

Run Size Forecast for Klickitat River Adult Spring Chinook, 2009

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Summary

For 2008 the forecast was for a return of 1,100 adult (age-4 and age-5) spring Chinook to the Klickitat River. The actual return in 2008 was estimated to be about 1,000 age-4 and age-5 spring Chinook, with about 63% of the return estimated to be of Klickitat Hatchery origin.

Regressions for the years 1990-2004 (excluding 2001) were used to project 2009 returns of age-4 and age-5 spring Chinook from 2008 returns of 463 age-3 and 815 age-4 fish, respectively. **This method projects a 2009 return of approximately 2000 adult spring Chinook to the Klickitat River including about 1700 age-4 and 300 age-5 fish.** We also reviewed 1984-2004, 1994-2004, and 1990-2000, and 1990-2004 cohort ratio and regression forecast data as possible predictors. Table 1 gives the forecasts from these various methods with the 1990-2004 (excluding 2001) regression forecast highlighted in **bold**. Relatively high jack numbers are resulting in a higher forecast as compared to the last few years.

Table 1. 2009 Klickitat River Spring Chinook Predictors

	'84-04	R ²	'94-04	R ²	'90-00	R ²	'90-00 & '02-04	R ²	'90-04	R ²
<u>Age-4</u>										
Ratio	2397		1944		2124		2246		2143	
Regression	1596	0.16	1485	0.52	1688	0.76	1706	0.75	1482	0.57
<u>Age-5</u>										
Ratio	513		327		397		391		381	
Regression	450	0.42	308	0.57	330	0.56	336	0.57	331	0.57
<u>Total</u>										
Ratio	2909		2271		2520		2637		2524	
Regression	2046		1792		2018		2042		1813	

Review of 2008 Klickitat River spring Chinook return

The estimated spring Chinook return to the Klickitat River mouth in 2008 was nearly 1,700 fish including nearly 700 jacks and mini-jacks and about 1,000 adult spring Chinook (Table 2). Harvest was estimated at 110 spring Chinook (35 adults) in the recreational fishery (Table 3) and 620 fish (472 adults) in the tribal ceremonial and subsistence fishery at Lyle Falls (Table 4). Observed age composition from adults sampled at the Lyle Falls adult trap was assumed to apply to the tribal fishery. Escapement to the Klickitat Hatchery was 178 mini-jack, 228 jack, and 331 adult spring Chinook (Table 5). A total of 76 spring Chinook redds were observed in spawning ground surveys in 2008 and the natural spawning escapement was estimated to be 228 fish using an estimate of 3 fish per redd (Table 6). The fish per redd estimate was based on a review of 2002-2004 adult plants and redd observations above Castile Falls as well as a review of 1982-2006 fish per redd data for spring Chinook in the Yakima Basin. Observed age composition for unmarked spring Chinook sampled at the Lyle Falls adult trap was assumed to represent the natural spawner escapement. Jacks (3-year-olds) and mini-jacks (2-year-olds) comprised a substantially higher-than-average percentage of the total return this year.

Finally, Table 7 gives brood year productivity estimates for Klickitat spring Chinook for the years 1984 to present. These are the data used to derive the cohort ratio and regression estimates given in Table 1.

Table 2. Klickitat River spring chinook run by return year.

Return Year	Age					Total	Adult Total	1/
	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>			
1977	*		371				904	533
1978	*		154				1,682	1,528
1979	*		2,921				3,772	851
1980	*		955				2,640	1,685
1981		441	193				3,162	2,528
1982		236	70				3,544	3,238
1983		817	173				3,407	2,417
1984		201	64	489	305	--	1,588	1,323
1985		152	94				1,094	848
1986		204	262				1,578	1,112
1987		341	111				2,134	1,682
1988 2/		143	273	1,819	2,108	2	4,345	3,929
1989 3/		291	508	4,486	762	6	6,053	5,254
1990 4/		795	399	766	1,797	20	3,777	2,583
1991		1,604	246	973	500	4	3,327	1,477
1992		736	131	1,000	527	13	2,407	1,540
1993		923	44	1,640	1,998	64	4,669	3,702
1994		1,935	78	146	790	22	2,971	958
1995		1,476	271	465	193	38	2,443	696
1996		56	113	1,034	117	5	1,325	1,156
1997		540	52	1,147	704	10	2,453	1,861
1998		3,193	148	316	333	53	4,043	702
1999		165	560	523	204	1	1,453	728
2000 5/		3,730	383	2,450	258	0	6,821	2,708
2001 5/		5,648	420	531	586	9	7,194	1,126
2002 5/		3,071	817	2,313	236	0	6,437	2,549
2003 5/		3,863	610	2,769	1,197	0	8,439	3,966
2004 5/		313	852	1,818	1,172	4	4,159	2,994
2005 5/		231	137	1,298	83	47	1,796	1,428
2006 5/		76	140	1,186	408	9	1,819	1,603
2007 5/		30	159	519	559	0	1,267	1,078
2008 5/		203	463	815	215	0	1,695	1,029

1/ Adult totals prior to 1988 include some jacks.

