

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES
NEWS RELEASE



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Date Issued: Nov. 21, 2017

2018 UPPER COOK INLET SOCKEYE SALMON FORECAST

The forecasts of the 2018 Upper Cook Inlet sockeye salmon run and harvests are as follows:

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	4.6	3.6–5.5
Escapement	2.0	
UCI Commercial Harvest	1.9	
Other UCI Harvests	0.7	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet (UCI) are the Kenai, Kasilof, and Susitna rivers, and Fish Creek. Available escapement (spawner abundance), return, sibling, fry, and smolt data were examined for each system. Four models were evaluated to forecast the total run of sockeye salmon to UCI in 2018: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fall fry, (3) the relationship between adult returns and smolts, and (4) the relationship between sibling adult returns. Several forecast models were evaluated for each stock and age class. Models providing the smallest mean absolute percent error (MAPE) between the forecast and actual runs over the past 10 years were typically selected. Forecast model predictions were compared to evaluate uncertainty.

The return of age-1.3 Kenai River sockeye salmon in 2018 was forecasted using a sibling model. The sibling-model prediction of the return of age-1.3 salmon is based on the abundance of age-1.2 salmon that returned in 2017. A spawner-recruit model predicts the age-1.2 salmon return based upon the spawning escapement in 2014. The Kenai River return of age-2.2 salmon was forecasted using a sibling model based upon the abundance of age-2.1 salmon that returned in

2017, and the return of age-2.3 salmon was forecasted using a fry model based upon the abundance of age-1 fry rearing in Skilak and Kenai lakes in the fall of 2014. The returns of age-1.2, -1.3, and -2.2 Kasilof River sockeye salmon in 2018 were forecasted using sibling models based upon returns of age-1.1, -1.2, and -2.1 salmon in 2017. A smolt model based upon age-1 smolt abundance in 2015 was used to forecast the return of age-2.3 Kasilof River sockeye salmon in 2018.

The returns of age-0.3, -1.2, -1.3, -2.2 and -2.3 Susitna River sockeye salmon were forecasted using mean return per spawner by age class for brood years 2006–2013. Mark-recapture estimates of inriver run and genetic estimates of commercial harvest were available for these brood years.

The sockeye salmon forecast for unmonitored systems in UCI was estimated as 17% of the aggregate forecast for the four monitored stocks. Unmonitored stocks include Crescent River, Big River, McArthur River, Chilligan River, Coal Creek, Cottonwood Creek, Wasilla Creek, Eagle River, and many other smaller systems in the area. The fraction of the total run destined for unmonitored systems was estimated using genetic estimates of the stock composition of offshore test fishery harvests.

The total harvest by all user groups was estimated by subtracting the aggregate escapement from the total run forecast for all stocks. Aggregate escapement was estimated from the sum of the midpoints of the escapement goal ranges for each of the monitored sockeye salmon-producing systems and the escapement into unmonitored systems, which was estimated as 17% of the escapement into monitored systems. Commercial harvest was estimated from the average fraction (2011–2015) of total harvest taken in the commercial fishery. The harvest by all other user groups (sport, personal use, and subsistence) was estimated by subtracting commercial harvest from total harvest.

The total UCI run forecast range was calculated by multiplying the forecast by the MAPE of the actual UCI runs from published UCI run forecasts from 2008 through 2017.

2017 Run and Forecast

In 2017, the commercial harvest of sockeye salmon in UCI (1.8 million) was 0.1 million greater than the preseason forecast of 1.7 million. In 2017, the estimated total run was 2.9 million to the Kenai River; 817,000 to the Kasilof River; 306,000 to the Susitna River; and 83,000 to Fish Creek. The 2017 run forecast was 2.2 million to the Kenai River; 825,000 to the Kasilof River; 366,000 to the Susitna River; and 75,000 to Fish Creek. Overall, the 2017 sockeye salmon run (4.6 million) was 15% above forecast (4.0 million), largely due to the above forecast Kenai River sockeye salmon run.

Forecast Discussion

In 2018, a run of approximately 4.6 million sockeye salmon is forecasted to return to UCI with a commercial harvest of 1.9 million. The forecasted commercial harvest in 2018 is 0.9 million less than the 20-year average harvest.

The run forecast for the Kenai River is approximately 2.5 million, which is 1.1 million less than the 20-year average run of 3.6 million. A sibling model based upon the return of age-1.2 salmon in 2017 (201,000; 391,000 20-year average) predicted a return of 1.2 million age-1.3 salmon. A fry model based upon the abundance of age-0 fry rearing in Skilak and Kenai lakes in the fall of 2014 (16.2 million; 17.3 million 20-year average) and the average weight of age-0 fall fry

rearing in Skilak Lake (0.8 grams; 1.1 grams 20-year average) predicted a return of 1.1 million age-1.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (21%) than the fry model (26%). A fry model based upon the abundance of age-1 fry rearing in Skilak and Kenai lakes in the fall of 2014 (1.4 million; 2.1 million 20-year average) predicted a return of 718,000 age-2.3 salmon in 2018. A sibling model based upon the return of age-2.2 salmon in 2017 (89,000; 247,000 20-year average) predicted a return of 315,000 age-2.3 salmon. The fry model was used for this forecast, because the 10-year MAPE was lower for the fry (37%) than the sibling model (49%). The predominant age classes in the 2018 run forecast are age 1.2 (17%), age 1.3 (47%) and age 2.3 (29%). The 10-year MAPE for the set of models used for the 2018 Kenai sockeye salmon run forecast is 14%.

