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

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2016 UPPER COOK INLET SOCKEYE SALMON FORECAST

The forecast of the 2016 Upper Cook Inlet sockeye salmon run is as follows:

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	7.1	5.6–8.6
Escapement	1.8	
Commercial Harvest	4.1	
Other Harvests	1.2	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet (UCI) are the Kenai, Kasilof, Susitna, and Crescent rivers, and Fish Creek. Available escapement (spawner abundance), return, sibling, fry, and smolt data, if available, were examined for each system. Four models were evaluated to forecast the total run of sockeye salmon to UCI in 2016: (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 2016 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 2015. A spawner-recruit model predicts the age-1.2 salmon return based upon the spawning escapement in 2012. The Kenai River return of age-2.3 salmon was forecasted using a smolt model based upon age-2 smolt abundances available after brood year

2002 and age-1 fall fry abundances available for brood years 1984–2002. The returns of age-1.2, -1.3 and -2.2 Kasilof River sockeye salmon in 2016 were forecasted using sibling models based upon returns of age-1.1, -1.2 and -2.1 salmon in 2015. A smolt model based upon age-2 smolt abundances in 2013 was used to forecast the return of age-2.3 Kasilof River sockeye salmon in 2016.

The total run of Susitna River sockeye salmon was forecasted using mean return per spawner by age class for brood years 2006–2011. 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 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 commercial harvest was estimated from the fraction of total harvest taken in the commercial fishery in relation to run sizes in 2010–2014. The harvest by all other user groups (sport, personal use, and subsistence) was estimated by subtracting commercial harvest from total harvest.

The total run forecast range was calculated by multiplying the forecast by the MAPE of the actual runs from published forecast runs from 2006 through 2015.

Forecast Discussion

In 2015, the harvest of sockeye salmon by all user groups in UCI (3.6 million) was 0.1 million less than the preseason forecast of 3.7 million. In 2015, the total run was 3.9 million to the Kenai River; 1,168,000 to the Kasilof River; 435,000 to the Susitna River; and 120,000 to Fish Creek. The 2015 run forecast was 3.6 million to the Kenai River; 1,092,000 to the Kasilof River; 276,000 to the Susitna River; and 61,000 to Fish Creek.

A run of approximately 7.1 million sockeye salmon is forecasted to return to UCI in 2016, with a commercial harvest of 4.1 million. The forecasted commercial harvest in 2016 is 1.1 million greater than the 20-year average harvest.

The run forecast for the Kenai River is approximately 4.7 million, which is 1.0 million greater than the 20-year average run of 3.7 million. A sibling model based upon the return of age-1.2 salmon in 2015 (534,000; 404,000 20-year average) predicted a return of 3.1 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 2012 (23.6 million; 17.3 million 20-year average) predicted a return of 2.6 million age-1.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (27%) than the fry model (55%). A sibling model based upon the return of age-2.2 salmon in 2015 predicted a return of 413,000 age-2.3 salmon in 2016. A smolt model based upon the abundance of age-2 smolt emigrating from the Kenai River in spring 2013 (5.6

million) predicted a return of 1.0 million age-2.3 salmon. The smolt model was used for this forecast, because the 10-year MAPE was lower for the smolt (38%) than the sibling model (46%). The predominant age classes in the 2016 run forecast are age 1.3 (65%), age 1.2 (8%), and age 2.3 (21%). The 10-year MAPE for the set of models used for the 2016 Kenai sockeye salmon run forecast is 20%.

The Kasilof River sockeye salmon run forecast is 861,000, which is 13% less than the 20-year average of 987,000. A sibling model based upon the abundance of age-1.2 salmon in 2015 was used to forecast a return of 215,000 age-1.3 salmon in 2016. The smolt model predicted a return of 288,000 age-1.3 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (33%) than the smolt model (55%). A sibling model based upon the abundance of age 1.1 salmon in 2015 was used to forecast a return of 262,000 age-1.2 salmon in 2016. A spawner-recruit model based upon the abundance of spawners in 2012 forecasted a return of 248,000 age-1.2 salmon. The sibling model was used for this forecast, because the 10-year MAPE was lower for the sibling (56%) than the spawner-recruit model (59%). A sibling model based upon the abundance of age-2.1 salmon in 2015 was used to forecast a return of 256,000 age-2.2 salmon in 2016. A spawner-recruit model forecast for age-2.2 salmon was 214,000. The sibling model was used for this forecast, because the 5-year MAPE was lower for the sibling (12%) than the spawner-recruit model (22%). The predominant age classes in the 2016 run forecast are age 1.2 (31%), age 1.3 (25%), and age 2.2 (30%). The 10-year MAPE for the set of models used for the 2016 Kasilof sockeye salmon run forecast is 17%.

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

System		Major Age Classes				Total Run	Escapement Goals[a]
		1.2	1.3	2.2	2.3		
Kenai River	**Forecast**	**370**	**3,061**	**225**	**992**	**4,731**	**1,100 – 1,350[b]**
	20-yr average	404	2,217	255	701	3,652	
Kasilof River	**Forecast**	**262**	**215**	**256**	**113**	**861**	**160 – 340**
	20-yr average	307	339	239	84	987	
Susitna River	**Forecast**	**42**	**249**	**28**	**23**	**372**	**No Goal[c]**
	20-yr average	97	215	27	23	421	
Fish Creek	**Forecast**	**63**	**32**	**9**	**2**	**110**	**20 – 70**
	20-yr average	48	21	8	3	84	
Unmonitored	**Forecast**	**126**	**608**	**88**	**193**	**1,039**	**No Goal**
	20-yr average	146	477	91	139	880	
Total Run	**Forecast**	**863**	**4,166**	**606**	**1,323**	**7,113**	
	20-yr average	1,003	3,269	619	950	6,023	

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 measured using sonar at river mile 19 on the Kenai River.

[c] Susitna sockeye salmon are managed to achieve escapement goals (in thousands of fish) at Larson (15–50), Chelatna (20-65), and Judd (25–55) lakes.

The Susitna River sockeye salmon run forecast is 372,000, which is 12% less than the 10-year average of 421,000. This forecast was derived using mean return per spawner by age class for brood years 2006–2011 and mark–recapture estimates of spawner abundance in 2010-2012. 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 3-year MAPE for this forecast method is 21%. The predominant age classes in the 2016 Susitna sockeye salmon run forecast are age 1.2 (11%) and age 1.3 (67%).

The Fish Creek sockeye salmon run forecast is 110,000, which is 31% greater than the 20-year average of 84,000. Sibling models were used to forecast the returns age-1.2, -1.3, -2.2 and -2.3 salmon in 2016. The predominant age classes in the 2016 Fish Creek run forecast are age 1.2 (57%) and age 1.3 (29%). The 10-year MAPE for the Fish Creek sockeye salmon run forecast is 62%.

OTHER SALMON SPECIES

The forecast of the 2016 commercial harvest of other salmon species is as follows:

	Commercial Harvest Forecasts
Pink Salmon	393,000
Chum Salmon	184,000
Coho Salmon	160,000
Chinook Salmon	6,700

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2016. 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 regulatory changes have substantially restricted harvests of these species in recent years.

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