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

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2018 PRINCE WILLIAM SOUND AND COPPER RIVER SALMON FORECAST

This news release provides Prince William Sound (PWS) Area salmon forecasts for 2018. Formal forecasts of total run were calculated for Copper River Chinook and sockeye salmon, Gulkana Hatchery sockeye salmon, and Coghill Lake sockeye salmon. Formal forecasts of commercial common property (CCP) harvest were calculated for wild PWS pink and chum salmon. Prince William Sound Aquaculture Corporation (PWSAC) and Valdez Fisheries Development Association (VFDA) provide additional forecasts for hatchery-specific stocks. In addition to formal forecasts, a summary of recent 10-year averages (2008–2017) of CCP harvest for most wild stocks and Gulkana Hatchery production are also included.

2018 Prince William Sound Area Formal Salmon Forecast Summary (thousands of fish)

Area/Production Type	Species	Forecast Type	Forecast Point	Forecast Range	% Above/Below 10-yr Average
Copper River					
Wild Production	Chinook Salmon	Total Run	43	19–66	4.4% Below
Wild Production	Sockeye Salmon	Total Run	1,736	1,264–2,208	16.5% Below
Gulkana Hatchery Production	Sockeye Salmon	Total Run	148	108–188	
Total Production	Sockeye Salmon	Total Run	1,884	1,391–2,376	
Coghill Lake					
Wild Production	Sockeye Salmon	Total Run	183	95–407	22.0% Above
Prince William Sound					
Wild Production	Pink Salmon	CCP Harvest	2,020	310–13,151	20.7% Below
Wild Production	Chum Salmon	CCP Harvest	391	189–594	83.6% Above

2018 COPPER RIVER CHINOOK SALMON FORECAST SUMMARY

The 2018 Copper River Chinook salmon total run point estimate is **43,000 fish (80% confidence interval: 19,000–66,000 fish)**. Subtracting the lower bound sustainable escapement goal of 24,000 fish from the total run forecast results in a common property harvest point estimate (all fisheries) of **19,000 fish (range: 0–42,000 fish)**. The recent 10-year average (2008–2017) Copper River Chinook salmon total run is 45,000 fish.

FORECAST METHODS

Following a detailed biometric retrospective review of Copper River Chinook forecast methods the department concluded the use of complex sibling models to forecast Copper River Chinook salmon is not appropriate due to poor performance. Running averages of total run consistently out-performed the more complex sibling models. Several forecast methods were examined for the 2018 Copper River Chinook salmon total run forecast including exponential smoothing, and 2-, 3-, and 5-year running averages of total run. Exponential smoothing and moving average models all produced similar forecast results in the 42,000–47,000 fish range, and the 2-year moving average forecast out-performed the other models when compared retrospectively. Total run size was calculated as the sum of commercial and subsistence harvests of Chinook salmon below Miles Lake and the mark-recapture point estimate of Chinook salmon inriver abundance. There are currently 19 years (1999–2017) of inriver abundance estimates available for this analysis. The 80% confidence intervals were calculated from the mean squared error of the retrospective forecast predictions.

2018 COPPER RIVER SOCKEYE SALMON FORECAST SUMMARY

The 2018 wild Copper River sockeye salmon total run point estimate is **1,736,000 fish (80% prediction interval: 1,264,000–2,208,000 fish)**. The recent 10-year average (2008–2017) Copper River wild sockeye salmon total run is 2,078,000 fish. Gulkana Hatchery sockeye salmon total return is predicted to be **148,000 fish** (**80% prediction interval: 108,000–188,000 fish**) for a total Copper River sockeye salmon return (wild + hatchery production) of **1,884,000 fish (80% prediction interval: 1,391,000–2,376,000 fish)**. Total Copper River sockeye salmon common property harvest (all fisheries) is predicted to be **1,220,000 fish (80% prediction interval: 815,000–1,626,000 fish)** with a CCP harvest of **942,000 fish (80% prediction interval: 536,000–1,347,000 fish)**.

FORECAST METHODS

A detailed biometric retrospective review of Copper River sockeye salmon forecast methods determined that the more complex sibling relationship models out-perform more simplistic average return models. Forecast models examined for wild Copper River sockeye salmon for 2018 included mean total run size estimates (2-, 3-, 4-, 5-, 10-, and all-year averages), mean return of individual age classes, and regression models of sibling relationships. The forecast of natural sockeye salmon to the Copper River is the total of estimates for six age classes. Linear regression models with log-transformed data were used to predict returns for age 1.2, 1.3 and 2.2 sockeye salmon. These three age classes were predicted from the relationship between returns of each age class and returns of the age class one year younger from the same brood year (sibling model). Predicted return of age 1.1, 0.3, and 2.3 sockeye salmon were calculated as the 5-year (2013–2017) mean return of those age classes. The 2018 run to Gulkana Hatchery was estimated as the recent 3-year average fry-to-adult survival estimate (0.67%) from all Gulkana I and Gulkana II hatcheries releases combined (onsite and remote). The run was apportioned to brood year using a maturity schedule of 17% age 4 and 83% age 5.

The total common property harvest forecast was calculated by subtracting the Gulkana Hatchery broodstock, hatchery surplus, and wild stock escapement goal needs (upriver and Copper River Delta) from the total run forecast. The CCP harvest estimate was calculated by subtracting inriver goal categories (5 AAC 24.360(b)) and the Copper River Delta spawning escapement goal from the total run forecast. An estimated exploitation rate of 70% was used to project the total harvest of Gulkana Hatchery stocks in 2018. There are currently 53 years (1965–2017) of harvest, escapement, and age composition data available for this analysis. Total run 80% prediction intervals were calculated as the sum of the individual age class forecast point estimates plus/minus the square root of the sum of the squared differences between the age class forecast point estimates and age class forecast 80% prediction intervals.

