MEMORANDUM

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

TO: Distribution DATE: 2/9/2015

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Division of Sport Fish

SUBJECT: Outlook for the Kenai River Chinook salmon late run

The outlook for the late run of Kenai River Chinook salmon in 2015 is well below average, with a forecast total run of approximately 22,115 fish. If realized, this run would be the 3rd lowest (28th out of 30 years of record), be a few thousand fish more than the 2013 and 2014 runs, and would be less than one-half of the 1986–2014 average run. If the 2015 forecast is realized, the 2015 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 2015 forecast were those that had the minimum mean absolute percent error (MAPE) in 2010 – 2014 hindcasts of forecasts, 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 873 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 (6,091) was selected. In 3 of the last 5 years returns of this age class have approximated this forecast.

The forecast of 5,081 age-5 fish (recent 5 year sibling model) is also the approximate mean of the return in the last 2 years. The MAPE for this forecast is very small at 18.

Age-6 fish are typically the predominant age class for late-run Kenai River Chinook salmon, and if the forecast is realized they will approximate 45% of the run. The recent 5 year sibling model (from age -5 and age-4) was used, and forecast a run of 9,809 age-6 fish. The MAPE and forecast from the recent 5 year mean sibling model (but using only age-5's) is almost identical.

For age-7 fish, the most recent sibling model had the least amount of error and forecast a run of 261 fish in 2015, nearly identical to the run in 2014. All of the sibling models had the lowest MAPE and all forecast a run of less than 500 fish.

There is some uncertainty in the 2015 forecast estimate. While the 2014 forecast and actual run both approximated 19,000, the 2013 actual run of approximately 19,800 fish was 33% less than the forecast of approximately 29,000 fish. 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 2015 forecast gives the expectation of a run in the below average category.

Table 1.–Chinook salmon forecasts for the 2015 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 2015	5-Year MAD[a]	5-Year MAPE[b]	5-Year MPE[c]
Age-3				
5-year mean	1,241	560	56	-38
Mean	**873**	511	**36**	14
Median	646	671	45	41
Forecast estimate	**873**			
Age-4				
5-year mean	6,252	3,750	88	-88
Mean	8,717	3,662	83	-76
Median	**6,091**	2,381	**49**	-32
Mean sibling	20,541	16,306	290	-290
Median sibling	13,459	8,554	154	-154
Most recent sibling	5,678	3,556	69	-39
5-year mean sibling	6,974	6,162	92	-74
Forecast estimate	**6,091**			
Age-5				
5-year mean	8,090	2,429	39	-32
Mean	12,360	4,822	79	-79
Median	10,780	3,171	55	-53
Mean sibling	7,441	5,379	58	-58
Median sibling	6,024	3,369	36	-32
Most recent sibling	4,952	1,788	25	-1
5-year mean sibling	**5,081**	1,316	**18**	13
Forecast estimate	**5,081**			
Age-6				
5-year mean	10,558	10,537	110	-110
Mean	31,269	23,251	251	-251
Median	30,683	20,878	228	-228
Mean sibling	18,400	12,387	128	-128
Median sibling	15,244	7,473	80	-80
Most recent sibling (5's and 4's)	11,102	6,606	69	-20
Most recent sibling	9,631	5,386	58	-21
5-year mean sibling	9,958	4,052	44	-39
5-year mean sibling (5's and 4's)	**9,809**	4,040	**43**	-29
Forecast estimate	**9,809**			
Age-7				
5-year mean	833	1,535	216	-216
Mean	2,423	1,729	320	-320
Median	1,564	1,025	190	-190
Mean sibling	455	185	36	-31
Median sibling	410	220	36	-21
Most recent sibling	**261**	253	**31**	-12
5-year mean sibling	397	341	53	-53
Forecast estimate	**261**			
TOTAL RUN FORECAST	**22,115**			

[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 late run, 2015.

Model	Description
5-year mean	Mean of the 2010-2014 run for the specified age class.
Mean	Mean using all brood years (1983-2008, except thru 2007 for age-7).
Median	Median return of all brood years (1983-2008, except thru 2007 for age-7).
Mean sibling	Mean of sibling ratios (age/age minus 1) for all returns (1983-2008 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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