

Bristol Bay Sockeye Salmon

UW-FRI

Inseason Report #1

June 17, 2022

1 Introduction

During the 2022 season, UW-FRI inseason forecast methods will use three primary sources of information to generate run size estimates:

1) the UW-FRI preseason forecast, 2) Port Moller catch per unit effort (CPUE) and associated age and genetic composition information, and 3) catch + escapement to date (C+E). Given the sensitivity of inseason predictions based on these data to variation in run timing, we also use the distribution of Port Moller catches to inform estimates of run timing and update forecasts accordingly.

To generate inseason forecasts for Bristol Bay and district-specific run size we use a “Bayesian updating” inseason forecast model that: (1) weights forecasts based on past performance on a given date, and (2) updates those weights across the season as different data become more informative. This approach estimates the relative probability of different 2022 run sizes conditioned on current observations of salmon abundance and timing (data), our “prior” prediction of run size from the preseason forecast, and the uncertainty in predictions based on the different sources of information (uncertainty). This method also allows us to ask probabilistic questions regarding predicted run size throughout the season, for example: “what is the probability, given the data, of a 2022 run size below 60 million sockeye”.

In addition to our inseason forecast reports:

<https://alaskasalmonprogram.org/inseason-reports/>

we will provide an online supplement with up-to-date versions of several standard graphs often included in our reports. This webpage displays C+E and

Port Moller test fishery data, and is intended to track the daily progression of the 2022 season compared with the preseason forecast and recent years. The online supplement provides a quick reference on the progress of the Bristol Bay run compared to expectations and will be updated whenever new data become available, as opposed to the 4 to 6-day cycle for inseason reports. **The online supplement is available at the following link** (updated for 2022 when daily C+E are available):

<https://alaskasalmonprogram.org/bristol-bay-daily-updates/>

Figure 1 (page 3) shows a timeline of the UW-FRI forecasting process and accompanying data sources. The vertical line on the left of the figure is the entire year beginning with preseason forecasting in October, through run reconstruction at the end of September. The expansion of the inseason portion of the timeline generally illustrates how different inseason data types are weighted in our overall forecast methods, as they become available and more reliable across the season.

On any particular day, run size estimates based on single type of data will differ from those based on other sources of information. In addition, the accuracy of forecasts based on C+E and Port Moller data change (become more reliable) as the season progresses. The run size forecast generated from each data type contributes to our overall Bristol Bay forecast in proportion to how well forecasts based on that data type have performed historically, on the current date. The width of the shaded area for a particular forecast type in the expanded portion of the inseason forecasting timeline (Figure 1, page 3), indicates the reliability of this type of information relative to other data types available at that time and the *approximate* weight it receives in the overall forecast.

For instance, at the beginning of the season the preseason forecast is the most reliable source of information, as indicated by the width of the dark blue area on June 10-20. This is due to the fact that the Port Moller test fishery has just started and there is very little or no catch and escapement information through that date. However, by the middle of the season, July 3-5, all three sources of information are equally reliable. Late in the season, when a large proportion of sockeye have returned, catch and escapement data are the best estimator for total run size.

