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

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2019 UPPER COOK INLET SOCKEYE SALMON FORECAST

The forecasts of the 2019 Upper Cook Inlet sockeye salmon run and harvests are as follows:

	Forecast estimate (millions)	Forecast range (millions)
TOTAL PRODUCTION:		
Total run	6.0	4.8–7.3
Escapement	2.0	
UCI commercial harvest	3.0	
Other UCI harvests	1.0	

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. To forecast the total return of sockeye salmon to UCI in 2019, up to four models were used to evaluate each stock and major age class: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fall fry, (3) the relationship between adult returns and emigrating smolt, 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 selected. Forecast model predictions were compared to evaluate uncertainty.

The return of age-1.3 Kenai River sockeye salmon in 2019 was forecasted using a fry model. The fry-model prediction of the return of age-1.3 salmon is based on the abundance estimates of age-0 sockeye salmon fry that reared in Kenai and Skilak lakes in 2015. A spawner-recruit model was used to predict the age-1.2 salmon return based upon the spawning escapement in 2015. 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 2018, and the return of age-2.3 salmon was forecasted using a sibling model based upon the abundance of age-2.2 salmon that returned in 2018.

The returns of age-1.2, -1.3, -2.2, and -2.3 Kasilof River sockeye salmon in 2019 were all forecasted using sibling models based upon returns of age-1.1, -1.2, -2.1, and -2.2 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 2006–2015. 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 potential 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 2019 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 2009–2018. The run forecast ranges for Kenai, Kasilof, and Susitna rivers and Fish Creek were calculated by multiplying each system's forecast by the 10-year (2009–2018) MAPE for that watershed (Table 1).

2018 Run and Forecast

In 2018, the estimated total run was 1.7 million to the Kenai River; 697,000 to the Kasilof River; 250,000 to the Susitna River; and 106,000 to Fish Creek. The 2018 total run forecast was 2.5 million to the Kenai River; 866,000 to the Kasilof River; 329,000 to the Susitna River; and 211,000 to Fish Creek. In 2018, the commercial harvest of sockeye salmon in UCI (0.8 million) was 1.1 million less than the preseason forecast of 1.9 million. Overall, the 2018 sockeye salmon run of 3.1 million was approximately 1.5 million below the mid-point forecast of 4.6 million (range 3.6–5.5 million).

Forecast Discussion

In 2019, a total run of approximately 6.0 million sockeye salmon (range 4.8–7.3 million) is forecast to return to UCI with a potential commercial harvest of 3.0 million. The forecasted commercial harvest in 2019 is 200,000 more than the 20-year average harvest.

The run forecast for the Kenai River is approximately 3.8 million sockeye salmon (range 3.1–4.5 million), which is approximately 200,000 fish greater than the 20-year average run of 3.6

million. A fry model based upon the age-0 fry rearing in Kenai and Skilak lakes in 2015 (22.2 million compared to the 20-year average of 18.2 million) and the average weight of age-0 fall fry rearing in Skilak Lake (1.0 grams compared to the 20-year average of 1.1 grams) predicts a return of 2.7 million age-1.3 salmon in 2019. In contrast, a sibling model from the return of age-1.2 salmon in 2018 predicted a return of 3.1 million age-1.3 salmon. The fry-model was selected for this forecast because the 10-year MAPE was lower for the fry model (27%) compared to the sibling model (29%). A sibling model based upon the return of age-2.2 salmon in 2018 (202,000 vs. 20-year average of 247,000) predicted a return of 442,000 age-2.3 fish. A fry model based upon the abundance of age-1 fry rearing in Skilak and Kenai lakes in the fall of 2015 (996,000 vs. 20-year average of 2.1 million) predicted a return of 345,000 age-2.3 fish. The sibling model was selected for the forecast because the 10-year MAPE was lower for this method (82%) compared to the fry model (124%). The predominant age classes in the 2019 run forecast are age-1.2 (10%), age-1.3 (71%) and age-2.3 (12%). The 10-year MAPE for the set of models used for the 2019 Kenai sockeye salmon run forecast is 19%.

