

DRAFT
**Three Year Review of the Lower Columbia River tule fall Chinook Abundance-based
Harvest Matrix**
February 17, 2015

At its November 2011 meeting, the Pacific Fishery Management Council (Council) considered, among other matters, new methodological approaches for use in the 2012 ocean salmon fishery management. The Council passed a motion to recommend that NOAA's National Marine Fisheries Service (NMFS) consider an abundance-based management (ABM) matrix for lower Columbia River (LCR) tule fall Chinook salmon when formulating Endangered Species Act (ESA) Section 7 Biological Opinion consultation standards for salmon fisheries in 2012 and beyond. In 2012 NMFS issued a biological opinion under the authority of Section 7 of the ESA of 1973, as amended (16 U.S.C. 1536), on approval of the management of the ocean fisheries subject to the Fishery Management Plan for salmon fisheries off the coasts of Washington, Oregon and California. The biological opinion evaluated the proposed harvest impacts to the ESA-listed LCR Chinook Salmon Evolutionarily Significant Unit (ESU), including an ABM matrix for the tule fall Chinook salmon component (Table 1). NMFS concluded in the biological opinion that the proposed fishing seasons were not likely to jeopardize the continued existence of the LCR Chinook Salmon ESU (NMFS 2012). The opinion adopted the recommendation from the Council to assess the performance of the ABM matrix every three years as a check on projected results and any changes in key assumptions.

NMFS is initiating the planned review since the ABM matrix has now been implemented for three years. This report is provided in draft. We invite the comments of those interested and expect to consider comments received at the Council's April 2015 meeting prior to finalizing the three year review.

Table 1. Variable fishing exploitation rate limits based on abundance tier as proposed by the Pacific Fishery Management Council (from McIsaac 2011).

Lower River Hatchery Abundance Forecast	Total Exploitation Rate Limit
0 – 30,000	0.30
30,000 – 40,000	0.35
40,000 – 85,000	0.38
>85,000	0.41

The effectiveness of an ABM strategy depends, in part, on whether abundance can be predicted with reasonable accuracy and precision. When the current ABM matrix (Table 1) was proposed annual tule fall Chinook salmon run sizes were predicted, for fishery management purposes, using sibling models for the hatchery stock aggregate consisting primarily of lower river hatchery Chinook salmon. This stock grouping is referred to as the Lower River Hatchery (LRH) stock management unit. Wild fall Chinook salmon returns could not be forecasted independently because of the lack of reliable age data for

most wild populations. Examining correlations between the aggregate LRH return and the abundance of wild fish considered in the aggregate between 1964 and 2010 suggested that the hatchery forecast provided a suitable proxy for wild returns due to common effects of marine conditions on both hatchery and wild fish (Beamesderfer et al. 2011). Table 2 lists the annual preseason forecast of LRH Chinook salmon since implementing the ABM matrix along with the resulting exploitation rate for each year.

Table 2. Annual LRH Chinook salmon stock forecasts and allowable preseason exploitation rates (from PFMC preseason Report I, 2012-2014).

Year	Lower River Hatchery Abundance Forecast	Allowed Exploitation Rate based on ABM matrix
2012	127,000	0.41
2013	88,000	0.41
2014	110,000	0.41

Table 2 indicates that since implementation of the AMB matrix the preseason abundance of LRH fall Chinook salmon have allowed fisheries to operate at the highest tier available. Table 3 lists the annual postseason return of LRH Chinook salmon for the same time period along with the associated postseason estimate the exploitation rate. For context, the recent 10-year average abundance estimate for LRH fall Chinook salmon was 81,250 (PFMC 2014).

Table 3. Annual LRH Chinook salmon stock post season returns and resulting exploitation rates (from Joint Columbia River Management Staff (JCRMS) Fall Stock Status and Fisheries Reports, 2012-2014).

Year	Lower River Hatchery Actual Return	Exploitation Rate achieved¹
2012	84,800	0.41
2013	103,200	0.33
2014	101,800	0.41

¹ Calculated total exploitation on LCR tule Chinook salmon in all fisheries in the ocean and in the Columbia River below Bonneville Dam. These are estimated using the Fisheries Regulation Assessment Model (FRAM) which is currently used by the Council to annually estimate impacts of proposed ocean and terminal fisheries on Chinook and coho salmon stocks.