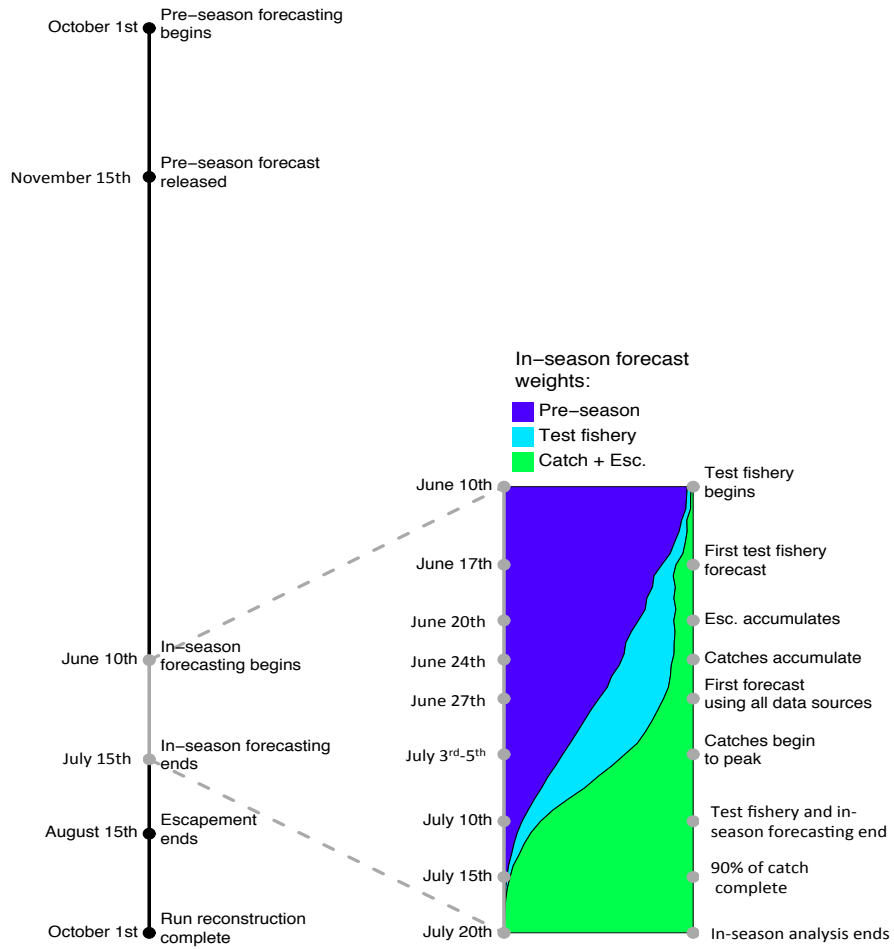


Figure 1. Data and forecasting time-line: The area plot for the inseason forecasting portion of the year describes the relative weight given to each source of information in the overall weighted UW-FRI forecast.

2 Forecast summary

The *Forecast summary* section will include our inseason run size estimate and the preseason forecast for reference. Figure 2 (page 5) compares the 2022 preseason forecast with runs 1970-2021. After this first report the *Forecast summary* will become Section 1.

Table 1: 2022 UW-FRI inseason forecast summary (in thousands).

Forecast	Sockeye	Projected harvest
Preseason forecast	71,914	52,400
Weighted model	71,914	52,400

Table 2: 2022 UW-FRI preseason sockeye salmon forecast (in thousands).

DISTRICT	RIVER	AGES				TOTAL
		1.2	1.3	2.2	2.3	
Nak\Kvi		11,283	9,211	3,005	835	24,334
	Kvichak	5,812	3,247	2,145	290	11,494
	Naknek	3,841	3,677	633	311	8,462
	Alagnak	1,630	2,287	227	234	4,378
	Egegik	6,132	3,314	2,498	1,566	13,510
	Ugashik	1,846	1,642	386	220	4,094
	Nushagak	12,517	15,791	276	91	28,801
	Wood	9,116	2,197	208	21	11,542
	Nushagak	2,683	12,293	50	47	15,199
	Igushik	718	1,301	18	23	2,060
	Togiak	153	1,008	10	4	1,175
	Totals	31,931	30,966	6,175	2,716	71,914

*The Nushagak River total includes 129,391 0.3 and 1.4 age fish not included in the body of the table

