Stock Assessment and Fishery Evaluation Report
for the
Salmon Fisheries
of the
Cook Inlet Exclusive Economic Zone Area

2025 Final Salmon SAFE

Compiled by

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1 Executive Summary

This is the second Stock Assessment and Fishery Evaluation (SAFE) report for the Federal salmon fishery in Cook Inlet Area exclusive economic zone (CI EEZ). This CI SAFE provides the necessary information for the North Pacific Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) to assess the status of the salmon stocks harvested in the CI EEZ during the 2024 CI EEZ salmon fishery and recommend status determination criteria (SDC), buffers, and the resulting acceptable biological catch (ABC) for the 2025 fishing season.

This Final 2025 SAFE has been updated from the Preliminary draft that was posted on the Council website in January 2025 for SSC review prior to the February 2025 Council meeting. Table 1 of this updated SAFE includes SSC-recommended SDC, overfishing limits (OFLs), buffers, and ABC; and Council recommended total allowable catch (TAC) for the seven federally managed CI EEZ salmon stocks and stock complexes. While this Executive Summary contains updated recommendations from the SSC and Council, other sections of this Final SAFE reflect the Preliminary SAFE that was posted to the Council website in January 2025, with the following exceptions:

1. Stock complex maps have been updated and restricted to only show watersheds that drain into Upper Cook Inlet.
2. Table 23 in this Final SAFE (Table 24 in the Preliminary SAFE) has been updated with the correct Deshka and Little Susitna escapement goals, as well as the corrected MSST (2019 is 46K and 2020–2024 is 38.8K).
3. Aggregate coho salmon stock complex MSST was corrected to 38.8K in Table 22 in the Final SAFE (Table 23 in the Preliminary SAFE).
4. Table 9 in the Final SAFE (Table 10 in the Preliminary SAFE) has been updated with the correct historical Kenai River Late Run sockeye salmon lower bound escapement goal.
5. Typos found in the Aggregate chum and coho salmon stock complex sections have been corrected in this Final SAFE (Specific corrections can be found in Appendix D).
6. Tables that include preliminary estimates of run size, escapement, and/or State harvest have been amended to note which values include, or are calculated using, preliminary estimates, which will be updated in future SAFE reports pending finalized estimates from the Alaska Department of Fish and Game (ADF&G). (Tables 1, 2, 6, 7, 8, 9, 11, 12, 13, and 14).
7. 2025 suggested corrections from SSC member Dr. Andrew Munro can be found in Appendix D along with NMFS SAFE Team responses to these suggestions.
8. 2025 SSC comments pertaining to the 2025 SAFE and future SAFE reports can be found in Appendix E.

Under the terms of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Standard 1 Guidelines (50 CFR 600.310), and amendment 16 to the Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska (Salmon FMP), this SAFE uses the tier system and harvest specifications process described in the Salmon FMP to calculate SDC and recommend ABC. As allowed by the Salmon FMP and National Standard Guidelines, this SAFE incorporates changes to assessment methods that were recommended by the SSC during 2024 (Section 2.1), and also makes new recommendations to the SSC for the coming fishing season (Section 2.2). The National Marine Fisheries Service (NMFS) prepared this SAFE as part of the process to federally manage the salmon fisheries in the CI EEZ. In implementing the CI EEZ salmon fishery in 2024, NMFS published a proposed rule and notice of availability for amendment 16 on October 18, 2023 (88 FR 72314). The final rule implementing amendment 16 was published on April 30, 2024 (89 FR 34718). Proposed harvest specifications for the 2024 CI EEZ salmon fishery were published on April 12, 2024 (89 FR 25857); NMFS received 21 public comment letters on the proposed harvest specifications before the end of the comment period on May 13, 2024. Public comments pertaining to the 2024 CI SAFE were responded to in the final 2024 harvest specifications published on June 18, 2024 (89 FR 51448). The 2024 salmon fishing season in the CI EEZ began on June 20, 2024 and closed by regulation on August 15, 2024.

This Executive Summary begins with changes to data and assessment methods used in this 2025 SAFE; followed by SSC recommendations for 2025 SDC and ABC, and then ends with a preliminary assessment of stock status relative to SDC and harvests relative to harvest specifications after the first CI EEZ salmon fishery during 2024. Section 2 of this SAFE provides the recommendations that the SSC made during the 2024 assessment and the NMFS SAFE Team responses to those recommendations.

In organizing this CI EEZ SAFE, the NMFS SAFE Team used examples of other SAFE reports written for Federal fisheries in Alaska and elsewhere and welcomes suggestions pertaining the organization and content of future CI EEZ SAFE reports.

