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

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2013 UPPER COOK INLET SOCKEYE SALMON FORECAST

The preliminary forecast of the 2013 Upper Cook Inlet sockeye salmon run is as follows:

	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	6.7	4.3–10.8
Escapement	1.8	
Harvest	4.9	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet (UCI) are the Kenai, Kasilof, Susitna, and Crescent rivers, and Fish Creek. Escapement (spawner abundance), return, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the run of sockeye salmon to UCI in 2013: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and 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 generally used. In most cases, these were sibling models. Forecast model predictions based on spawners, fry, smolt, or siblings were compared to evaluate uncertainty.

The returns of ages 1.3 and 2.2 sockeye salmon to the Kenai River in 2013 were forecasted using sibling models. For example, the sibling-model prediction of the return of age-1.3 salmon was based on the abundance of age-1.2 salmon in 2012. A spawner-recruit model prediction of the age-1.2 salmon return was based upon escapement in 2009. The return of age-2.3 salmon to the Kenai River was forecasted using a fry-smolt model based upon age-1 fall fry abundance in Skilak and Kenai lakes and smolt data when available (after brood year 2002). The returns of age-1.3 and 2.2 sockeye salmon to the Kasilof River were forecasted using sibling models based

upon the abundance of age-1.2 and 2.1 salmon in 2012. A spawner-recruit model was used to forecast the return of age-1.2 salmon, and a smolt model was used to forecast the return of age-2.3 salmon to the Kasilof River.

The total run of Susitna River sockeye salmon was forecasted using mean return per spawner by age class for brood years 2006–2007. 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 15% of the aggregate forecast for the 5 major stocks. 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 2013 total harvest by all user groups was estimated by subtracting the aggregate escapement from the total run forecast for all stocks. Aggregate escapements were estimated from the sum of the midpoints of the escapement goal ranges for each of the major sockeye salmon-producing systems in UCI and the escapement into unmonitored systems (estimated as 15% of the aggregate escapement into monitored systems). The estimated sport harvest upstream of the sonar at river mile 19 on the Kenai River was subtracted from the aggregate escapement into monitored systems. The total run forecast range was calculated by multiplying the forecast with the upper and lower values of the percent error of the actual runs from published forecast runs from 2003 through 2012.

Forecast Discussion

In 2012, the harvest of sockeye salmon by all user groups in UCI was equal to the preseason forecast of 4.4 million. In 2012, the total run was 4.7 million to the Kenai River: 788,000 to the Kasilof River; 305,000 to the Susitna River; 89,000 to the Crescent River; and 32,000 to Fish Creek. The 2012 run forecast was 4.0 million to the Kenai River: 754,000 to the Kasilof River; 443,000 to the Susitna River; 81,000 to the Crescent River; and 84,000 to Fish Creek.

A run of 6.7 million sockeye salmon is forecasted to return to UCI in 2013, with a harvest by all user groups of 4.9 million. The forecasted harvest in 2013 is 1.1 million fish above the 20-year average harvest of 3.8 million by all user groups.

The run forecast for the Kenai River is approximately 4.4 million, which is 13% greater than the 20-year average run of 3.8 million. Age-1.3 salmon typically comprise about 56% of the run to the Kenai River. A sibling model based upon the return of age-1.2 salmon in 2012 (423,000; 20-year average is 371,000) predicted a return of 2.0 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 2009 (10.7 million; 20-year average is 18.2 million) 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 model (26%) than the fry model (53%). Age-2.3 salmon typically comprise about 20% of the run to the Kenai River. A sibling model based upon the return of age-2.2 salmon in 2012 (513,000; 20-year average is 256,000) predicted a return of 1,227,000 age-2.3 salmon in 2013. A fry-smolt model based upon the abundance of age-2 smolt emigrating from the Kenai River in spring 2010 (5.9 million: 95% confidence interval 5.0–6.7 million) predicted a return of 1.5 million age-2.3 salmon. The fry-smolt model was used for this forecast due to the high age-2 smolt abundance in 2010 and the failure of the sibling model to accurately predict large returns of age-2.3 salmon like that seen in 2011–2012. The forecasted age-2.3 return is 194% greater

than the 20-year average return for this age class (760,800). The predominant age classes in the 2013 run should be age 1.3 (45%), age 1.2 (9%), and age 2.3 (34%). The 10-year MAPE for the set of models used for the 2013 Kenai sockeye salmon run forecast was 23%.

