		268	
1978	507		195		268	
1979	622		173		138	
1980	345		118		172	
1981	195		55		121	
1982	142		23		56	
1983	65		36		57	
1984	162		235		301	
1985	164		138		309	
1986	169		197		300	

Appendix B. Peak number of summer Chinook salmon redds counted during spawning ground surveys on the Methow, Okanogan, and Similkameen rivers. Total ground counts are in italics when available

Veer	Methow		Okanogan		Similkan	Similkameen	
rear	Aerial	Ground	Aerial	Ground	Aerial	Ground	
1987	211		201		164		
1988	123		113		191		
1989	126		134		221	370	
1990	229		88	47	94	147	
1991		153	55	64	68	91	
1992		107	35	53	48	57	
1993		154	144	162	152	288	
1994		310	372	375	463	777	
1995		357	260	267	337	616	
1996		181	100	116	252	419	
1997		205	149	158	297	486	
1998		225	75	88	238	276	
1999		448	222	369	903	1,275	
2000		500	384	549	549	<i>993</i>	
2001		675	883	1,108	865	1,540	
2002		2,013	1,958	2,667	$2,000^{a}$	3,358	
2003		1,624	1,099	1,035	103	378	
2004		<i>973</i>	1,310	1,327	2,127	1,660	
2005		874	1,084	1,611	1,111	1,423	

^a Unable to accurately count due to superimposition of redds.