

## SKYKOMISH RIVER JUVENILE SALMON OUT-MIGRATION STUDY PROGRESS REPORT February – June 2014

### 1. Summary of activities completed during the sampling season.

On January 30<sup>th</sup>, 2014 installation of the rotary screwtrap began and full trapping operations commenced on February 25<sup>th</sup>. The 2014 season ended on June 13<sup>th</sup>. The trap was fished for approximately 888.2 hours over 70 days within a 16 week period. 521.6 of those hours were fished at night representing 58.7% of total trapping effort. There were 8 scheduled fishing events (7 night shifts, 1 day shift) that were unfishable during this five month period due to unfavorable sampling conditions (i.e. high debris and discharge levels). During the sampling season 259,700 salmon and trout were captured, counted and released. Of that number, 237,877 were pinks accounting for 91.5% of the total catch. A total of 21,823 “other” salmonids were sampled. Captured unmarked Chinook included 1,354 sub-yearlings and 56 yearlings. The number of Chinook sub-yearlings caught at the Skykomish River trap has varied widely from year to year, with this years’ total falling 21% lower than the 10 year documented average (2004-2014 average; 1,716). Captured unmarked Coho included 2,625 yearlings and 1,528 sub-yearlings. The number of unmarked Coho yearling caught was lower than last year, and was 37% lower than the 10 year documented average (2004-2014 average: 4,165) (Table 2).

During the trapping and handling process a total of 71 salmonid mortalities were reported, of which only 1 was Chinook. Mortality rates were calculated for all species and cohorts (Table 1). Mortality as a percentage of the total salmonid catch was approximately 0.01, well below project averages. Of the 71 mortalities, 61 were pinks accounting for 86% of the total salmonid mortality in 2014.

A preliminary review of the data reveals that catch per unit effort (CPUE) for unmarked Chinook sub-yearlings was the highest during Calendar Week (CW) 16 when the capture rate was approximately 5 fish per hour. There is a clear ascending trend in sub-yearling Chinook outmigration beginning in CW 11 and increasing rapidly beginning CW14 eventually peaking in CW16. A secondary, slightly smaller peak was recorded during CW20 when approximately 2 fish were captured per hour (Figure 1). The 2014 peak outmigration timing for sub-yearling Chinook was consistent with observed seasonal norms which have occurred between CW11 and CW17 for all years recorded for this project. The sub-yearling Chinook outmigration occurred over a relatively extended period, while migration for unmarked Coho yearlings was more abbreviated, taking place over a 5 week period from CW15 to 19. The peak for Coho yearlings occurred during CW19 when approximately 10 fish per hour were captured. The timing of yearling Coho outmigration is very consistent from year to year, and the 2014 data is consistent with monitoring trends observed since the beginning of trap operations in 2000. In all years the peak outmigration occurred between CW18 and CW22, as was observed in the 2014 sampling season. Table 1 shows a monthly breakdown of catch numbers for all species and Table 3 shows calendar weeks and the corresponding dates. Figure 2 illustrates the outmigration timing for sub-yearling Chinook and yearling Coho and exhibits the aforementioned patterns observed in 2014.

A total of 12 trap efficiency tests (7 with Chinook sub-yearlings and 5 with Coho yearlings) were conducted on 12 different days throughout the 2014 sampling season. During these tests, groups of hatchery origin juvenile salmon were collected from Wallace River Hatchery, marked with biological dye, and released over a mile upstream of the trap site. These releases were conducted weekly throughout the duration of the sampling season unless the river was deemed unfishable. Following each release, the trap was operated continuously (except during debris removal) for a minimum of 36 hours. Efficiency calculations were then expressed as a percentage of the number of captured dyed fish in correlation to the total number of fish marked and released. The results of these tests are still being evaluated, but preliminary calculations suggest that the trap was operating at an efficiency rate of 1.49% for Chinook sub-yearlings and 0.61% for Coho yearlings during the 2014 sampling season. The 2014 Chinook efficiency is very close to documented seasonal averages (2001-2012 average: 1.5%), whereas Coho efficiency rates were much lower than observed averages at this site (2001-2012 average: 1.2%). Generally, Chinook efficiency rates are higher than Coho percentages at this site, but the extremely low Coho efficiency rates experienced fall well below documented averages. Lower than normal efficiency rates began occurring in 2013, and the cause is still of yet unknown. During the 2013 and 2014 seasons, trapping equipment was inspected and monitored frequently and the trap was found to be in fully operational condition with no escape paths detected and no major equipment malfunctions.