The sockeye salmon run forecast for the Kasilof River is 903,000, which is 5% less than the 20-year average run of 947,300. Age-1.3 salmon typically comprise about 34% of the run to the Kasilof River. The forecast for age-1.3 salmon is 274,000, which is 15% less than the 20-year average return (322,000) for this age class. A sibling model based upon the abundance of age-1.2 salmon in 2012 was used to forecast the return of age-1.3 salmon in 2013. The abundance of age-1.2 salmon in 2012 was 256,000, which is 10% less than the 20-year average abundance (285,000) for this age class. A smolt model predicted a return of 236,000 age-1.3 salmon. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (27%) than the smolt model (31%). Age-1.2 salmon typically comprise about 30% of the run. The forecast for age-1.2 salmon is 248,000, which is 13% less than the 20-year average return (285,000) for this age class. A spawner-recruit model based upon the abundance of spawners (325,000) in 2009 was used to forecast the return of age-1.2 salmon in 2013. A sibling model based upon the abundance of age 1.1 salmon (36,000) in 2012 forecasted a return of 241,000 age-1.2 salmon. The spawner-recruit model was used for this forecast because the 10-year MAPE was lower for the spawner-recruit model (64%) than the sibling model (104%). Age-2.2 salmon typically comprise about 24% of the run. The forecast for age-2.2 salmon is 307,000, which is 34% greater than the 20-year average return (228,000) for this age class. A sibling model based upon the abundance of age-2.1 salmon in 2012 was used to forecast the return of age-2.2 salmon in 2013. The spawner-recruit model forecast for age 2.2 salmon was 254,000. The sibling model was used for this forecast because the 10-year MAPE was lower for the sibling model (33%) than the spawner-recruit model (34%). The predominant age classes in the 2013 run should be age 1.2 (27%), age 1.3 (30%), and age 2.2 (34%). The 10-year MAPE for the set of models used for the 2013 Kasilof sockeye salmon run forecast was 21%.

The sockeye salmon run forecast for the Susitna River is 363,000, which is 20% less than the 6-year average run of 452,000. This forecast was derived using mean return per spawner by age class for brood years 2006–2007 and mark–recapture estimates of spawner abundance in 2007-2009. Sonar and age composition catch allocation models 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. This is the first year this forecast method has been used, so MAPE is not available. The 6-year average run (2006–2011) was calculated using mark–recapture estimates of inriver run and genetic estimates of commercial harvests.

The sockeye salmon run forecast for Fish Creek is 61,000, which is 52% less than the 20-year average run of 127,000. Age-1.2 and -1.3 salmon typically comprise 72% of the run to Fish Creek. A smolt model based upon the estimated abundance of age-1 smolt emigrating from Fish Creek in 2011 (269,000; 12-year average: 438,000) predicted a return of 47,000 age-1.2 salmon. A sibling model based upon the abundance of age-1.2 salmon returning in 2012 predicted a return of 6,200 age-1.3 salmon in 2013. The age-1.2 forecast is 12% less than the 20-year average return (60,000) for this age class, while the age-1.3 forecast is 80% less than the 20-year average return (31,000) for this age class. The predominant age classes in the 2013 run should be age 1.2 (76%) and age 1.3 (10%).

The sockeye salmon run forecast for Crescent River is 110,000, which is equal to the 20-year average run. Age-1.3 and -2.3 salmon typically comprise 63% of the run to Crescent River. Sibling models based upon returns of age-1.2 and -2.2 salmon in 2012 were used to forecast returns of age-1.3 (60,000) and -2.3 (28,000) salmon in 2013. The predominant age classes in the 2013 run should be age 1.3 (54%) and age 2.3 (26%).

Run forecasts to individual freshwater systems are as follows:

System	Run	Escapement Goals
Crescent River	110,000	30,000–70,000
Fish Creek	61,000	20,000–70,000
Kasilof River	903,000	160,000–340,000
Kenai River	4,374,000	1,000,000–1,200,000[1]
Susitna River	363,000	NA[2]
Larson Lake	NA	15,000–50,000
Chelatna Lake	NA	20,000–65,000
Judd Lake	NA	25,000–55,000
Unmonitored Systems	872,000	NA
Total	6,683,000	

[1] This is the inriver sockeye salmon escapement goal measured using sonar at river mile 19 on the Kenai River.

[2] Susitna sockeye salmon are managed to achieve escapement goals at Larson, Chelatna, and Judd lakes.

OTHER SALMON SPECIES

The preliminary forecast of the 2013 commercial harvest of other salmon species is as follows:

	Commercial Harvest Forecasts
Natural Production:	
Pink Salmon	99,000
Chum Salmon	152,000
Coho Salmon	147,000
Chinook Salmon	9,000

Forecast Methods

The recent 5-year average commercial harvest was used to forecast the harvest of chum, coho, and Chinook salmon in 2013. The forecast for pink salmon was 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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