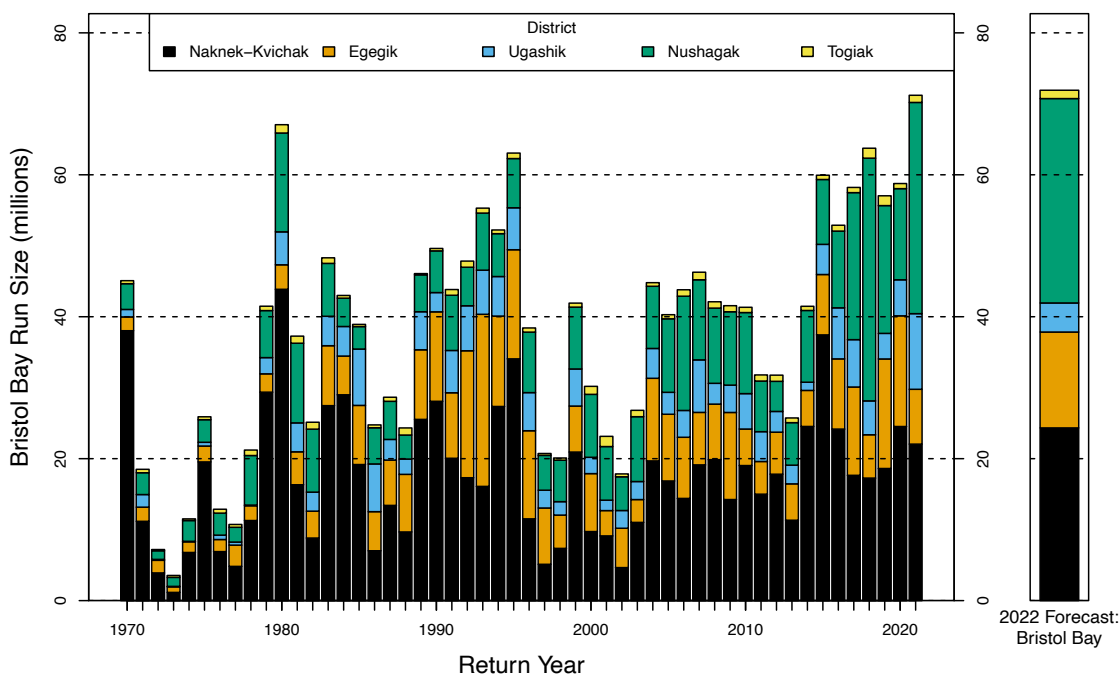


Figure 2. 2022 Bristol Bay Preseason Forecast: Comparison of the 2022 UW-FRI preseason forecast with run sizes 1970-2021.

3 Catch and escapement

The *Catch and escapement* section will include tables and figures that compare current catch and escapement (C+E) data with what is expected (preseason forecast) and C+E to date in previous years.

Figure 3 (page 6) displays cumulative C+E to date in 2022 (grey dots), relative to a Bristol Bay run that coincides with the preseason forecast (blue curve), with average run timing and run compression. Figure 3 also shows expected cumulative C+E for runs arriving inshore 2 days early (green dashed line) and 2 days late (red dashed line). The four panels below display this same information for the Ugashik, Egegik, Naknek-Kvichak, and Nushagak districts. Figure 3 indicates that for a Bristol Bay run totaling 71.9 million sockeye, with average run timing, we should expect to have 12.9 million sockeye inshore (as catch and escapement) by June 30, 30.9 million sockeye by July 5, and 51.5 million sockeye by July 10. This figure will be updated daily as part of the online supplement at:

