MEMORANDUM

STATE OF ALASKA
DEPARTMENT OF FISH AND GAME
Division of Sport Fish

TO: Distribution DATE: 1/14/2014

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SUBJECT: Outlook for the Kenai River Chinook salmon early run

The outlook for the early run of Kenai River Chinook salmon in 2014 is well below average, with a forecast total run of approximately 2,230 fish. If realized, this run will rank the 2nd lowest measured (28th out of 29 years), be nearly identical in abundance to the run of 2013 (approximately 2,150), and be about one-sixth the 1986–2013 average run of approximately 13,500 fish. The 2014 forecasted run is well below the optimum escapement goal (OEG) of 5,300 to 9,000 fish.

The forecast of total run is calculated from the sum of individual age-specific forecasts of abundance for fish ages 3 to 7. All of the selected run forecasts by age for 2014 are in the hundreds, when in all years except for 2013, 2 – 3 of these age classes would individually realize runs in the thousands. 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 it typically provides 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 of the previous five years.

For age-3 fish, the 5-year mean forecast estimate was selected (a run of 279 fish). Fewer models can forecast abundance for this age class as there are no prior sibling returns to provide insights. The maximum number of fish observed in this age has been ~600 fish; hence typically this has a small contribution to the run and run forecast.

For age-4 fish, the median was selected (a run of 950 fish). This is approximately twice the number that returned in 2012 and 2013, and less than one-half of the number that returned in 2011.

The 5-year mean sibling model was used to forecast the number of age-5 fish, for a forecast of 701 fish. This is approximately 120 fish more than the historic low in 2013, and is approximately one-fifth of the historical mean.

Age-6 fish are usually the predominant age class for early-run Kenai River Chinook salmon. The most recent sibling model is considered the best estimate for this age class for 2014, a forecast of only 288 fish. This forecast of age-6 fish is less than 5% of the historical mean and less than 10% of the mean for the previous 5 years, which were also very low.

For age-7 fish, the recent sibling model was selected, and forecast a run of 16 fish in 2014. If realized, this would also be an historic low for this age class, along with the age-6 fish.

There is some uncertainty in the 2014 forecast estimate. The 2013 forecast was for a total run of approximately 5,330 fish while the preliminary estimated total run is approximately 2,150 fish, less than

one-half 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 early 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. See Table 2 for a description of each model.

Model	Forecast 2014	5-Year MAD[a]	5-Year MAPE[b]	5-Year MPE[c]
	Age-3			
5-year mean	**279**	155	**48**	16
Mean	86	185	69	69
Forecast estimate	**279**			
	Age-4			
5-year mean	1,323	1,494	362	90
Mean	1,632	765	110	-93
Median	**950**	755	**70**	-12
Mean sibling	1,919	3,327	375	-309
Median sibling	2,210	3,442	387	-320
Most recent sibling	226	1,359	109	-9
5-year mean sibling	672	2,844	249	-183
Forecast estimate	**950**			
	Age-5			
5-year mean	2,232	1,415	118	50
Mean	3,655	1,426	135	-132
Median	3,373	1,289	117	-106
Mean sibling	1,508	3,196	126	-125
Median sibling	1,455	2,959	117	-114
Most recent sibling	497	1,698	60	17
5-year mean sibling	**701**	967	**37**	10
Forecast estimate	**701**			
	Age-6			
5-year mean	2,657	3,113	144	-33
Mean	6,267	3,884	213	-213
Median	6,092	3,386	193	-193
Mean sibling	1,056	2,198	104	-100
Median sibling	953	1,811	84	-77
Most recent sibling (5's and 4's)	229	1,969	69	-34
Most recent sibling	**288**	984	**34**	-5
5-year mean sibling	492	1,165	46	-31
5-year mean sibling (5's and 4's)	552	1,988	73	-59
Forecast estimate	**288**			
	Age-7			
5-year mean	75	267	355	-124
Mean	448	409	623	-623
Median	363	346	527	-527
Mean sibling	54	128	201	-197
Median sibling	56	127	197	-193
Most recent sibling	**16**	62	**82**	-53
5-year mean sibling	26	103	138	-122
Forecast estimate	**16**			
TOTAL RUN FORECAST	**2,234**			

[a]mean absolute deviation
[b]mean absolute percent error
[c]mean percent error

Table 2.–Description of models used in forecasting the Kenai River Chinook salmon early 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 sibling(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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