Summary of Changes for the 2025 SAFE

Based upon recommendations made by the SSC during the February 2024 Council meeting (NPFMC 2024; Section 2), the NMFS SAFE Team made the following changes to the data and assessment methodology used to assess stock status and recommend SDC and ABC for the 2025 CI EEZ salmon fishing season:

1. 2024 CI EEZ harvests are known, as opposed to past harvests (1999 – 2023) that were estimated as referenced in section 4.1 of this SAFE.
2. Tier 1 buffers to reduce the preseason overfishing limit (OFL_{PRE}) to the ABC are based on positive errors (i.e. over-forecasting), as opposed to the 2024 methodology that accounted for over- and under-forecasting.
3. The Tier 3 overfishing limit (OFL), used to assess overfishing post season, is calculated as the largest cumulative harvest over a species generation time in the timeseries under consideration (1999 – 2024).
4. Tier 3 OFL_{PRE}, used as the basis for setting the preseason ABC, is calculated as the largest average catch over a species generation time in the timeseries under consideration (1999 – 2024; i.e., the average EEZ harvest for the years used to calculate the OFL).
5. Buffers presented in the 2025 SAFE represent the relative percentage reduction from the preseason OFL to the resulting ABC ($b = 1 – m$).
6. A new Tier 1 Bayesian model for estimating the OFL_{PRE} is presented for SSC consideration. Using this approach, a preseason total run size forecast and State of Alaska harvest rate projections are generated under a Bayesian framework, whereby the posterior predictions for both forecasts are used to calculate the OFL_{PRE}, resulting in a posterior distribution of probable OFL_{PRE} values that fully incorporate the uncertainty associated with the forecasts. Buffers are presented along with their respective relative probabilities of over-forecasting the OFL.

2025 Tier, SDC, and Buffer Recommendations

For the 2025 assessment, Table 1 provides the 2025 SSC recommendations for the post-season OFL (Tier 3), the OFL_{PRE}, the buffer to account for scientific uncertainty, and the resulting ABC.

This 2025 SAFE report contains discussion of the approach used for establishing potential yield for Tier 1 stocks, which is the basis for SDC and the resulting harvest specifications (See response to SSC comments in Section 2.1.1). For the 2024 SAFE and harvest specifications, based on a recommendation from the SSC, $S_{MSY\text{-}POINT}$, the point estimate of the number of spawners to result in maximum sustainable yield, was used for calculating potential yield (potential yield = available CI EEZ harvest after the achievement of spawning escapement at $S_{MSY\text{-}POINT}$, and, harvests that are likely to occur outside of the CI EEZ), which, in turn, is the basis for SDC (including the OFL_{PRE}) and the resulting harvest specifications. At the February 2025 Council meeting, for Tier 1 stocks, the SSC again recommended that $S_{MSY\text{-}POINT}$ be used as the basis for the 2025 SDC and harvest specifications.

The NMFS SAFE Team recommended SDC and harvest specifications based on sources of uncertainty and the biological attributes of the species being assessed; however, additional sources of uncertainty were not factored into the 2025 SAFE recommendations, including the inability to confirm historical estimates of salmon harvests in the CI EEZ prior to 2024 (which are a substantial basis for the 2024 and 2025 recommendations); the level of participation in the EEZ salmon fishery prior to 2024; the spatial distribution of fishing effort within the CI EEZ prior to 2024 and effects of that effort on harvests of weaker stocks (Chinook and coho salmon in particular); and harvests and harvest rates for individual stocks and species given the new management structure of having both State of Alaska (State) and Federal salmon fisheries in CI. To the extent practicable, the NMFS SAFE Team aims to incorporate additional sources of uncertainty and include risk tables (see Appendix A) into future assessments and welcomes input on assumptions, estimates, and analyses used in this 2025 SAFE

Table 1. 2025 CI EEZ salmon fishery SDC and harvest specifications that use the SSC recommended point estimate of $\boldsymbol{S_{MSY}}$ *($S_{MSY\text{-}POINT}$) as the escapement target for SDC and resulting harvest specifications: MFMT, MSST, OFL, recommended buffers, and the resulting ABC/ACL. Buffers for the Tier 1 stocks were recommended by the SSC, as opposed to the methods described in the SAFE, which account for uncertainty in the preseason forecast and estimated harvests in fisheries outside the CI EEZ.*

Page	Stock	Tier	MFMT	MSST	OFL	OFL_{PRE}	Buffer	ABC/ACL
37	Kenai River Late-Run Sockeye (KNSOCK)**	1	0.196	3,030,000	NA	514,761	30%	360,332
52	Kasilof Sockeye (KASOCK)**	1	0.511	555,000	NA	664,294	57%	285,646
63	Aggregate “Other” Sockeye (AOSOCK)	3	NA	163,000	906,757	181,351	15%	154,148
77	Aggregate Chinook (ACHIN)	3	NA	45,000	2,237	373	30%	261
87	Aggregate Coho (COHO)	3	NA	38,600	268,053	67,013	75%	16,753
97	Aggregate Chum (CHUM)	3	NA	NA	390,030	97,508	20%	78,006
105	Aggregate Pink (odd-year) (PINK-ODD)	3	NA	NA	116,348	58,174	10%	52,357

** MFMT, OFL_{PRE}, and ABC were calculated using preliminary 2024 sport and personal use harvest estimates. Final values will be presented in future CI SAFE reports pending finalized data from ADF&G.

