MEMORANDUM

Department of Fish and Wildlife
Intra Departmental

Date: December 10, 2013
To: Files
From: Jeff Whisler
Subject: 2013 Willamette River Spring Chinook Run and 2014 Forecast

Summary of 2013 Willamette River Spring Chinook Return

The final 2013 Willamette River spring Chinook return is estimated at 47,311 total fish to the Columbia River mouth (Table 1). An estimated 10,130 of these were unmarked fish (21%). The 2013 total return was 79% of forecast. The Clackamas River component was less than forecasted, with 6,153 spring Chinook returning to the Clackamas River compared to an expected 7,312.

The total return of adipose-fin-marked hatchery fish in 2013 is estimated at 37,181 fish at the Columbia River mouth, compared to 47,277 fish expected. Counts at the Willamette Falls fishway indicate that about 22,200 fin-marked hatchery fish and 7,400 unmarked fish passed the fish ladder. The full reconstruction of the 2013 return is shown in Table 2.

Table 1. 2013 Willamette River forecasted and actual return (to Columbia River mouth).

	Columbia River Mouth Return				
	Age 3	Age 4	Age 5	Age 6	Total
2013 Forecast	**2,143**	**30,553**	**26,665**	**484**	**59,845**
Lower	2,143	28,970	14,333	484	45,930
Upper	2,143	49,444	35,406	484	87,477
2013 Actual Return	**2,431**	**32,576**	**12,134**	**170**	**47,311**

The projection for 2013 assumed that 21% of the return would be comprised of unmarked fish, based on the average percentage of unmarked fish seen in the 2008–2012 returns. The actual unmarked rate for the full 2013 return is estimated to be 21%.

Table 2. Preliminary summary of the 2013 Willamette River spring Chinook return.

Catch	Age 3	Age 4	Age 5	Age 6	Total
LCR Commercial	34	383	132	0	549
LCR Commercial release mortality	0	30	10	0	40
Select Area Commercial	22	716	431	65	1,234
LCR Sport kept catch	13	889	736	27	1,665
LCR Sport release mortality	0	15	12	0	27
Lower Willamette Sport kept catch	289	5,080	1,840	5	7,214
Lower Willamette Sport release mortality	7	115	42	0	164
Lower Clackamas Sport kept catch	66	302	66	0	434
Lower Clackamas Sport release mortality	3	13	3	0	19
Total	**434**	**7,543**	**3,272**	**97**	**11,346**
Escapement					
Willamette Falls Count	1,664	20,465	7,413	19	29,561
Mortality below Falls	5	92	33	0	130
Clackamas Hatchery swim-ins	226	1,359	424	18	2,027
Clackamas Hatchery transfers from N.F. Dam	2	648	202	9	861
Eagle Creek Hatchery return	1	52	16	1	70
North Fork Dam, passed upstream	68	1,689	527	22	2,306
North Fork Dam, recycled downstream	8	315	98	4	425
Natural Spawn below N.F. Dam	0	8	3	0	11
Sea Lion Predation	23	405	146	0	574
Total	**1,997**	**25,033**	**8,862**	**73**	**35,965**
Run Entering Columbia River	**2,431**	**32,576**	**12,134**	**170**	**47,311**
Run Entering Willamette River	**2,362**	**30,543**	**10,813**	**78**	**43,796**
Run Entering Clackamas River	**374**	**4,386**	**1,339**	**54**	**6,153**

Forecasted Willamette River Spring Chinook Return for 2014

Projections for Age-3 fish returning in 2014

In recent years, a regression of the observed Age-2:Age-3 cohort ratios versus Age-2 returns has been used to estimate the cohort ratio and forecast the return of Age-3 (jack) spring Chinook. For 2014, this method produces a point estimate of 3,000 Age-3 fish returning to the Columbia River mouth. Alternative methodologies have not proven to be useful in explaining variation in projected returns, therefore no lower or upper bounds are provided.

Projections for Age-4 fish returning in 2014

A linear regression of Age-3 versus Age-4 observed returns predicts 34,000 Age-4 fish will return and is used as the 2014 abundance forecast of Age-4 spring Chinook at the Columbia River mouth. The lower and upper bound projections for the Age-4 component are 32,400 (using a linear regression of

Age-3 versus Age-4 returns including a trend function of recent returns) and 52,400 (using observed Age-3:Age-4 cohort ratios versus Age-3 returns), respectively.

Projections of Age-5 fish returning in 2014

For 2014, a regression of natural log transformed Age-4 returns (including a trend function) versus observed Age-5 returns predicts a return of 21,400 Age-5 spring Chinook to the Columbia River mouth. The lower and upper bounds are 9,200 (using the three-year running average of the Age-4:Age-5 cohort ratio) and 35,500 (using a regression of Age-3 and Age-4 observed returns (including an Age-3 trend function) versus Age-5), respectively.

Projections for Age-6 fish returning in 2014

The Age-6 component makes up a very small portion of annual returns and, as a result, is difficult to correlate with prior year returns of the same cohort, but also contributes minimally to forecast errors. The 2014 projection is 290 spring Chinook to the Columbia River mouth, based on the 10-year average Age-5:Age-6 cohort ratio.

2014 Clackamas River Forecasted Return

Using a regression of the sum of the prior two year's jack (Age-3) returns versus the total return size produces a projected 8,200 spring Chinook returning to the mouth of the Clackamas River. Age-specific forecasts are not presented here but were calculated based on the average proportions of each age in Clackamas returns.

2014 Forecast Summary

Table 3. 2014 Projected Willamette spring Chinook return to Columbia River mouth.

	Columbia River Mouth Return				
	Age 3	Age 4	Age 5	Age 6	Total
2014 Forecast	**3,000**	**34,000**	**21,400**	**290**	**58,690**
Lower	3,000	32,400	9,200	290	44,890
Upper	3,000	52,400	35,500	290	91,190

The 2013 return included an estimated 21% unmarked fish. Using the most recent five-year average of unmarked fish (21%), the number of hatchery fish returning to the Columbia River mouth in 2014 is forecasted to be 46,230 (Table 4).

Table 4. 2014 Projected Willamette Basin (Clackamas included) spring Chinook hatchery fish return to Columbia River mouth.

	Columbia River Mouth Returns (hatchery fish only)				
	Age 3	Age 4	Age 5	Age 6	Total
2014 Forecast	**2,300**	**26,800**	**16,900**	**230**	**46,230**
Lower	2,300	25,600	7,300	230	35,430
Upper	2,300	41,400	28,000	230	71,930

Hatchery Surplus Estimates

The harvestable surplus of the 2014 return of hatchery fish is calculated by subtracting the hatchery fish escapement goals specified in the Willamette River Spring Chinook Fisheries Management and Evaluation Plan (FMEP) from the total forecasted hatchery component of the return. Based on the FMEP, at a total hatchery-fish run size of 46,230 fish the escapement goals for Willamette Falls and the Clackamas River are 22,000 and 3,300 fish, respectively. This results in a harvestable surplus of 20,930 fish.