The Kasilof River sockeye salmon run forecast is approximately 873,000 (range 0.7–1.0 million), which is 11% less than the 20-year average of 979,000. A sibling model based upon the return of age-1.2 salmon in 2018 (355,000 vs. 20-year average of 321,000) was used to forecast a return of 320,000 age-1.3 salmon in 2019 with a corresponding MAPE of 56%. A sibling model based upon the return of age-1.1 salmon in 2018 was selected to forecast a return of 237,000 age-1.2 salmon in 2019; in contrast, a spawner-recruit model based upon spawner abundance in 2015 forecasted a return of 329,000 age-1.2 salmon in 2019. The sibling model was selected for this forecast because the 10-year MAPE was lower for the sibling (44%) than the spawner-recruit model (61%). A sibling model based upon the return of age-2.1 salmon in 2018 was used to forecast a return of 200,000 age-2.2 salmon in 2019. A spawner-recruit model forecast for age-2.2 salmon was 255,000. The sibling model was selected for this forecast, because the 10-year MAPE was lower for the sibling model (14%) compared to the spawner-recruit model (20%). The predominant age classes in the 2019 run forecast are age 1.2 (27%), age 1.3 (37%), and age 2.2 (30%). The 10-year MAPE for the set of models used for the 2019 Kasilof sockeye salmon run forecast is 19%.

The Susitna River sockeye salmon run forecast is approximately 343,000 (range 233,000–422,000) fish, which is 16% less than the 20-year average of 409,000. This forecast was derived using mean return per spawner by age class and mark-recapture estimates of spawner abundance for brood years 2006–2014. The 10-year MAPE for this forecast method is 32%. The predominant age classes in the 2019 Susitna sockeye salmon run forecast are age-1.2 (45%) and age-1.3 (40%).

The Fish Creek sockeye salmon run forecast is 124,000 (range 38,000–210,000) fish, which is 50% greater than the 20-year average run of 83,000. A sibling model based upon the return of age-1.1 salmon in 2018 (4,000 vs. 20-year average of 3,000) was used to forecast a return of 72,000 age-1.2 salmon. A spawner-recruit model forecasted a return of 98,000 age-1.2 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (64%) than the spawner-recruit model (106%). 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 2019 Fish Creek run forecast are age 1.2 (57%) and age 1.3 (30%). 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 run[a]	Total run range	Escapement goals[b]
		1.2	1.3	2.2	2.3			
Kenai River	**Forecast**	**382**	**2,691**	**231**	**442**	**3,814**	**3,089 – 4,539**	**1,000 – 1,300[c]**
	20-yr average	402	2,064	247	759	3,545		
Kasilof River	**Forecast**	**237**	**320**	**200**	**97**	**873**	**707 – 1,039**	**160 – 340**
	20-yr average	321	308	250	81	979		
Susitna River	**Forecast**	**154**	**137**	**17**	**19**	**343**	**233 – 422**	**Lake goals[d]**
	20-yr average	91	179	26	37	377		
Fish Creek	**Forecast**	**72**	**27**	**11**	**2**	**124**	**38 – 210**	**15 – 45**
	20-yr average	47	19	6	2	83		
Unmonitored	**Forecast**	**144**	**543**	**79**	**96**	**881**		**No goal**
	20-yr average	147	439	90	150	852		
Total run	**Forecast**	**989**	**3,718**	**538**	**656**	**6,035**		
	20-yr average	1,008	3,009	619	1,029	5,821		

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 weirs. 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 2019 commercial harvest of other salmon species is as follows:

	Commercial harvest forecasts
Pink salmon	103,000
Chum salmon	175,000
Coho salmon	207,000
Chinook salmon	7,300

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2019. The forecast for pink salmon is based upon the average harvest during the previous 5 odd-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.

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