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2022 Copper River Chinook Salmon Forecast

2022 COPPER RIVER CHINOOK SALMON FORECAST SUMMARY

The 2022 Copper River Chinook salmon total run point estimate is **40,000 fish (80% prediction interval: 23,000–58,000 fish)**. This is 13% below the recent 10-year average (2012–2021) total run of 46,000 fish. The sustainable escapement goal for Copper River Chinook salmon is 21,000 to 31,000 fish.

FORECAST METHODS

For 2022, the Copper River Chinook salmon state-space model was chosen as the forecast method. This model simultaneously reconstructs runs and fits a spawner-recruit model to estimate total return, escapement, and recruitment of Copper River Chinook salmon from 1999 to 2021. Methods and details of this analysis are covered in separate reports (Joy et al. 2021, Savereide et al. 2018). The model uses harvest, age composition, and direct measures of inriver run abundance to estimate parameters that describe the spawner-recruit relationship for this stock. Uncertainty from the run reconstruction is passed through to the spawner-recruit analysis and all relevant data are considered and weighted by their precision. The model accommodates missing data, measurement error in the data, and changes in age at maturity.

Several forecast methods were examined for the 2022 Copper River Chinook salmon total run forecast including exponential smoothing, 2-, 3-, and 5-year running averages of total run, and projections from the Copper River Chinook salmon state-space model. The state-space model performed similarly when compared retrospectively to the simple average-based methods historically used to forecast this stock, while using more biological information to predict future runs (Table 1). The state-space model outperformed the average-based models by having a lower mean absolute percentage error (MAPE) and mean percentage error (MPE) 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 23 years (1999–2021) of inriver abundance estimates available for this analysis. The 80% prediction intervals were calculated from the posterior distributions of the model parameters, including the predicted run-size for 2022.

Savereide, J. W., M. Tyers, and S. J. Fleischman. 2018. Run reconstruction, spawner-recruit analysis, and escapement goal recommendation for Chinook salmon in the Copper River. Alaska Department of Fish and Game, Fishery Manuscript No. 18-07, Anchorage

Joy, P., J. W. Savereide, M. Tyers, and S. J. Fleischman. 2021. Run reconstruction, spawner–recruit analysis, and escapement goal recommendation for Chinook salmon in the Copper River. Alaska Department of Fish and Game, Fishery Manuscript No. 21-01, Anchorage

Table 1.– 2022 Copper River Chinook Salmon Forecast Model Performance Summary

Stock/model	Prediction Point Estimate	80% Prediction Interval	MAPE	MPE
State-space	40,231	22,723-57,739	31%	3%
Exponential	37,284	22,409-52,160	34%	15%
2-year	31,578	9,702-53,454	35%	6%
3-year	42,398	20,156-64,640	36%	14%
5-year	48,998	28,510-69,486	34%	13%