### 2. Project status and difficulties.

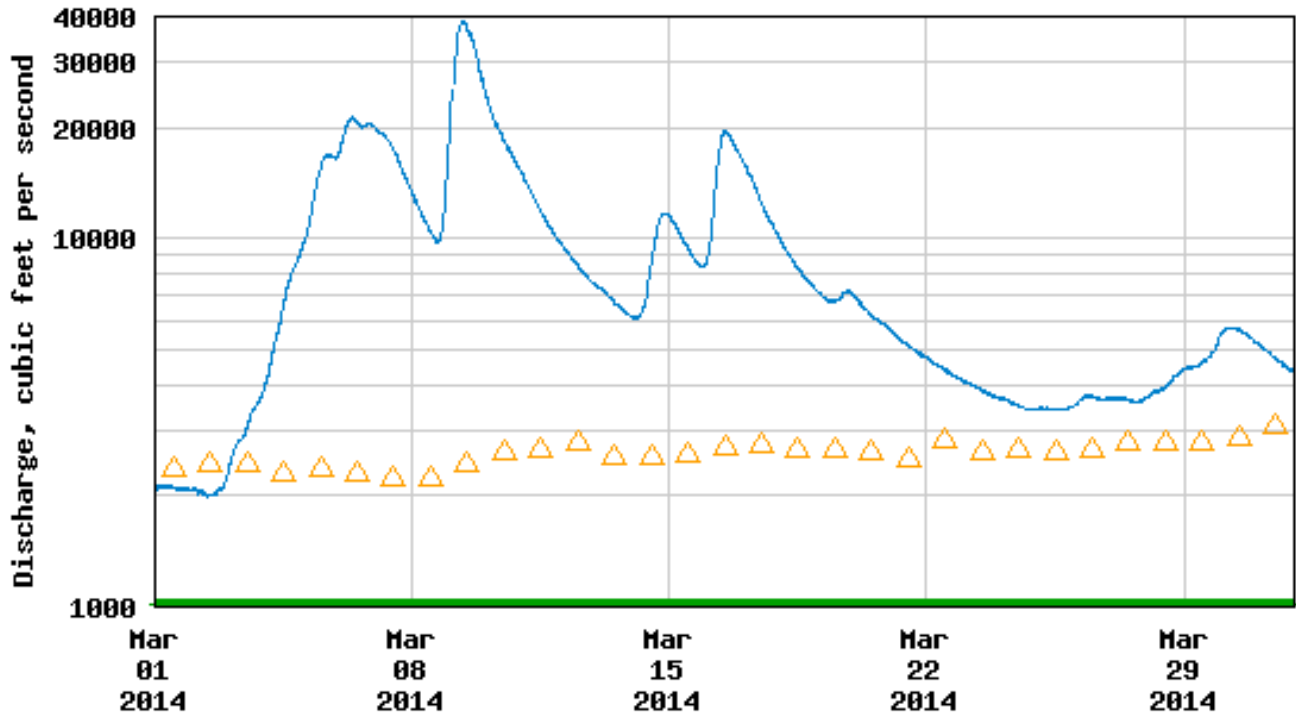
In terms of sampling success and trap operation the 2014 trapping season went fairly well. Total trapping effort (roughly 900 hours) and sample scheduling was impacted to a moderate degree by uncontrollable natural variables (weather) and difficulties with the employment process. In general, the project goal is to begin normal trap operations the first week of February each year. In 2014 we were delayed until the end of February due to logistical difficulties completing the employment process for our workers. Immediately following the start of trapping operations on February, 22<sup>nd</sup> we were faced with notably unpredictable and arduous hydrologic conditions during the month of March, 2014 (Figure 1). Generally, flooding events beyond 11,000 cfs have proven to result in potentially hazardous working conditions, and are considered too high to safely sample. This threshold limit was repeatedly met or exceeded several times over the course of the month of March, 2014. From March 3-11<sup>th</sup> 4 scheduled night shifts and 2 scheduled day shifts were cancelled due to rapidly rising and fluctuating river conditions. During this time period, the river rose gradually and steadily to over 20,000 cfs only to fall slightly and rise once again to peak at 37,100 cfs far surpassing the threshold for work safety. We attempted to reinstall the lines and resume trapping on March 13<sup>th</sup>, but our efforts were quickly thwarted as yet another front

