

MEMORANDUM

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

TO: Distribution

DATE: 2/5/2016

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SUBJECT: Outlook for the 2016 Kenai River Chinook salmon late run

The outlook for the late run of Kenai River Chinook salmon in 2016 is below average, with a forecast total run of approximately 30,011 fish. If realized, this run would be the 5th lowest (26th out of 30 years of record), be comparable to the 2015 run, and would be slightly more than one-half of the 1986–2015 average. The 2016 forecasted run approximates the upper end of 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 2016 forecast were those that had the minimum mean absolute deviation (MAD) in 2011 – 2015 hindcasts of forecasts, as compared to the actual runs in those years. In cases where the 5-yr MAD was similar between models the 3-year MAD was considered. In recent forecast of Kenai River Chinook salmon run size models with the smallest MAD have provided the best forecast accuracy.

For age-3 fish, the recent 5-year mean forecast estimate was selected (a run of 1,211 fish) based on the smallest 3-yr MAD. Fewer models can forecast abundance for this age class because there are no prior sibling returns. This forecast is similar to 2013 and 2014 run sizes and smaller than the 2015 run size.

For age-4 fish, the median forecast estimate was selected (a run of 6,329 fish). This forecast is approximately 2,400 fish less than the 2015 run but approximately 1,800 more than the 2014 run.

For age-5 fish, the median sibling forecast estimate was selected (a run of 12,040 fish) based on the smallest 3-yr MAD. If realized, this forecast would be the largest return of age-5 fish since 2012.

For age-6 fish the recent 5-year mean sibling forecast estimate (from age-5 and age-4) was selected, a run of 9,517 fish. This forecast of age-6 fish is approximately 3,900 fish less than the 2015 run but 3,200 fish more than the 2014 run. 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 32% of the run in 2016.

For age-7 fish, the median sibling forecast estimate was selected, a run of 914 fish. If realized this would be similar to the run in 2015. All the sibling models had low MAD's and forecast a run of over 900 fish.

There is much uncertainty in the 2016 forecast estimate. The 80% prediction interval for the total run forecast is 18,201 to 41,823 fish. In 2014, the forecast was for a total run of approximately 19,700 fish while the estimated total run is approximately 18,900 fish, close to the forecast. The 2015 forecast was for a total run of approximately 22,100 fish while the preliminary estimated total run is approximately 32,900 fish, eleven thousand fish more than forecast. 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. The 2016 forecast gives the expectation of a run in the below average category.

Table 1.–Chinook salmon forecasts for the 2016 Kenai River late run using several models, and the fit of each model to the previous 5 years of actual runs. Shaded boxes indicate forecasts with the lowest associated 3- or 5-year MAD and hence were selected to be part of the total run forecast for each age class. Transparent boxes indicate the lowest MAD for each age class. See Table 2 for a description of each model.

Model	Forecast 2016	5-year			3-year		
		MAD ^a	MAPE ^a	MD ^b	MAD	MAPE	MD
Age-3							
Mean	918	470	37%	346	597	36%	597
5-year mean	1,211	495	52%	-155	383	24%	183
Forecast estimate	1,211						
Age-4							
Mean	8,721	3,116	75%	-2,259	2,390	47%	-2,390
5-year mean	6,719	2,978	74%	-2,005	2,433	42%	-811
Median	6,329	2,762	53%	166	1,584	25%	136
Mean sibling	34,588	16,084	278%	-16,084	10,007	168%	-10,007
5-year mean sibling	12,371	5,353	79%	-3,594	2,202	38%	730
Median sibling	22,929	8,192	145%	-8,192	4,395	77%	-4,395
Most recent sibling	14,345	3,952	74%	-815	4,916	88%	312
Forecast estimate	6,329						
Age-5							
Mean	12,205	5,226	86%	-5,226	6,383	114%	-6,383
5-year mean	7,546	2,172	36%	-1,468	2,018	41%	-2,018
Median	10,723	3,636	61%	-3,339	4,650	84%	-4,650
Mean sibling	14,272	3,107	37%	-2,984	1,482	24%	-1,277
5-year mean sibling	11,242	1,632	23%	1,528	1,556	26%	1,384
Median sibling	12,040	2,044	25%	-1,123	1,447	22%	88
Most recent sibling	14,843	2,149	31%	475	2,439	39%	505
Forecast estimate	12,040						
Age-6							
Mean	30,670	21,700	228%	-21,700	22,934	285%	-22,934
5-year mean	11,271	6,446	68%	-5,303	6,304	81%	-4,400
Median	30,394	19,913	210%	-19,913	21,609	268%	-21,609
Mean sibling	21,625	12,660	129%	-12,660	12,533	157%	-12,533
5-year mean sibling	11,501	4,579	48%	-3,128	5,779	68%	-3,362
Median sibling	18,035	7,743	83%	-7,743	8,372	107%	-8,372
Most recent sibling	16,110	5,714	59%	-2,108	6,531	79%	-1,500
5-year mean sibling (5's and 4's)	9,517	4,432	45%	-2,415	5,301	62%	-2,346
Most recent sibling (5's and 4's)	13,093	6,425	66%	-2,565	6,487	82%	-2,229
Forecast estimate	9,517						
Age-7							
Mean	2,374	1,843	336%	-1,843	1,883	412%	-1,883
5-year mean	721	1,124	187%	-1,067	640	148%	-545
Median	1,540	1,008	192%	-1,008	1,023	236%	-1,023
Mean sibling	970	243	42%	-32	379	67%	-27
5-year mean sibling	997	394	58%	-159	423	70%	-32
Median sibling	914	235	40%	15	374	64%	7
Most recent sibling	2,041	251	34%	48	367	49%	120
Forecast estimate	914						
TOTAL RUN FORECAST	30,011						

^amean absolute deviation

^bmean absolute percent error

^cmean deviation (actual-forecast)

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

Model	Description
Mean	Mean using all brood years ^a
5-year mean	Mean of the 2011-2015 run for the specified age class.
Median	Median return of all brood years
Mean sibling	Mean of sibling ratios (age/age minus 1) for all returns 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.
Median sibling	Median of sibling ratios (age/age minus 1) for all returns multiplied by return of age minus 1 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 (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.
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.

a-1983-2012 for age-3 fish, 1982-2011 for age-4 fish, 1981-2010 for age-5 fish, 1980-2009 for age-6 fish, and 1979-2008 for age-7 fish.

Distribution:

Headquarters: Kelley, Bowers, Taube

Anchorage: Brookover, Hasbrouck, Vania, Erickson, Fleischman, M. Miller, J. Miller, Bosch, Thalhauser, Baumer, Lingnau, Baker, Volk

Palmer: Ivey, Oslund, Yanusz, St. Saviour, Campbell, Cleary

Homer: Kerkvliet, Booz

Soldotna: Eskelin, Key, Massengill, Begich, Pawluk, Cope, Willette, Shields, Dupuis