2/ Includes 120 (age 3) Carson stock.

3/ Includes 4,121 (age 4) Carson stock.

4/ Includes 1,088 (age 5) Carson stock.

5/ Preliminary.

Table 3. Klickitat River spring chinook sport harvest by return year.

Return Year	Age					Total	Adult Total	
	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>			
1977		0	0				9	9
1978		0	46				312	266
1979		0	31				120	89
1980		0	5				11	6
1981		0	69				221	152
1982		0	45				477	432
1983		0	156	142	141 *		439	283
1984		0	14	218	109 *		341	327
1985		0	50	99	82 *		231	181
1986		0	4	15	9 *		28	24
1987		0	38	151	9 *		198	160
1988 1/		0	29	104	144 *		277	248
1989 2/		0	97	788	43	0	928	831
1990 3/		0	36	107	247	2	392	356
1991		0	36	98	41	0	175	139
1992		0	0	92	31	0	123	123
1993		0	28	145	138	0	311	283
1994		0	0	0	48	3	51	51
1995		0	13	0	0	0	13	0
1996		0	39	124	19	0	182	143
1997		2	9	142	123	5	281	270
1998		0	7	5	5	4	21	14
1999		0	56	50	26	0	132	76
2000		0	222	360	35	0	617	395
2001		0	82	62	62	0	206	124
2002		0	157	366	7	0	530	373
2003		0	152	532	225	0	909	757
2004		0	239	374	181	0	794	555
2005		0	31	382	0	21	434	403
2006		0	22	189	37	0	248	226
2007		0	6	36	37	0	79	73
2008 4/		25	50	26	9	0	110	35

1/ Includes 12 (age 3) Carson stock.

2/ Includes 769 (age 4) Carson stock.

3/ Includes 204 (age 5) Carson stock.

4/ Preliminary Catch Record Card estimates.

* All 6's included in the 5's column.

Table 4. Klickitat River spring chinook tribal harvest by return year.

Return Year	Age					Total	Adult Total
	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>		
1977						86	86 1/
1978			72			712	640
1979						0	0
1980						61	61 1/
1981			78			500	422
1982						1,343	1,343 1/
1983						1,462	1,462 1/
1984						427	427 1/
1985			35			570	535
1986			61			522	461
1987						347	347 1/
1988 2/	0	85	511	594	0	1,190	1,105
1989 3/	0	85	928	24	0	1,037	952
1990 4/	0	113	436	984	9	1,542	1,429
1991	0	93	396	167	0	657	563
1992	0	25	292	168	4	489	464
1993	0	6	480	692	28	1,206	1,200
1994	0	11	16	159	7	193	182
1995	0	4	94	39	7	144	140
1996	0	24	142	23	0	189	165
1997	0	33	88	76	3	200	167
1998	0	31	53	54	28	166	135
1999	0	55	48	27	0	130	75
2000	0	129	977	74	0	1,180	1,051
2001	0	1	170	170	0	341	340
2002	0	45	407	7	0	459	414
2003	0	12	642	341	0	995	983
2004	0	5	384	187	0	576	571
2005 5/	0	18	381	0	25	424	406
2006 5/	0	20	381	74	0	475	455
2007 5/	0	8	130	134	0	272	264
2008 5/	0	148	367	105	0	620	472

1/ Jacks included.

2/ Includes 38 (age 3) Carson stock.

3/ Includes 763 (age 4) Carson stock.

4/ Includes 563 (age 5) Carson stock.

5/ Preliminary.

Note: Tribal harvest age composition derived from the sport fishery age composition until 2008, when Lyle adult trap age data was used due to mark-selective sport fishery.

Table 5. Klickitat Hatchery spring chinook escapement by return year.

Return Year	Age					Total	Adult Total
	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>		
1977	*		371			983	312
1978	*		36			508	472
1979	*		2,890			3,582	692
1980	*		950			2,505	1,555
1981		441	46			2,196	1,709
1982		236	25			1,611	1,350
1983		817	17			1,443	609
1984		201	50	271	196	0	718
1985		152	9				214
1986		204	197				886
1987		341	75				1,279
1988 1/		143	109	691	776	1	1,720
1989 3/		291	228	2,686	486	4	3,695
1990 5/		795	243	184	388	2	1,612
1991		1,604	113	421	113	0	2,251
1992		736	102	495	140	0	1,473
1993		923	8	945	834	10	2,720
1994		1,935	58	113	506	10	2,622
1995		1,476	221	323	134	27	2,181
1996		56	34	520	51	3	664
1997		538	6	534	294	1	1,373
1998		3,193	62	146	155	12	3,568
1999		165	355	337	120	1	978
2000		3,530	22	671	75	0	4,298
2001		5,648	311	204	146	0	6,309
2002 6/		3,071	432	828	36	0	4,367
2003 7/		3,863	268	799	285	0	5,215
2004 7/		313	473	595	453	3	1,837
2005 8/		231	88	454	39	1	813
2006 8/		76	94	475	205	0	850
2007 8/		30	129	278	167	0	604
2008 8/		178	228	279	52	0	737

1/ Includes 65 (age 3) Carson stock.