moved into the basin. From March 13<sup>th</sup>-17<sup>th</sup> the guide wires were again taken down, and 2 additional night shifts were cancelled. During this second event, the river peaked at 11,600 cfs before falling overnight, only to climb a second time and peak at 19,500 cfs, well beyond our threshold sampling safety limits. The lines were re-installed, and trapping resumed full operation beginning March 18<sup>th</sup>. This series of extreme weather events in conjunction with a one month employment delay in February directly impacted the total effort for the 2014 season and is likely a key component of the comparatively low sampling effort for the season and in turn the overall lower encounter rates for all species. Following the extreme conditions experienced in March, trap operations continued fairly unabated for the remainder of the season ending in June. On April 8<sup>th</sup>, due to fluctuating river levels, 1 night shift was cancelled one hour early due to rapidly rising river levels, and the day shift the following day was also cancelled April 9<sup>th</sup>. Other than this single day shift cancellation, no other shifts were altered due to weather conditions from April – June, 2014. There were no shifts in 2014 altered or cancelled by employee call in or absenteeism. In total, 8 shifts were ultimately cancelled and 1 shift was terminated early during the 2014 season over the course of 5 months.

From 2012-2014, in an attempt to further evaluate stock-specific production estimates and abundance, DNA samples were collected for genetic parentage-assignment analyses of juvenile Chinook salmon. In cooperation with Washington State Department of Fish and Wildlife (WDFW), all unmarked (adipose intact) Chinook (both 0+ and 1+ size classes) caught in the trap were clipped for DNA sampling. During the 2014 monitoring season approximately 1,354 upper-caudal DNA samples were taken from a mix of sub-yearling and yearling unmarked Chinook juveniles. This number closely mirrors the encounter rate for the pilot year in 2012, and is significantly lower than the number of samples taken in 2013. The total number of Chinook encounters is, in part, a function of the total trapping effort and CPUE. 2014 Chinook CPUE and total encounter rates appear to be well within seasonal averages for the project.

**Figure 1: USGS March, 2014 Hydrograph Results**

USGS 12134500 SKYKOMISH RIVER NEAR GOLD BAR, MA



△ Median daily statistic (85 years)    — Period of approved data  
— Discharge

**Table 1: Skykomish River trap catch and mortalities 2014**

(Data is preliminary)

**February**

	<i>Chinook</i>					<i>Coho</i>					<i>Steelhead</i>					<i>Dolly/ Bull Trout</i>	<i>Total Salmonid Catch</i>	<i>Juv. Lamp.</i>	<i>Dace spp.</i>	<i>Sculpin spp.</i>	<i>Stickle- back</i>
	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Unm 0+</i>	<i>Mark 0+</i>	<i>0+</i>	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Chum</i>	<i>Pink</i>	<i>Sockeye</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>	<i>Cut. Trout</i>	<i>Rain. Trout</i>	<i>Trout Fry</i>						
<i>Day</i>	( 12.1 hours of effort)																				
<b>Catch</b>	0	0	1	0	0	0	0	0	19	0	0	0	0	0	0	0	20	0	0	0	0
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Night</i>	( 18.0 hours of effort)																				
<b>Catch</b>	0	0	32	0	2	8	0	18	700	0	0	0	0	0	0	0	760	0	0	1	0
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Monthly Totals</b>	( 30.1 hours of effort)																				
<b>Catch</b>	0	0	33	0	2	8	0	18	719	0	0	0	0	0	0	0	780	0	0	1	0
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**March**

