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Advisory Announcement

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2027 Bristol Bay Sockeye Salmon Forecast

FORECAST OF THE 2027 RUN:

TOTAL PRODUCTION:	Forecast (millions)	Forecast range (millions)
Total run	49.31	35.47–63.14
Escapement	14.04	
Total harvestable surplus	35.26	
Bristol Bay harvestable surplus	33.97	
South Peninsula	1.29	
Inshore Run	48.01	

The sockeye salmon total run forecast for Bristol Bay in 2027 is predicted to be **strong,** with a point estimate of **49.31 million fish and a range of 35.47–63.14 million fish (80% prediction interval).** Categorical ranges of sockeye salmon total run strength were formulated from percentiles of total runs from 1963 to 2026 (Table 1).

Table 1. Categorical ranges of sockeye salmon total run and this year's forecast in bold.

Category	Range (millions)	Percentile
Poor	Less than 20	Less than 20th
Weak	20 to 32	20th to 40th
Average	32 to 44	40th to 60th
Strong	**44 to 55**	**60th to 80th**
Excellent	Greater than 55	Greater than 80th

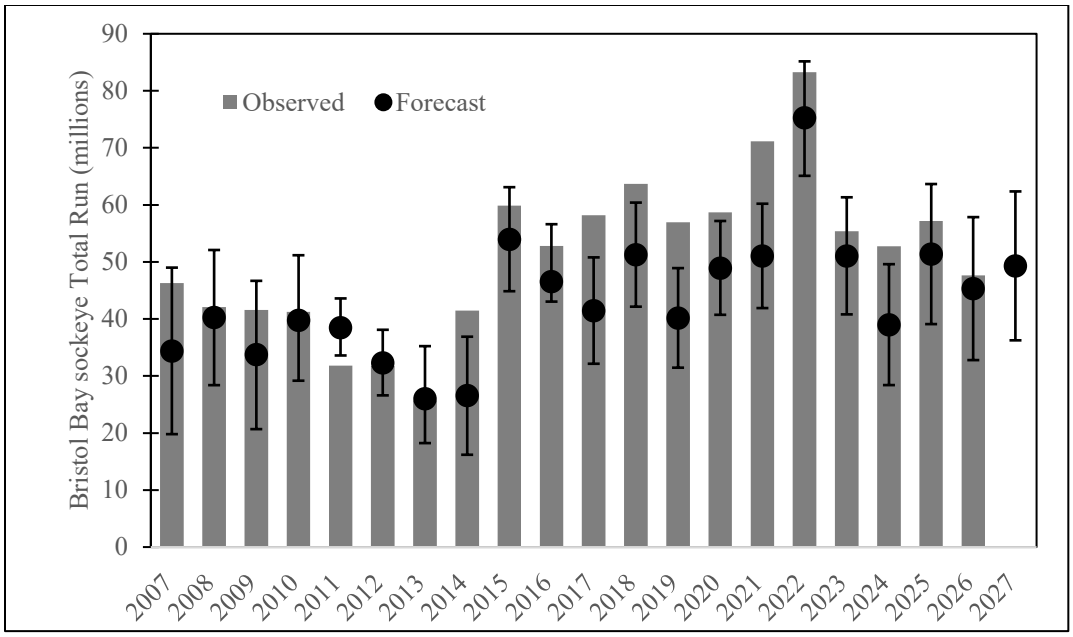

Figure 1. Annual observed total run of sockeye salmon in Bristol Bay compared to preseason total run forecasts, 2007–2027. Error bars represent 80% prediction intervals of forecasts.

METHODS

The 2027 Bristol Bay sockeye salmon forecast is the sum of individual predictions from nine river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak, and Togiak Rivers) and four age classes (ages 1.2, 1.3, 2.2, and 2.3). Adult escapement and return data from brood years 1972–2021 were used in the analyses for most rivers.

Forecasts for each age class returning to a river system were derived from models based on the relationship between adult returns of that age class and either total returns or sibling returns from the same brood years. The average return over the last five years was also considered as a forecast model, and in certain cases, competing models were averaged in a weighted hybrid model approach. In general, models with statistically significant parameters and/or the best past performance metrics were chosen. Performance was evaluated using mean absolute deviation, mean absolute percent error, mean arctangent absolute percent error, and mean percent error between forecasted and observed returns measured across the most recent 3- and 5-year time frames.

Where practical, the Alaska Department of Fish and Game will manage escapements proportional to the run size (5 AAC 06.355(d)(1)). Forecasted escapements are the 75th percentile of the escapement goal ranges for Egegik and Ugashik Rivers as the total runs are forecast to be above average (Table 2). Escapements are projected as the 25th percentile of the escapement goal range when the forecast is in the lower range of historical run sizes, as seen in Naknek, Igushik, and Togiak Rivers. Kvichak River escapement is forecasted at 3.70 million based on a 50% exploitation rate. Since the Alagnak River is passively managed, the exploitation rate is assumed to be the same as that of the Kvichak.

In the Nushagak District, escapement goals for the Wood and Nushagak Rivers will be modified in accordance with the *Nushagak District King Salmon Stock of Concern Management Plan* (5AAC

06.391). Based on this regulation, the upper ends of the Optimal Escapement Goal (OEG) ranges in 2027 will be 3.02 and 1.75 million sockeye salmon for the Wood and Nushagak Rivers, respectively, and escapements are projected as the 75th percentile of the OEGs.