<https://alaskasalmonprogram.org/bristol-bay-daily-updates/>

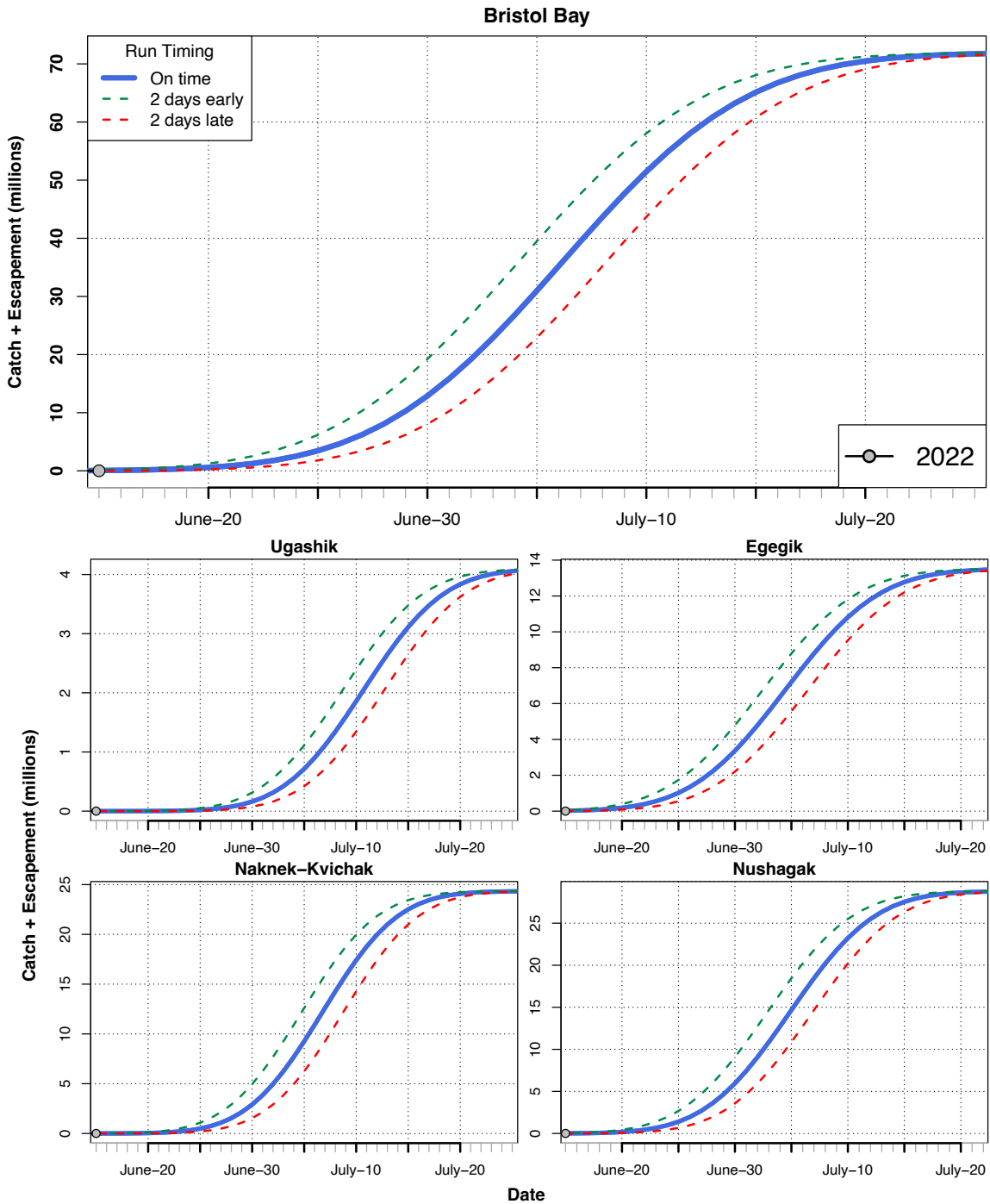


Figure 3. Cumulative C+E Comparison: Comparison of daily cumulative C+E observed for Bristol Bay in 2022, and expected daily values (blue curve). Expected daily values are calculated relative to the 2022 preseason forecast and the average distribution of inshore arrivals (1980–2021). Connected gray dots show the 2022 observed daily cumulative C+E. Green dashed line represents expectations if the run is 2 days early, red dashed line if the run is 2 days late.

Figure 4 (page 7), illustrates daily catch and escapement (non-cumulative) for Bristol Bay 2018–2021. These graphs are a conventional way to look at the distribution of the Bristol Bay sockeye run across seasons, and compare run timing and run compression with previous years. As daily catch and escapement data become available, this figure will be updated with a top panel showing 2022 for comparison purposes, and included with the online supplement.