2018 COGHILL LAKE SOCKEYE SALMON FORECAST SUMMARY

The 2018 wild Coghill Lake sockeye salmon total run point estimate is **183,000 fish (80% prediction interval: 95,000–407,000 fish)**. Subtracting the escapement target of 30,000 fish from the total run forecast results in a common property harvest point estimate (all fisheries) of **153,000 fish (range: 65,000–377,000 fish)**. The recent 10-year average (2008–2017) Coghill Lake sockeye salmon total run is 150,000 fish.

FORECAST METHODS

Forecast models examined for Coghill Lake sockeye salmon for 2018 included mean total run size estimates (2-, 3-, 4-, 5-, 10-, and all-year averages), mean return of individual age classes, and regression models of sibling relationships. The natural sockeye salmon run forecast to Coghill Lake is the total of estimates for five age classes. Natural run by year was estimated as the total commercial harvest contribution combined with the Coghill River weir escapement count. A linear regression model with log-transformed data was used to predict returns of age-1.3 sockeye salmon. This linear regression model was parameterized using the historical relationship between returns of age-1.3 sockeye salmon and returns of the age-1.2 fish one year previous (sibling model), which are from the same brood year. For example, the model to predict the return of age-1.3 sockeye salmon in 2018 used the return of age-1.2 fish in 2017 as the input parameter. Predicted returns of age-1.1, -1.2, -2.2, and -2.3 sockeye salmon were calculated as the 2008–2017 mean return of that age class. Harvest, escapement, and age composition data are available for Coghill Lake sockeye salmon runs since 1962; however, inclusion of escapements prior to the installation of a full weir in 1974 reduced forecast reliability. Therefore, only data collected since 1974 were used. The 80% prediction intervals for the Coghill Lake sockeye salmon total run were calculated using the method described previously for Copper River sockeye salmon.

2018 PWS EVEN-YEAR WILD PINK SALMON FORECAST SUMMARY

The PWS wild pink salmon CCP harvest point estimate is **2,020,000 fish (80% confidence interval: 310,000–13,150,000 fish)**. The recent 10 even-year average (1998–2016) PWS wild pink salmon CCP harvest is 2,548,000 fish.

FORECAST METHODS

Recent changes in assessment methods for PWS pink and chum salmon escapements have occurred as a result of budget reductions. Beginning in 2015, the number of index streams surveyed was reduced from 214 to 134 streams. In response to the reduced number of stream surveyed by ADF&G, PWS pink and chum salmon escapement goals were changed in 2017 to be comparable to the reduced set of index streams. Yearly total natural run is estimated by adding the wild component of commercial harvest to escapement indices. Aerial escapement indices are used to assess and manage pink and chum salmon escapements in PWS. Estimating the escapement component of total run by expanding escapement indices from a small number of streams to a sound-wide total escapement is likely associated with a large amount of error. Because of this, the decision was made to forecast CCP harvest in 2018. CCP harvests contributions of natural stock pink salmon were determined through systematic sampling of thermal marked otoliths (1997–2017) and coded wire tags (1985–1996), and through average fry-to-adult survival estimates multiplied by fry release numbers and estimated exploitation rates (1977–1984).

Several trend forecast models were examined for the 2018 PWS wild pink CCP harvest forecast including exponential smoothing and 2-, 3-, and 5-year running averages of past even-year CCP harvests. Exponential smoothing and moving average models produced similar forecast results in the 2,020,000–2,380,000 fish range, and the 2-year moving average using log-transformed data out-performed the other models. The 80% confidence intervals were calculated from the mean squared error of the retrospective forecast predictions.

2018 PWS WILD CHUM SALMON FORECAST SUMMARY

The PWS wild chum salmon CCP harvest point estimate is **391,000 fish (80% confidence interval: 189,000–594,000 fish)**. The recent 10-year average (2008–2017) PWS wild chum salmon CCP harvest is 213,000 fish.

FORECAST METHODS

See pink salmon forecast methods for details on recent changes to assessment and forecast methods. Several trend forecast models were examined for the 2018 PWS wild chum CCP harvest forecast including exponential smoothing and 2-, 3-, and 5-year running averages of past commercial harvests. The selected 2018 forecast was based on the average of the two most recent year CCP harvests. Exponential smoothing and moving average models all produced forecast results in the 222,000–391,000 fish range, and the 2-year moving average out-performed the other models. Our ability to accurately forecast natural chum salmon stocks is limited by the lack of data available on the wild component of CCP harvest before 2004. CCP harvest contributions of natural stock chum salmon were estimated using pre-hatchery average natural runs (1998–2003) or thermally marked otolith estimates (2004–2017) for each district in PWS. The 80% confidence intervals were calculated from the mean squared error of the retrospective forecast predictions.

PWS Area Recent 10-Year (2008–2017) Average CCP Salmon Harvest by Species (thousands of fish)

Area/Production Type	Chinook	Sockeye	Coho	Pink	Chum	Total
Bering River						
Wild Production	0	3	59	0	0	62
Copper River						
Wild Production	13	1,294	226	34	16	1,583
Hatchery Production	0	205	0	0	0	205
Total Production	13	1,499	226	34	16	1,788
Prince William Sound						
Wild Production	1	165	N/A[a]	2,548[b]	213	2,927
Area Totals						
Wild Production	14	1,667	285	2,582	229	4,777

[a] Estimates of wild coho salmon harvests in are not available due to limited samples of thermally marked coho otoliths from the commercial harvest.

[b] Recent 10 even-year CCP harvest (1998-2016).