2/ Includes 73 adults and 2 jacks of Klickitat stock and 3 jacks of Carson stock distributed to YIN.

3/ Includes 2,559 (age 4) Carson stock.

4/ Includes 39 adult males and 44 jacks of Klickitat stock and 1,001 (age 4) of Carson stock distributed to YIN.

5/ Includes 321 (age 5) Carson stock.

6/ Excludes 165 males, 275 females, and 170 jacks released above Castille Falls.

7/ Excludes 122 males, 440 females, and 98 jacks released above Castille Falls.

8/ Mini jacks assumed to be two year olds.

Table 6. Klickitat River spring chinook natural spawn escapement by return year.

Return Year	Age					Total	Adult Total	
	2	3	4	5	6			
1977						126	126	
1978						150	150	
1979						70	70	
1980						63	63	
1981						245	245	
1982						113	113	
1983						63	63	
1984						102	102	
1985						79	79	
1986						142	142	
1987						312	312	
1988 1/		0	50	513	594	1	1,158	1,108
1989 2/		0	98	84	209	2	393	295
1990 3/		0	7	39	178	7	231	224
1991		0	4	58	179	4	245	241
1992		0	4	121	188	9	322	318
1993		0	2	70	334	26	432	430
1994		0	9	17	77	2	105	96
1995		0	33	48	20	4	105	72
1996		0	16	248	24	2	290	274
1997		0	4	383	211	1	599	595
1998		0	48	112	119	9	288	240
1999		0	94	88	31	0	213	119
2000		200	10	442	74	0	726	516
2001		0	26	95	208	9	338	312
2002 4/		0	183	712	186	0	1,081	898
2003 5/		0	178	796	346	0	1,320	1,142
2004 6/		0	135	465	351	1	952	817
2005 7/		0	0	81	44	0	125	125
2006 8/		0	4	141	92	9	246	242
2007 8/		0	16	74	222	0	312	296
2008 8/		0	37	143	49	0	228	191

1/ Includes 5 (age 3) Carson Stock. Estimate includes 1,000 fish that spawned below the hatchery.

2/ Includes 30 (age 4) Carson stock.

3/ Includes 0 (age 5) Carson stock.

4/ Includes 165 males, 275 females, and 170 jacks released above Castile Falls.

5/ Includes 122 males, 440 females, and 98 jacks released above Castile Falls.

6/ Includes 195 males, 320 females, and 85 jacks released above Castile Falls.

7/ No biological sampling available. Used Klickitat Hatchery unmarked age comp (only unmarked morts sampled from spawning grounds)

8/ Used Lyle adult trap age sample information and assumed all unmarked fish were wild/natural

Note: Age composition for 1990-1993 derived from scale samples taken from naturally spawning spring chinook. Population estimates are derived using redd counts applied to an expansion formula. Age 2 fish are generally not well sampled during spawner surveys and are probably underrepresented in most years.

Table 7. Productivity (Returns per Age 4/5/6 Spawner) of Klickitat spring chinook by brood year.

Brood Year	Est. Adult Spawners			Estimated Total Returns						R:S
	Hat.	Wild	Total	Age-3	Age-4	Age-5	Age-6	Total		
1984	467	102	569	111	1819	762	20	2712	4.77	
1985	53	79	132	273	4486	1797	4	6560	49.70	
1986	485	142	627	508	766	500	13	1787	2.85	
1987	863	312	1175	399	973	527	64	1963	1.67	
1988	1468	1108	2576	246	1000	1998	22	3266	1.27	
1989	3176	295	3471	131	1640	790	38	2599	0.75	
1990	574	224	798	44	146	193	5	388	0.49	
1991	534	241	775	78	465	117	10	670	0.86	
1992	635	318	953	271	1034	704	53	2062	2.16	
1993	1789	430	2219	113	1147	333	1	1594	0.72	
1994	629	96	725	52	316	204	0	572	0.79	
1995	484	72	556	148	523	258	9	938	1.69	
1996	574	274	848	560	2450	586	0	3596	4.24	
1997	829	595	1424	383	531	236	0	1150	0.81	
1998	313	240	553	420	2313	1197	4	3934	7.11	
1999	458	119	577	817	2769	1172	47	4805	8.33	
2000	746	516	1262	610	1818	83	9	2520	2.00	
2001	350	312	662	852	1298	408	0	2558	3.86	
2002	864	898	1762	137	1186	559	0	1882	1.07	
2003	1084	1142	2226	140	519	215		874	0.39	
2004	1051	817	1868	159	815					
2005	494	125	619	463						
2006	680	242	922							
2007	445	296	741							
2008	331	191	522							