Over the past five years, an average of 2.6% of the Bristol Bay return is thought to have been harvested in the South Alaska Peninsula fisheries in June. Preseason harvestable surplus projections are provided to aid industry in planning for the upcoming season.

RESULTS

A total of 49.31 million sockeye salmon (with a range of 35.47–63.14 million) are expected to return to Bristol Bay in 2027 (Table 2). This is 3% smaller than the most recent 20-year average of 50.96 million fish and 31% greater than the long-term average of 37.56 million fish (1963–2026). All systems are expected to meet their spawning escapement goals in 2027. The forecast range represents the upper and lower values of the 80% prediction interval for the total run forecast. These bounds were calculated from the difference between actual runs and run forecasts from 2007 through 2026.

A run of 49.31 million sockeye salmon would allow for a potential harvestable surplus of 35.26 million fish; 33.97 million fish in Bristol Bay and 1.29 million fish in the South Peninsula June fishery. A Bristol Bay inshore harvest of this size is 1% less than the most recent 20-year average harvest of 34.30 million (ranging from 15.39 to 60.52 million), and 45% greater than the long-term average harvest of 23.50 million fish (1963–2026).

Age-specific forecasts for the 2027 run consist of 18.59 million age-1.2 fish (38% of the total run), 8.83 million age-2.2 fish (18% of the total run), 18.43 million age-1.3 fish (37% of the total run), and 3.34 million age-2.3 fish (7% of the total run; Table 2).

DISCUSSION

Forecasting future salmon returns is inherently difficult and uncertain. The department has used similar methods since 2001 to produce Bristol Bay sockeye salmon forecasts, which have performed well when applied to Bristol Bay as a whole. In the last 20 years, our forecasts have on average under forecasted the run by 13%, ranging from 36% below the actual run in 2014 to 21% above the actual run in 2011 (Figure 1). Forecasted harvestable surplus has had a mean absolute percentage error of 16% since 2007.

Forecasts at the individual river scale exhibit greater uncertainty than the total Bristol Bay forecast. Since 2007, return estimates have been biased low for the Alagnak (-15%), Kvichak (-34%), Wood (-18%), Nushagak (-15%), Igushik (-9%), and Ugashik (-10%) Rivers, and biased high for Egegik (4%), Togiak (2%) and Naknek (0.3%) Rivers. These offsetting errors contribute to higher accuracy in the bay-wide forecast compared to forecasts for individual rivers.

The department would like to acknowledge the Bristol Bay Fisheries Collaborative (BBFC) for its support of Bristol Bay fisheries. The collaborative is an agreement between the department, Bristol Bay Science and Research Institute (BBSRI), and other contributors to work together and with stakeholders to maintain the management system for this world-class fishery. A list of organizations that committed financial support to the BBFC, as well as additional information about this agreement can be found at https://www.bbsri.org/bbfc.

Table 2.–Forecast of total run, escapement, and harvest of major age classes of sockeye salmon returning to Bristol Bay river systems in 2027.

	Millions of Sockeye Salmon								
DISTRICT	Forecasted Production by Age Class					Forecasted		South	
River	1.2	2.2	1.3	2.3	Total	Escapement	Surplus	Peninsula [a]	BB Inshore
NAKNEK-KVICHAK									
Kvichak	3.40	1.61	1.87	0.45	7.34	3.70	3.45	0.19	7.15
Alagnak	1.81	0.30	1.78	0.37	4.27	2.15	2.00	0.11	4.15
Naknek	1.01	0.66	1.58	0.43	3.67	1.10	2.48	0.10	3.58
Total	6.22	2.57	5.23	1.25	15.28	6.95	7.92	0.40	14.88
EGEGIK	2.41	4.60	3.94	1.28	12.23	1.70	10.21	0.32	11.91
UGASHIK	2.83	0.86	2.62	0.14	6.44	1.18	5.09	0.17	6.27
NUSHAGAK									
Wood	4.94	0.55	2.39	0.29	8.16	2.44	5.51	0.21	7.95
Igushik	0.34	0.04	0.72	0.09	1.19	0.21	0.95	0.03	1.16
Nushagak	1.70	0.21	3.36	0.27	5.64 [b]	1.40	4.09	0.15	5.49
Total	6.97	0.79	6.47	0.64	15.00	4.06	10.54	0.39	14.60
TOGIAK	0.16	0.01	0.17	0.02	0.36 [c]	0.16	0.19	0.01	0.35
BRISTOL BAY	18.59	8.83	18.43	3.34	49.31	14.04	33.97	1.29	48.01
	38%	18%	37%	7%	100%				

Note: This table is a summary. Slight difference may appear due to rounding.

[a] Projected harvest based on a current 5-year running average exploitation rate of 2.6%.

[b] Nushagak River forecast includes approximately 119,000 age-1.4 fish.

[c] Forecasts for Kulukak, Kanik, Osviak, and Matogak river systems are not included. These systems contribute approximately 50,000 sockeye salmon to Togiak District harvest each year.