The exploitation rates calculated in Table 3 use harvest from all fisheries in marine waters and the Columbia River below Bonneville Dam. While ongoing monitoring efforts continue to be directed at gathering consistent natural population status and trends (e.g., abundance numbers, age composition, hatchery fractions, and productivity) the data sets are still too short to use to forecast preseason abundance. As evidenced by blank columns, escapement data for two populations in Table 4, four populations in Table 5, and both populations in Table 6 were not previously monitored. Updated spawning abundances are highlighted in bold red in Tables 4 through 6, with data coming from either the Washington Department of Fish and Wildlife’s Salmon Conservation and

Reporting Engine (SCORE) or Oregon Department of Fish and Wildlife's Salmon and Steelhead Recovery Tracker online databases. Data in Tables 4-6 for years 1990 – 2009 came from the risk assessment report examining the ABM matrix (Beamesderfer et al. 2011).

During the last three years preseason abundance forecasts for LRH Chinook salmon have been high (Table 2), which is consistent with high abundances seen for other fall Chinook salmon stocks in the Columbia River (JCRMS 2012-2014). Because abundance has been high fisheries have been managed subject to a 41% exploitation rate limit in all years (Table 2). Post season estimates of abundance indicate that the abundance category was correctly forecast in two of the three years. In 2012 the post season estimate of abundance was 84,800 (Table 3). This is 200 fish below the threshold of 85,000 for the high abundance tier. Preliminary post season estimates based on FRAM model analysis indicate that exploitation rates have not exceeded the preseason limit in any year and were actually well below the limit in 2013. When more data points allow for a more comprehensive review, the estimates of exploitation rates from FRAM should be compared to independent exploitation rate estimates derived from coded-wire tag groups.

New escapement information that has been gathered over the last four or five year shows no substantive changes in abundance or hatchery fractions that are inconsistent with previous trends (Tables 4-6). There is also new information for seven populations that result from increased sampling and help fill in some the gaps in existing data.

References

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Table 4. Annual available escapement of Lower Columbia River tule Chinook salmon Coastal strata populations.

Year	Youngs Bay		Grays / Chinook		Big Creek		Elochoman / Skamokawa		Clatskanie		Mill / Abernathy / Germany	
	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild
1990			166	46.0			174	42.0	175	10.0	650	63.0
1991			127	47.0			196	9.0	287	10.0	2,017	85.0
1992			109	76.0			190	100.0	287	10.0	839	47.0
1993			27	52.0			288	78.0	287	10.0	885	71.0
1994			30	70.0			706	98.0	136	10.0	3,854	40.0
1995			9	39.0			156	50.0	194	10.0	1,395	51.0
1996			280	17.0			533	66.0	1,069	10.0	593	54.0
1997			15	12.0			1,875	11.0	155	10.0	603	23.0
1998			96	24.0			228	25.0	214	10.0	368	60.0
1999			195	68.0			718	25.0	233	10.0	575	69.0
2000			169	70.0			196	62.0	607	10.0	416	58.0
2001			261	43.0			2,354	82.0	607	10.0	4,024	39.0
2002			107	47.0			7,581	0.0	894	10.0	3,343	5.0
2003			398	39.0			6,820	65.0	1,088	10.0	3,810	56.0
2004			766	25.0			4,796	1.0	252	10.0	6,804	2.0
2005			147	41.0			2,204	5.0	233	10.0	2,083	13.0
2006			302	100.0			317	100.0	97	10.0	636	62.0
2007			63	100.0			165	100.0	n/a	n/a	335	48.0
2008			40	68.0			841	10.0	n/a	n/a	750	49.0
2009			312	43.0			2,246	18.0	n/a	n/a	604	93.0
2010	1,152	n/a	405	60.0	5,909	6.0	1,127	12.0	12,805	12.0	1,678	7.0
2011	4,011	39.0	208	17.0	2,709	5.0	172	5.0	12,074	5.0	180	7.0
2012	6,686	3.0	2,033	17.0	1,096	5.0	637	26.0	3,205	6.0	1,033	13.0
2013	8,485	5.0	729	9.0	946	0.0	869	29.0	2,012	1.0	656	20.0
2014	n/a	n/a	225	44.0	n/a	n/a	1,318	22.0	n/a	n/a	2,778	8.0

Table 5. Annual available escapement of Lower Columbia River tule Chinook salmon Cascade strata populations.