	<i>Chinook</i>					<i>Coho</i>					<i>Steelhead</i>					<i>Dolly/ Bull Trout</i>	<i>Total Salmonid Catch</i>	<i>Juv. Lamp.</i>	<i>Dace spp.</i>	<i>Sculpin spp.</i>	<i>Stickle- back</i>
	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Unm 0+</i>	<i>Mark 0+</i>	<i>0+</i>	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Chum</i>	<i>Pink</i>	<i>Sockeye</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>	<i>Cut. Trout</i>	<i>Rain. Trout</i>	<i>Trout Fry</i>						
<i>Day</i>	( 87.2 hours of effort)																				
<b>Catch</b>	1	0	45	0	34	9	1	198	5648	0	0	0	1	0	0	0	5937	0	0	1	0
<b>Morts.</b>	0	0	0	0	1	0	0	0	8	0	0	0	0	0	0	0	9	0	0	0	0
<i>Night</i>	(116.3 hours of effort)																				
<b>Catch</b>	5	0	233	0	181	174	0	3389	36405	1	11	1	13	0	0	0	40413	12	11	31	1
<b>Morts.</b>	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	0
<b>Monthly Totals</b>	(203.5 hours of effort)																				
<b>Catch</b>	6	0	278	0	215	183	1	3587	42053	1	11	1	14	0	0	0	46350	12	11	32	1
<b>Morts.</b>	0	0	0	0	1	0	0	0	11	0	0	0	0	0	0	0	12	0	0	0	0

**Table 1: Skykomish River trap catch and mortalities 2014**

(Data is preliminary)

**April**

	<i>Chinook</i>					<i>Coho</i>					<i>Steelhead</i>					<i>Dolly/Bull Trout</i>	<i>Total Salmonid Catch</i>	<i>Juv. Lamp.</i>	<i>Dace spp.</i>	<i>Sculpin spp.</i>	<i>Stickle-back</i>	
	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Unm 0+</i>	<i>Mark 0+</i>	<i>0+</i>	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Chum</i>	<i>Pink</i>	<i>Sockeye</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>	<i>Cut. Trout</i>	<i>Rain. Trout</i>	<i>Trout Fry</i>							
<i>Day</i>	(110.3 hours of effort)																					
<b>Catch</b>	0	14	34	0	14	56	13	346	34309	0	0	3	0	2	0	0	34791	0	3	0	0	
<b>Morts.</b>	0	0	0	0	0	0	5	2	37	0	0	0	0	0	0	0	44	0	0	0	0	
<i>Night</i>	(184.7 hours of effort)																					
<b>Catch</b>	7	835	746	0	682	832	4	8217	145579	1	15	120	2	0	0	0	157040	7	56	17	3	
<b>Morts.</b>	0	0	0	0	0	0	1	0	13	0	0	0	0	0	0	0	14	0	0	0	0	
<b>Monthly Totals</b>	(294.9 hours of effort)																					
<b>Catch</b>	7	849	780	0	696	888	17	8563	179888	1	15	123	2	2	0	0	191831	7	59	17	3	
<b>Morts.</b>	0	0	0	0	0	0	6	2	50	0	0	0	0	0	0	0	58	0	0	0	0	

**May**

	<i>Chinook</i>					<i>Coho</i>					<i>Steelhead</i>					<i>Dolly/Bull Trout</i>	<i>Total Salmonid Catch</i>	<i>Juv. Lamp.</i>	<i>Dace spp.</i>	<i>Sculpin spp.</i>	<i>Stickle-back</i>	
	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Unm 0+</i>	<i>Mark 0+</i>	<i>0+</i>	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Chum</i>	<i>Pink</i>	<i>Sockeye</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>	<i>Cut. Trout</i>	<i>Rain. Trout</i>	<i>Trout Fry</i>							
<i>Day</i>	(100.2 hours of effort)																					
<b>Catch</b>	3	2	37	1	21	35	4	10	4641	0	0	16	0	0	1	0	4771	0	0	0	0	
<b>Morts.</b>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
<i>Night</i>	(115.0 hours of effort)																					
<b>Catch</b>	26	972	190	10	454	1357	11	180	10426	0	13	415	1	0	0	0	14056	4	11	3	1	
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Monthly Totals</b>	(215.2 hours of effort)																					
<b>Catch</b>	29	974	227	11	475	1392	15	190	15067	0	13	431	1	0	1	0	18827	4	11	3	1	
<b>Morts.</b>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	