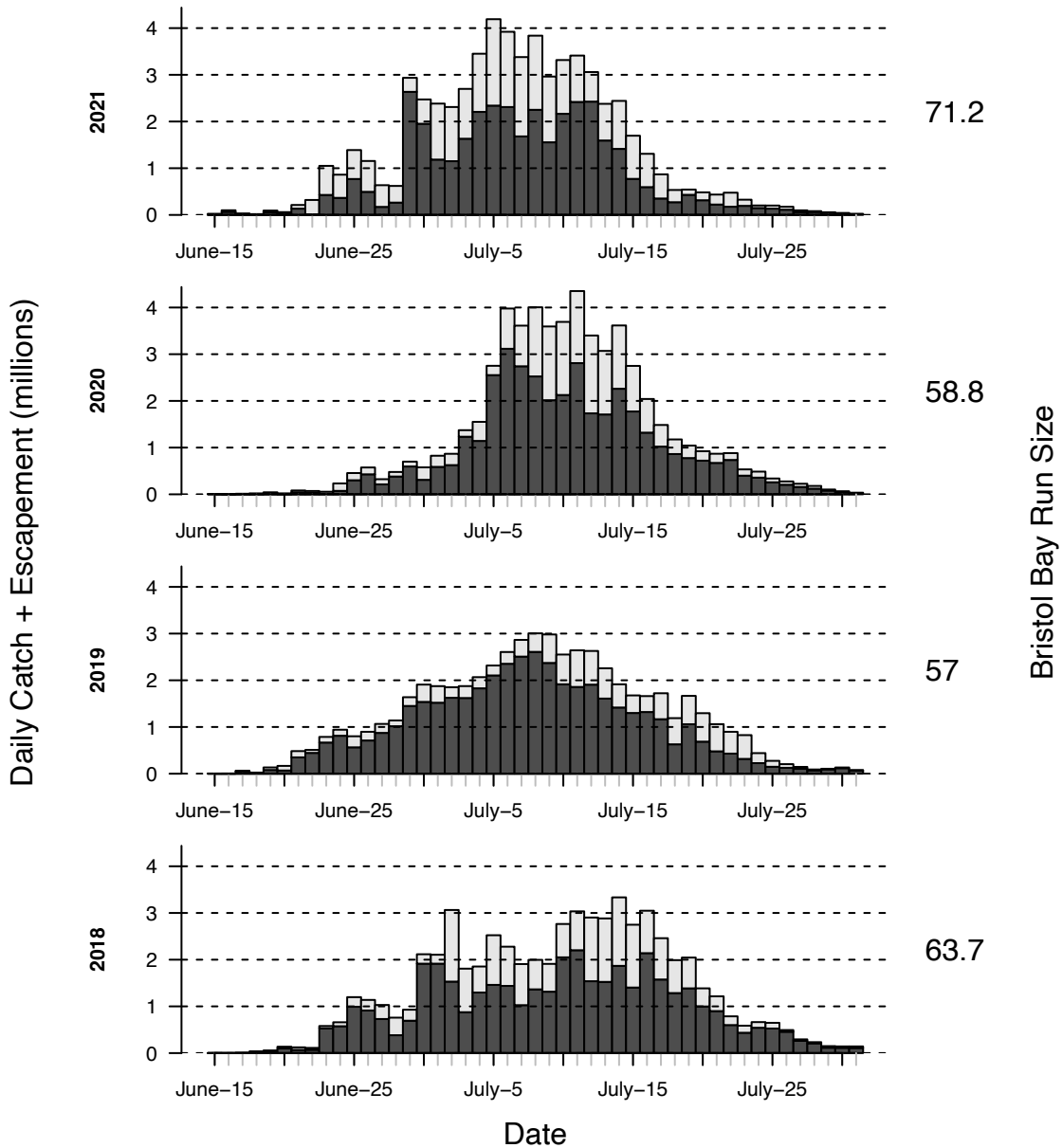


Figure 4. Daily Catch and Escapement: Observed catch and escapement for years 2018–2021 as stacked bars. Escapements are in light gray and catches in dark gray. Total run for Bristol Bay is shown in millions of sockeye on the right hand axis.

4 Gulf of Alaska sockeye escapement

For context we provide sockeye salmon escapement counts from select river systems within the Gulf of Alaska that exhibit earlier run timing relative to Bristol Bay. Figure 5 (page 8) shows cumulative sockeye salmon escapement to each river in 2022 compared with 2016-2021. It should be noted that the correlation between cumulative escapement for these Gulf of Alaska sockeye stocks and the abundance or timing of the Bristol Bay sockeye run has been limited in previous years.