Year	Lower Cowlitz ¹		Upper Cowlitz		Toutle		Coweeman		Kalama		Lewis ²		Clackamas		Sandy		Washougal	
	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild	#	% wild
1990	1,833	26.0					812	100.0	2,157	50.0	563	100.0					2,205	46.0
1991	935	26.0					340	100.0	5,152	54.0	470	100.0					3,673	47.0
1992	1,022	26.0					1,247	100.0	3,683	48.0	335	100.0					2,399	76.0
1993	1,330	6.0					890	100.0	1,961	89.0	164	100.0					3,924	52.0
1994	1,225	19.0					1,695	100.0	2,014	71.0	610	100.0					3,888	70.0
1995	1,370	13.0					1,368	100.0	3,012	69.0	409	100.0					3,063	39.0
1996	1,325	58.0					2,305	100.0	10,630	44.0	403	100.0					2,921	17.0
1997	2,007	72.0					689	100.0	3,539	40.0	305	100.0					4,669	12.0
1998	1,665	37.0					491	100.0	4,294	69.0	127	100.0					2,971	24.0
1999	969	16.0					299	100.0	2,577	3.0	331	100.0					3,129	68.0
2000	2,165	10.0					290	100.0	1,284	21.0	515	100.0					2,155	70.0
2001	3,647	44.0					802	73.0	3,553	18.0	750	70.0					3,901	43.0
2002	9,671	76.0					877	97.0	18,627	1.0	1,032	77.0					6,050	47.0
2003	7,001	88.0					1,106	89.0	24,684	0.0	738	98.0					3,444	39.0
2004	4,621	70.0					1,503	91.0	6,434	11.0	1,388	29.0					10,597	25.0
2005	2,968	17.0					853	60.0	9,053	3.0	607	100.0					2,678	41.0
2006	2,051	47.0					561	100.0	10,386	1.0	1,300	82.0					1,936	14.0
2007	1,401	53.0					234	100.0	3,296	6.0	492	73.0					1,528	87.0
2008	1,259	90.0					404	52.0	3,734	4.0	567	87.0					2,491	93.0
2009	2,602	45.0					780	63.0	7,548	10.0	299	100.0					2,741	30.0
2010	4,488	71.0	10,142	31.0	2,139	13.0	639	70.0	7,057	12.0	2,490	64.0	18	22.0	3,640	47.0	6,087	14.0
2011	3,685	75.0	14,182	30.0	1,608	21.0	566	88.0	8,869	7.0	2,364	71.0	118	29.0	3,542	46.0	4,725	18.0
2012	2,725	71.0	6,143	32.0	908	24.0	413	86.0	8,007	7.0	1,700	70.0	321	19.0	714	80.0	1,913	29.0
2013	4,436	81.0	7,366	45.0	2,283	42.0	2,035	69.0	12,061	9.0	6,407	85.0	422	92.0	2,576	97.0	7,185	42.0
2014	n/a	n/a	225	40.0	745	50.0	890	96.0	11,537	9.0	942	91.0	n/a	n/a	n/a	n/a	2,038	67.0

1 Tule Chinook salmon in the Cowlitz River were previously a conglomerate estimate.

2 Tule Chinook salmon estimates from both East and North Fork Lewis Rivers.

Table 6. Annual available escapement of Lower Columbia River tule Chinook salmon Gorge strata populations.

Year	Upper Gorge		White Salmon	
	#	% wild	#	% wild
1990				
1991				
1992				
1993				
1994				
1995				
1996				
1997				
1998				
1999				
2000				
2001				
2002				
2003				
2004				
2005				
2006				
2007				
2008				
2009				
2010	432	87.0	1,505	73.0
2011	1,815	32.0	379	88.0
2012	n/a	n/a	755	93.0
2013	n/a	n/a	1,232	67.0
2014	n/a	n/a	1,704	80.0