The Kasilof River sockeye salmon run forecast is 866,000, which is 11% less than the 20-year average of 971,000. A sibling model based upon the return of age-1.2 salmon in 2017 (295,000; 313,000 20-year average) was used to forecast a return of 294,000 age-1.3 salmon in 2018. A smolt model based upon the abundance of age-1 smolt in 2015 (5.3 million; 4.3 million 20-year average) predicted a return of 320,000 age-1.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (31%) than the smolt model (64%). A sibling model based upon the return of age-1.1 salmon in 2017 was used to forecast a return of 254,000 age-1.2 salmon in 2018. A spawner-recruit model based upon spawner abundance in 2014 forecasted a return of 278,000 age-1.2 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (47%) than the spawner-recruit model (61%). A sibling model based upon the return of age-2.1 salmon in 2017 was used to forecast a return of 226,000 age-2.2 salmon in 2018. A spawner-recruit model forecast for age-2.2 salmon was 294,000. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (16%) than the spawner-recruit model (19%). The predominant age classes in the 2018 run forecast are age 1.2 (29%), age 1.3 (34%), and age 2.2 (26%). The 10-year MAPE for the set of models used for the 2018 Kasilof sockeye salmon run forecast is 21%.

The Susitna River sockeye salmon run forecast is 329,000, which is 18% less than the 10-year average of 398,000. This forecast was derived using mean return per spawner by age class and mark-recapture estimates of spawner abundance for brood years 2006–2014. Sonar estimates of spawner abundance were not used, because mark-recapture studies have shown that the Yentna sonar project underestimated sockeye salmon escapement causing estimates of adult returns to also be underestimated. The 5-year MAPE for this forecast method is 17%. The predominant age classes in the 2018 Susitna sockeye salmon run forecast are age 1.2 (20%) and age 1.3 (57%).

The Fish Creek sockeye salmon run forecast is 211,000, which is 276% greater than the 20-year average run of 76,000. A sibling model based upon the return of age-1.1 salmon in 2017 (15,000; 3,000 20-year average) was used to forecast a return of 164,000 age-1.2 salmon. A spawner-recruit model forecasted a return of 68,000 age-1.2 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (94%) than the spawner-recruit model (143%). Sibling models were also used to forecast the returns of age-1.3, -2.2 and -2.3 salmon. The predominant age classes in the 2018 Fish Creek run forecast are age 1.2 (78%) and age 1.3 (11%). The 10-year MAPE for the Fish Creek sockeye salmon run forecast is 69%.

Table 1.- Sockeye salmon run forecasts, 20-year average runs and escapement goals (in thousands of fish) to individual freshwater systems in Upper Cook Inlet:

System		Major Age Classes				Total	Escapement
		1.2	1.3	2.2	2.3	Run ^a	Goals ^b
Kenai River	Forecast	428	1,167	127	718	2,485	1,000 – 1,300^c
	20-yr average	391	2,072	247	768	3,556	
Kasilof River	Forecast	254	294	226	75	866	160 – 340
	20-yr average	313	312	244	83	971	
Susitna River	Forecast	67	186	24	20	329	No Goal^d
	20-yr average	93	193	27	43	398	
Fish Creek	Forecast	164	23	11	1	211	15 – 45
	20-yr average	43	20	6	3	76	
Unmonitored	Forecast	156	286	66	139	665	No Goal
	20-yr average	144	444	89	153	855	
Total Run	Forecast	1,069	1,956	454	953	4,556	
	20-yr average	984	3,041	613	1,050	5,856	

Note: BEG = Biological Escapement Goal, SEG = Sustainable Escapement Goal.

^a Total run includes all age classes.

^b Goals listed here are as follows, Kenai River: Inriver; Kasilof River: BEG; Susitna River: SEG (weir goals); and Fish Creek: SEG.

^c This is the inriver sockeye salmon goal for runs between 2.3 and 4.6 million measured using sonar at river mile 19 on the Kenai River.

^d Susitna sockeye salmon are managed to achieve escapement goals at Larson, Chelatna and Judd lakes. Current escapement goals for these lakes are: Larson (15,000–35,000), Chelatna (20,000–45,000) and Judd (15,000–40,000).

OTHER SALMON SPECIES

The forecast of the 2018 commercial harvest of other salmon species is as follows:

Commercial Harvest Forecasts	
Pink Salmon	389,000
Chum Salmon	177,000
Coho Salmon	203,000
Chinook Salmon	7,400

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2018. The forecast for pink salmon is based upon the average harvest during the past 5 even-numbered years.

Forecast Discussion

The recent 5-year average commercial harvest was used in the forecast, because harvests in these years likely best represent harvests under current regulations with a sockeye salmon run below average.

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