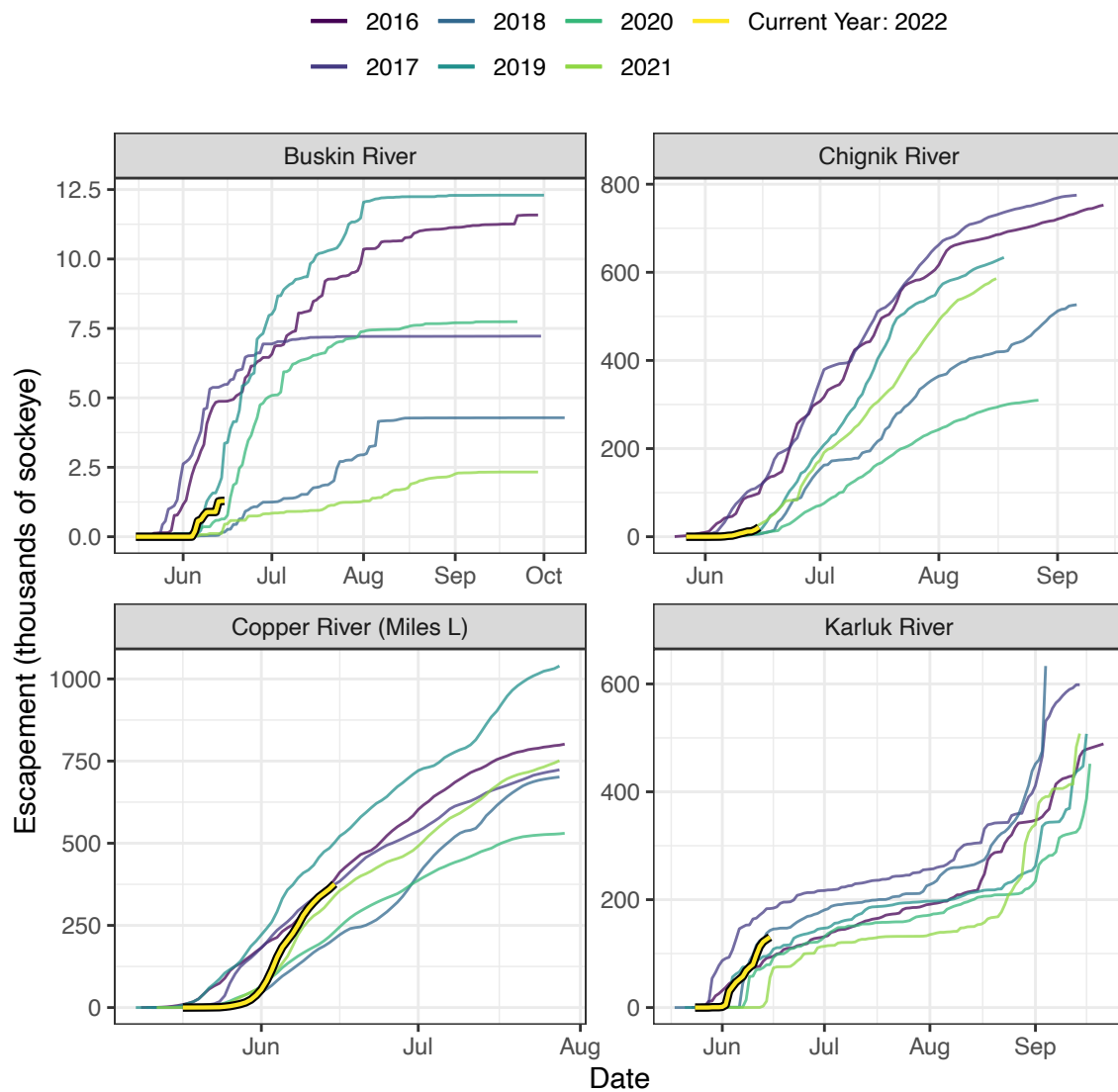


Figure 5. GOA Sockeye Escapement: 2016-2022 cumulative sockeye escapement to select Gulf of Alaska river systems.

Contributing Authors:

Curry Cunningham
Chris Boatright
Ray Hilborn

Acknowledgements

The Alaska Department of Fish and Game collects the catch, escapement, and age composition data integral to these analyses. The Bristol Bay Science and Research Institute (BBSRI) operates the Port Moller test fishery, data from which becomes a substantial part of the analysis included in UW-FRI inseason reports. The Alaska Department of Fish and Game Gene Conservation Laboratory analyzes genetic samples collected during the Port Moller test fishery. We thank both BBSRI and ADF&G for making these data available to us prior to and during the Bristol Bay season. We appreciate all of the hard work by individuals collecting data at counting towers, dockside, and on the test fishery boat.