MEMORANDUM

Department of Fish and Wildlife
Intra Departmental

Date: December 5, 2012
To: Files
From: CRM Staff
Subject: 2013 Willamette River Spring Chinook Forecast

The final 2012 Willamette River spring Chinook return is estimated at 65,115 total fish to the Columbia River mouth (Table 1). An estimated 11,417 of these were unmarked fish (18%). The 2012 total return was 78% of forecast. Clackamas River returns returned at less than forecasted with 5,799 spring Chinook returning to the Clackamas River compared to an expected 6,775.

The total return of hatchery fish in 2012 is estimated at 53,698 fish at the Columbia River mouth, compared to 65,888 fish expected. Willamette Falls ladder counts indicate that about 28,500 marked hatchery fish and 8,700 unmarked fish passed through the fishway at Willamette Falls. The full reconstruction of the 2012 return is shown in Table 2.

Table 1. 2012 Willamette River projected and actual return (to Columbia River mouth).

	Columbia River Mouth Returns				
	Age 3	Age 4	Age 5	Age 6	Total
2012 Forecast	**2,097**	**60,692**	**20,101**	**512**	**83,402**
Lower	2,097	42,968	12,797	512	53,384
Upper	2,097	63,040	43,050	512	108,699
2012 Actual Return	**2,078**	**42,587**	**20,276**	**174**	**65,115**

The projection for 2012 assumed that 21% of the return would be comprised of unmarked fish, based on the average percentage of unmarked fish seen in the 2009-2011 returns. The actual estimated unmarked rate for the full return in 2012 was 18%. The return year 2003 was the first year in which all returning age classes of hatchery-reared fish were part of mass-marking programs. Prior to that time fewer fish were adipose fin-clipped making it difficult to estimate returns of wild fish.

Table 2. Preliminary summary of the 2012 Willamette River spring Chinook return.

Catch	Age 3	Age 4	Age 5	Age 6	Total
LCR Commercial (Gillnet)	26	1,007	529	0	1,562
LCR Commercial (Gillnet-rel. mortality)	1	31	17	0	49
Select Area Commercial	0	338	368	0	706
LCR Sport (kept catch)	125	2,163	845	0	3,133
LCR Sport (release mortality)	3	48	19	0	70
L. Will. Sport Fishery kept catch	418	10,512	4,547	37	15,514
L. Will. Sport Fishery release mortality [1]	9	216	93	1	319
Lower Clackamas Sport (kept catch)	21	309	236	0	566
Lower Clackamas Sport (rel. mortality) [1]	1	11	9	0	21
Totals	**604**	**14,635**	**6,663**	**38**	**21,940**
Escapement					
Willamette Falls Count [2]	1,314	24,998	10,813	88	37,213
Mortality Below Falls	3	82	35	0	120
Clackamas Hatchery swim-ins [2]	27	718	757	13	1,515
Clackamas Hatchery transfers from N.F. Dam [2]	25	682	719	13	1,439
Eagle Creek Hatchery Return [3]	5	94	99	2	200
North Fork Dam, Passed Upstream [2]	79	882	932	16	1,909
North Fork Dam, Recycled Downstream [2]	2	42	44	1	89
Natural Spawn Bel. N.F. Dam	2	28	29	1	60
Sea Lion Predation [4]	17	426	185	2	630
Totals	**1,474**	**27,952**	**13,613**	**136**	**43,175**
Run Entering Columbia	**2,078**	**42,587**	**20,276**	**174**	**65,115**
Run Entering Willamette	**1,923**	**39,000**	**18,498**	**174**	**59,595**
Run Entering Clackamas	**162**	**2,766**	**2,825**	**46**	**5,799**

Projections for Age 3 fish returning in 2015

In recent years, a regression of Age 2/3 cohort ratio versus Age 2 return has been used to predict the cohort ratio and project Age 3 returns. This method produces an estimate of 2,143 Age 3 fish, and will be used for the point estimate of the forecast. Alternative methodologies do not appear to be useful in explaining variation in projected returns, so no lower or upper bounds are provided.

Projections for Age 4 fish returning in 2014~~3~~

For 2013, a linear regression of Age 3 versus Age 4, including a trend function of recent returns, yields a forecast of 30,553 Age 4 fish and will be used to project the 2013 abundance of Age 4 fish. The trend function is included in an attempt to address issues with missed forecasts on increasing/decreasing returns. The lower and upper bound projections for Age 4 will be 28,970 (linear regression of Age 3 versus Age 4) and 49,444 (sibling regression with NOAA ocean conditions ranking covariate), respectively.

Projections of Age 5 fish returning in 2013

For 2013, a sibling regression with NOAA ocean conditions ranking covariate yields a forecast of 26,665. The lower and upper bounds will be 14,333 (5 –year running average of the Age 4-to-Age 5 cohort ratio) and 35,406 (linear regression of Age 4 versus Age 5), respectively.

Projections for Age 6 fish returning in 2013

Age 6 comprise a very small portion of annual returns, and as a result are difficult to correlate with prior year returns of the same brood, but also contribute few fish to total returns and forecast errors. The 2013 projection of 484 fish is based on the 10-year average Age 5 to Age 6 cohort ratio.

2013 Clackamas River Return

Using a regression of the sum of the last two year's jack returns versus the total return size for current year produces a projection of 7,312. Age-specific forecasts are not shown here but were calculated based on the average proportions of each age in Clackamas returns.

2013 Forecast Summary

Table 3. 2013 Projected Willamette spring Chinook 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

The 2012 return contained an estimated 18% unmarked fish. Using the most recent five average of unmarked fish (21%), the number of hatchery fish returning to the Columbia River mouth in 2013 would be fish 47,277 (Table 4).

Table 4. 2013 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
2013 Forecast	**1,693**	**24,137**	**21,065**	**382**	**47,277**
Lower	1,693	22,886	11,323	382	36,284
Upper	1,693	39,061	27,971	382	69,107

Hatchery Surplus Estimates

The harvestable surplus of the 2013 return of hatchery fish is calculated by subtracting the Willamette FMEP hatchery fish escapement goals from the total estimated hatchery return. Based on the FMEP at a total hatchery-fish run size of 47,300 fish the escapement goals for Willamette Falls and the Clackamas River are 22,000 and 3,000 fish, respectively. This results in a harvestable surplus of 21,700 fish.