

MEMORANDUM

STATE OF ALASKA DEPARTMENT OF FISH AND GAME

Division of Sport Fish
Division of Commercial Fisheries

TO: Distribution

DATE: 1/14/2014

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SUBJECT: Outlook for the Kenai River Chinook salmon late run

The outlook for the late run of Kenai River Chinook salmon in 2014 is well below average, with a forecast total run of approximately 19,700 fish. If realized, this run would be the lowest in the 29 years of record, approximately the same abundance as the 2013 run, and would be less than one-half of the 1986–2013 average run of approximately 57,000 fish. If the 2014 forecast is realized, the 2014 total run will be within the sustainable escapement goal (SEG) of 15,000 - 30,000 fish.

The forecast of total run is calculated from the sum of individual age-specific forecasts of abundance for fish ages 3 to 7. Forecast abundance for each age class (Table 1) was calculated from several models based on relationships between adult returns or siblings from previous years (Table 2). The model estimates selected for each age class for inclusion in the 2014 forecast were those that had the minimum mean absolute percent error (MAPE) in 2009 – 2012 hindcasts of forecasts, and the 2013 forecast, as compared to the actual runs in those years. Most forecast models are chosen based on MAPE (from hindcasts going back 3 to 5 years), as they typically provide forecasts that are closest to the actual run (best accuracy). Mean absolute deviation (MAD) and mean percent error (MPE) were also used to evaluate accuracy and precision (respectively) between hindcasts and actual runs.

For age-3 fish, the mean model forecast estimate was selected, a run of 861 fish. Fewer models can forecast abundance for this age class because there are no prior sibling returns.

For age-4 fish, the median model forecast (6,308) was selected even though the most recent sibling model had a lower MAPE. We believe the median model a better forecast estimate because of the volatility of the abundance of age-3 fish in recent years and the relatively large return of age-3 fish in 2013, resulting in an age-4 forecast estimate from the most recent sibling model very dissimilar to the recent 2012 and 2013 runs.

The forecast of 9,024 age-5 fish (most recent sibling model) is approximately twice what was realized for this age class in 2013, but approximately 2,500 fish less than realized in 2012.

Age-6 fish are typically the predominant age class for late-run Kenai River Chinook salmon, but if the forecast is realized they will approximate only 15% of the run. The most recent sibling model was used to forecast a run of 2,987 age-6 fish. The 5-year mean sibling model has a MAPE nearly as low, and forecasts more than double the selected estimate. If the selected forecast is realized in 2014, it would be the lowest run of this age class on record, less than one-half of the current lowest in 2013.

For age-7 fish, the median sibling model had the least amount of error and forecast a run of 535 fish in 2014, nearly identical to the run in 2013.

There is some uncertainty in the 2014 forecast estimate. The 2013 forecast was for a total run of approximately 29,000 fish, while the preliminary total run is approximately 19,800, about 33% less than the forecast. Probably the best way to consider this salmon forecast is in terms of 3 broad categories: approximately average run, below average run or above average run. Clearly the 2014 forecast gives the expectation of a run in the below average category.

Table 1.—Chinook salmon forecasts for the 2014 Kenai River late run using several models, and the fit of each model to the previous 5 years of actual runs. Shaded boxes around values indicate those with the lowest associated 5-year MAPE and hence were selected to be part of the total run forecast for each age class. See Table 2 for a description of each model.

Model	Forecast 2014	5-Year		
		MAD ^a	MAPE ^b	MPE ^c
Age-3				
5-year mean	1,219	1,184	90	76
Mean	861	559	39	21
Median	609	729	49	45
Forecast estimate	861			
Age-4				
5-year mean	7,898	6,629	88	79
Mean	8,865	3,753	76	-60
Median	6,308	3,211	52	-21
Mean sibling	16,891	16,066	252	-252
Median sibling	11,106	8,000	129	-129
Most recent sibling	10,410	2,366	41	-6
5-year mean sibling	6,237	6,486	93	-77
Forecast estimate	6,308			
Age-5				
5-year mean	7,654	8,288	101	66
Mean	12,569	5,062	91	-91
Median	10,867	3,204	63	-61
Mean sibling	9,925	7,275	79	-79
Median sibling	8,278	4,896	54	-50
Most recent sibling	9,024	1,371	19	8
5-year mean sibling	6,521	1,957	23	4
Forecast estimate	9,024			
Age-6				
5-year mean	12,934	16,059	103	64
Mean	32,152	19,178	164	-164
Median	30,833	15,998	141	-141
Mean sibling	12,690	15,625	118	-118
Median sibling	10,363	9,890	75	-75
Most recent sibling (5's and 4's)	2,522	6,664	54	-34
Most recent sibling	2,987	4,879	43	-31
5-year mean sibling	6,929	5,366	44	-40
5-year mean sibling (5's and 4's)	5,511	7,539	51	-44
Forecast estimate	2,987			
Age-7				
5-year mean	1,037	1,601	172	-168
Mean	2,498	1,499	177	-170
Median	1,637	1,021	108	-95
Mean sibling	555	568	37	-14
Median sibling	535	602	36	-3
Most recent sibling	349	841	67	-45
5-year mean sibling	484	821	63	-44
Forecast estimate	535			
TOTAL RUN FORECAST	19,715			

^amean absolute deviation

^bmean absolute percent error

^cmean percent error

Table 2.—Description of models used in forecasting the Kenai River Chinook salmon late run, 2014.

Model	Description
5-year mean	Mean of the 2009-2013 run for the specified age class.
Mean	Mean using all brood years (1983-2007, except thru 2006 for age-7).
Median	Median return of all brood years (1983-2007, except thru 2006 for age-7).
Mean sibling	Mean of sibling ratios (age/age minus 1) for all returns (1983-2007 brood years) multiplied by the return of age minus 1 siblings.
Median sibling	Median of sibling ratios (age/ age minus 1) for all returns (1983-2007 brood years) multiplied by return of age minus 1 siblings.
Most recent, relative to mean sib (5's and 4's)	Most recent ratio of (age-6)/(age-5+age-4), multiplied by the return of age-5 and age-4 siblings.
Most recent sibling	Most recent sibling ratio (age/age minus 1), multiplied by the return of age minus 1 siblings.
5-year mean sibling	Mean of sibling ratios (age/age minus 1) for previous 5 brood years multiplied by the return of age minus 1 siblings.
5-year mean sibling (5's and 4's)	Mean of sibling ratios (age/ age minus 1+ age minus 2) for previous 5 brood years multiplied by return of age-5 and age-4 siblings.

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