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

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2017 UPPER COOK INLET SOCKEYE SALMON FORECAST

The forecast of the 2017 Upper Cook Inlet sockeye salmon run is as follows:

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	4.0	3.2–4.8
Escapement	1.4	
Commercial Harvest	1.7	
Other Harvests	0.9	

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 2017: (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 2017 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 2016. A spawner-recruit model predicts the age-1.2 salmon return based upon the spawning escapement in 2013. The Kenai River returns of age-2.2 and -2.3 salmon were forecasted using sibling models based upon the abundances of age-2.1 and -2.2

salmon that returned in 2016. The returns of age-1.3, -2.2 and -2.3 Kasilof River sockeye salmon in 2017 were forecasted using sibling models based upon returns of age-1.2, -2.1 and -2.2 salmon in 2016. A smolt model based upon age-1 smolt abundances in 2015 was used to forecast the return of age-1.2 Kasilof River sockeye salmon in 2017.

The returns of age-0.3, -1.2, -2.2 and -2.3 Susitna River sockeye salmon were forecasted using mean return per spawner by age class for brood years 2006–2012. Mark–recapture estimates of inriver run and genetic estimates of commercial harvest were available for these brood years. A sibling model based upon the abundance of age-1.2 salmon returning in 2016 was used to forecast the return on age-1.3 Susitna River sockeye salmon.

The sockeye salmon forecast for unmonitored systems in UCI was estimated as 17% of the aggregate forecast for the 4 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. The harvest by all other user groups (sport, personal use, and subsistence) was estimated using a relationship between 'other harvests' and total run. Commercial harvest was estimated by subtracting 'other harvests' 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 2007 through 2016.

2016 Run and Forecast

In 2016, the harvest of sockeye salmon by all user groups in UCI (3.3 million) was 2.0 million less than the preseason forecast of 5.3 million. In 2016, the total run was 3.7 million to the Kenai River; 607,000 to the Kasilof River; 390,000 to the Susitna River; and 64,000 to Fish Creek. The 2016 run forecast was 4.7 million to the Kenai River; 861,000 to the Kasilof River; 372,000 to the Susitna River; and 110,000 to Fish Creek. Overall, the 2016 sockeye salmon run was 26% below forecast, largely due to the below forecast Kenai sockeye salmon run.

Forecast Discussion

In 2017, a run of approximately 4.0 million sockeye salmon is forecasted to return to UCI with a commercial harvest of 1.7 million. The forecasted commercial harvest in 2017 is 1.2 million less than the 20-year average harvest.

The run forecast for the Kenai River is approximately 2.2 million, which is 1.4 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 2016 (239,000; 399,000 20-year average) predicted a return of 1.3 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 2013 (9.5 million; 17.7 million 20-year average) and the average weight of fall fry rearing in Skilak Lake predicted a return of 1.6 million age-1.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (26%) than the fry model (27%). A sibling model based upon the return of age-2.2 salmon in 2016 (128,000; 249,000

20-year average) predicted a return of 322,000 age-2.3 salmon in 2016. A fry model based upon the abundance of age-1 fry rearing in Skilak Lake in fall 2013 (2.9 million) predicted a return of 625,000 age-2.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (44%) than the fry model (52%). The predominant age classes in the 2017 run forecast are age 1.3 (60%), age 1.2 (16%), and age 2.3 (15%). The 10-year MAPE for the set of models used for the 2017 Kenai sockeye salmon run forecast is 20%.