**Table 1: Skykomish River trap catch and mortalities 2014**

(Data is preliminary)

**June**

	<i>Chinook</i>					<i>Coho</i>					<i>Steelhead</i>					<i>Dolly/Bull Trout</i>	<i>Total Salmonid Catch</i>	<i>Juv. Lamp.</i>	<i>Dace spp.</i>	<i>Sculpin spp.</i>	<i>Stickle-back</i>
	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Unm 0+</i>	<i>Mark 0+</i>	<i>0+</i>	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Chum</i>	<i>Pink</i>	<i>Sockeye</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>	<i>Cut. Trout</i>	<i>Rain. Trout</i>	<i>Trout Fry</i>						
<i>Day</i>	( 57.0 hours of effort)																				
<b>Catch</b>	2	22	9	0	6	10	4	0	35	0	0	0	0	0	0	0	88	0	0	1	0
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Night</i>	( 87.6 hours of effort)																				
<b>Catch</b>	12	1371	27	0	134	144	4	3	115	0	8	5	1	0	0	0	1824	9	17	8	0
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Monthly Totals</b>	(144.6 hours of effort)																				
<b>Catch</b>	14	1393	36	0	140	154	8	3	150	0	8	5	1	0	0	0	1912	9	17	9	0
<b>Morts.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Totals**

( 888.2 total hours of effort)

	<i>Chinook</i>					<i>Coho</i>					<i>Steelhead</i>					<i>Dolly/Bull Trout</i>	<i>Total Salmonid Catch</i>	<i>Juv. Lamp.</i>	<i>Dace spp.</i>	<i>Sculpin spp.</i>	<i>Stickle-back</i>
	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Unm 0+</i>	<i>Mark 0+</i>	<i>0+</i>	<i>Unm 1+</i>	<i>Mark 1+</i>	<i>Chum</i>	<i>Pink</i>	<i>Sockeye</i>	<i>Unm Smolts</i>	<i>Mark Smolts</i>	<i>Cut. Trout</i>	<i>Rain. Trout</i>	<i>Trout Fry</i>						
<b>Catch</b>	56	3216	1354	11	1528	2625	41	12361	237877	2	47	560	18	2	1	0	259700	32	98	62	5
<b>Morts.</b>	0	0	0	1	1	0	6	2	61	0	0	0	0	0	0	0	71	0	0	0	0
<b>% Mort</b>	0.00%	0.00%	0.00%	9.09%	0.07%	0.00%	14.63%	0.02%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.03%				
<b>% of Total Catch</b>	0.0%	1.2%	0.5%	0.0%	0.6%	1.0%	0.0%	4.8%	91.5%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	99.9%	0.0%	0.0%	0.0%	0.0%