The Kasilof River sockeye salmon run forecast is 825,000 which is 16% less than the 20-year average of 987,000. A sibling model based upon the abundance of age-1.2 salmon in 2016 (167,000; 306,000 20-year average) was used to forecast a return of 231,000 age-1.3 salmon in 2017. A spawner-recruit model predicted a return of 292,000 age-1.3 salmon, no smolt data was available for this forecast. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (37%) than the spawner-recruit model (79%). A smolt model based upon the abundance of age-1 smolts emigrating from the Kasilof River in 2015 (5.3 million; 4.1 million 20-year average) was used to forecast a return of 282,000 age-1.2 salmon in 2017. A sibling model based upon the abundance of age-1.1 salmon in 2016 forecasted a return of 239,000 age-1.2 salmon. The smolt model was used for this forecast, because the 10-year MAPE was lower for the smolt (54%) than the sibling model (56%). A sibling model based upon the abundance of age-2.1 salmon in 2016 was used to forecast a return of 203,000 age-2.2 salmon in 2017. A smolt model forecast for age-2.2 salmon was 357,000. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (16%) than the smolt model (35%). The predominant age classes in the 2017 run forecast are age 1.2 (34%), age 1.3 (28%), and age 2.2 (25%). The 10-year MAPE for the set of models used for the 2017 Kasilof sockeye salmon run forecast is 12%.

The Susitna River sockeye salmon run forecast is 366,000, which is 5% less than the 10-year average of 387,000. This forecast was derived using mean return per spawner by age class and mark–recapture estimates of spawner abundance for brood years 2006–2012. 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 4-year MAPE for this forecast method is 17%. The predominant age classes in the 2017 Susitna sockeye salmon run forecast are age 1.2 (20%), age 1.3 (53%) and age 2.3 (12%).

The Fish Creek sockeye salmon run forecast is 75,000, which is 11% less than the 20-year average of 84,000. A sibling model was used to forecast the return of age-1.3 salmon, and smolt models were used to forecast returns age-1.2, -2.2 and -2.3 salmon in 2017. The predominant age classes in the 2017 Fish Creek run forecast are age 1.2 (64%) and age 1.3 (23%). The 10-year MAPE for the Fish Creek sockeye salmon run forecast is 70%.

Sockeye salmon run forecasts, 20-year average runs and escapement goals (in thousands of fish) to individual freshwater systems are as follows:

		Major Age Classes				Total		Escapement
System		1.2	1.3	2.2	2.3	Run		Goals[a]
Kenai River	**Forecast**	**345**	**1,299**	**161**	**322**	**2,164**		**900 – 1,100[b]**
	20-yr average	399	2,185	249	737	3,634		
Kasilof River	**Forecast**	**282**	**231**	**203**	**81**	**825**		**160 – 340**
	20-yr average	306	325	240	83	987		
Susitna River	**Forecast**	**75**	**194**	**12**	**44**	**366**		**See Below[c]**
	20-yr average	79	221	26	42	387		
Fish Creek	**Forecast**	**48**	**17**	**1**	**1**	**75**		**See Below[d]**
	20-yr average	44	22	6	3	84		
Unmonitored	**Forecast**	**128**	**298**	**65**	**76**	**586**		**No Goal**
	20-yr average	141	471	89	148	871		
Total Run	**Forecast**	**877**	**2,039**	**411**	**523**	**4,016**		
	20-yr average	968	3,223	610	1,013	5,961		

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

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

[b] This is the inriver sockeye salmon goal for runs less than 2.3 million measured using sonar at river mile 19 on the Kenai River.

[c] Susitna sockeye salmon are managed to achieve escapement goals at Larson, Chelatna and Judd lakes. Current escapement goals for these lakes are (in thousands of fish): Larson (15–50), Chelatna (20–65) and Judd (25–55), and recommended escapement goal ranges are: Larson (15–35), Chelatna (20–45) and Judd (15–40).

[d] The current escapement goal for Fish Creek sockeye salmon is (in thousands of fish): 20–70 and the recommended escapement goal range is 15–45.

OTHER SALMON SPECIES

The forecast of the 2017 commercial harvest of other salmon species is as follows:

	Commercial Harvest Forecasts
Pink Salmon	98,000
Chum Salmon	184,000
Coho Salmon	167,000
Chinook Salmon	6,300

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2017. The forecast for pink salmon is based upon the average harvest during the past 5 odd-numbered years.

Forecast Discussion

The recent 5-year average commercial harvest was used in the forecast, because regulatory changes have substantially restricted harvests of these species in recent years.

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