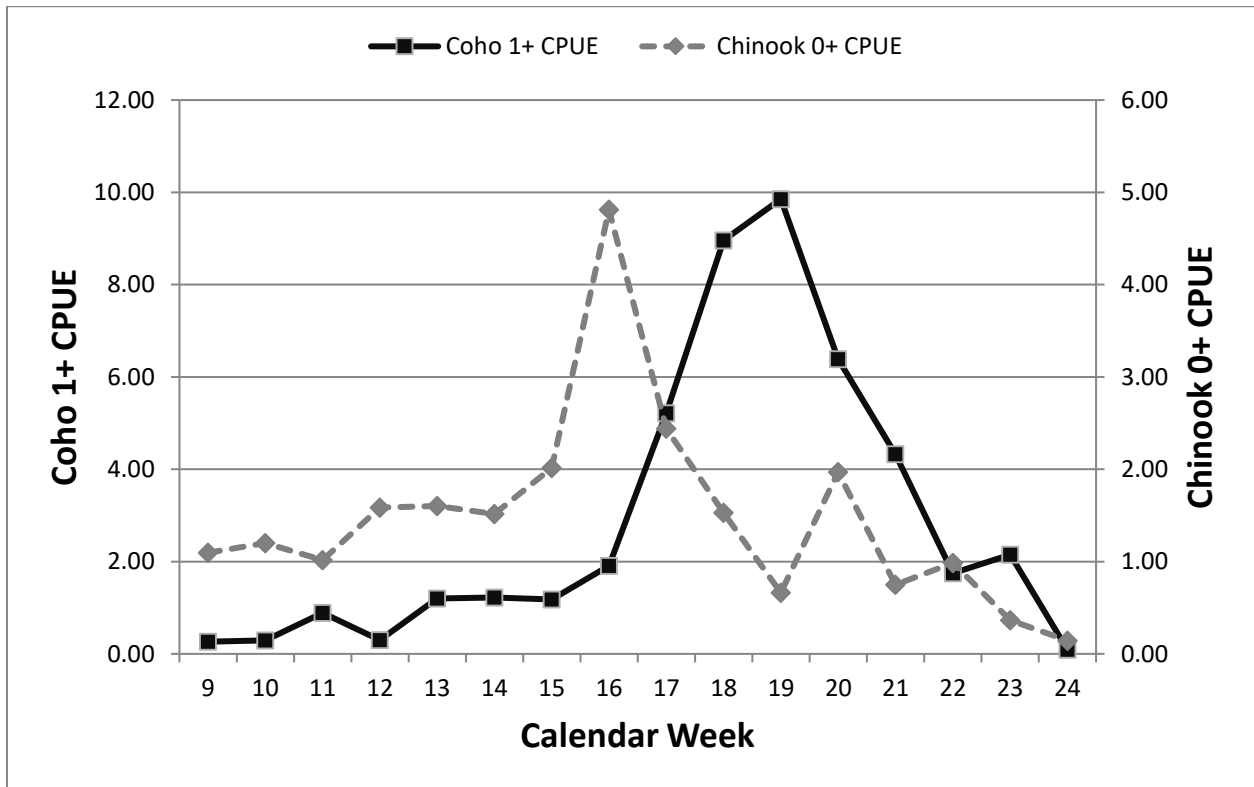
**Table 2. Annual sampling effort and catch totals for unmarked Sub-yearling Chinook and yearling Coho at the Skykomish River rotary screwtrap 2000-2014 (preliminary data).**

Year	Effort (hrs)	Chinook	Coho
2000	308.5	1287	5972
2001	900.6	1786	5512
2002	671.7	1093	8851
2003	992.1	3394	8713
2004	1071	951	13949
2005	944.3	2411	3082
2006	1125.3	2928	6218
2007	446.8	1348	3882
2009	686.6	1650	1410
2010	1045.8	1989	1245
2011	666.8	765	1798
2012	1015.7	1323	3005
2013	1217.77	2446	4443
2014	888.2	1354	2625
<i>10 Year Avg.</i>		<i>1716.5</i>	<i>4165.7</i>

**Table 3. Calendar weeks and corresponding dates for 2014 sampling season.**

Year	2014			
	CalWeek	BegWeek	MidWeek	EndWeek
2014	9	2/23	2/26	3/1
2014	10	3/2	3/5	3/8
2014	11	3/9	3/12	3/15
2014	12	3/16	3/19	3/22
2014	13	3/23	3/26	3/29
2014	14	3/30	4/2	4/5
2014	15	4/6	4/9	4/12
2014	16	4/13	4/16	4/19
2014	17	4/20	4/23	4/26
2014	18	4/27	4/30	5/3
2014	19	5/4	5/7	5/10
2014	20	5/11	5/14	5/17
2014	21	5/18	5/21	5/24
2014	22	5/25	5/28	5/31
2014	23	6/1	6/4	6/7
2014	24	6/8	6/11	6/14
2014	25	6/15	6/18	6/21
2014	26	6/22	6/25	6/28

**Figure 2. Chinook sub-yearling (age 0+) and coho (1+) migration patterns observed during 2014 at the Skykomish River trap, river mile 26.5. (preliminary data).**



*Prepared by:  
 Matt Pouley, Field Projects Coordinator  
 The Tulalip Tribes, Cultural & Natural Resources Department  
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