Summary of Buffers to Account for Scientific Uncertainty in Reducing the Preseason Overfishing Limits (OFL_{PRE}) to the Acceptable Biological Catch (ABC)

Full assessments for Federal salmon stocks harvested in the CI EEZ are provided in Section 4 of this SAFE, with the following summaries for each stock intended to provide considerations for the buffers that are recommended by the SSC (Tables 1-2) for reducing the OFL_{PRE} to the resulting ABCs.

Tier 1 Kenai River late run sockeye salmon, Section 4.2: 30% based on SSC recommendations. In the Preliminary 2025 SAFE, a 27.3% buffer was recommended by the SAFE Team based on SDC using the lower bound of the escapement goal range and were set based on the method and model described in Section 3.3.2. At the February 2025 Council meeting, the SSC recommended that the lower bound buffers be applied to SDC using $S_{MSY\text{-}POINT}$. The buffers account for uncertainty associated with the predicted total run size, harvests in State fisheries, and the achievement of the spawning escapement target ($S_{MSY\text{-}POINT}$ based on SSC recommendation). Model results using the lower bound escapement target suggested that the buffers and resulting ABC were conservative with respect to the achievement of harvests and escapement targets over the long term and that there is a surplus of sockeye salmon from this stock that could be harvested in the CI EEZ.

Tier 1 Kasilof River sockeye salmon, Section 4.3: 57% based on SSC recommendations. In the Preliminary 2025 SAFE, a 57% buffer was recommended by the SAFE Team based on SDC using the lower bound of the escapement goal range; the recommended buffers are set based on the method described in Section 3.3.2. At the February 2025 Council meeting, the SSC recommended that the lower bound buffers be applied to SDC using $S_{MSY\text{-}POINT}$. The buffers account for uncertainty associated with the predicted total run size, harvests in State fisheries, and the achievement of the spawning escapement target ($S_{MSY\text{-}POINT}$ based on SSC recommendation). Model results using the lower bound escapement target suggest that the buffers and resulting ABC are conservative with respect to the achievement of harvests and escapement targets over the long term and that there is a harvestable surplus of sockeye salmon from this stock that could be harvested in the CI EEZ.

Tier 3 Aggregate Other sockeye salmon, Section 4.4: 15%; the SSC recommended buffer reflects a NMFS SAFE Team recommendation that 15% be a “default” level for Tier 3 stocks shown to be achieving spawning escapement targets without overfishing occurring and for which annual estimates of harvests are less than the ABC. The NMFS SAFE Team recommendation that the Aggregate sockeye salmon stock complex is healthy given the degree to which this stock has achieved spawning escapement goals concomitant with historical estimates of harvests. While sockeye salmon are considered vulnerable to harvest with gillnets in the CI EEZ based on their size, State data suggests there are many sockeye salmon spawning locations throughout Upper Cook Inlet with an estimated total run size for the AOSOCK stock complex believed to be as large or larger than KASOCK. The AOSOCK stock complex could be considered for a Tier 2 designation in the future if additional escapement data were available to estimate total run size, which would be necessary to calculate a harvest rate from the CI EEZ portion of the fishery.

Tier 3 Aggregate Chinook salmon, Section 4.5: 30%; the SSC recommended buffer reflects a heightened level of concern given that there are several Chinook salmon stocks listed as “Stocks of Concern” by the State of Alaska, including the Kenai Late Run large Chinook salmon indicator stocks for the ACHIN stock complex. In addition, Chinook salmon are currently at a low state of abundance throughout the eastern North Pacific. However, there were only 31 Chinook salmon harvested during the CI EEZ salmon fishery during 2024. Chinook salmon are considered vulnerable to harvest in gillnets based on their size, but historical harvest estimates suggests they may be infrequently encountered in the CI EEZ relative to all other salmon species. The NMFS SAFE Team is not aware of any available genetic data to support stock of origin for Chinook salmon harvested in the CI EEZ, but historically such harvests were not included in the State’s stock assessments for Chinook salmon stocks in Northern Cook Inlet (e.g., Susitna River stocks). There is also no available length data for CI EEZ harvests with which the harvested Chinook salmon harvests could be attributed to the Kenai Late Run Large Chinook salmon stock, but available weight data (average delivered weight of 7.9 lbs) suggests that few if any of the Chinook salmon harvested in the CI EEZ were of sufficient size (greater than 75 cm mid-eye to tail fork length, MEFT) to attribute them to the Kenai Late Run Large indicator stock. Chinook salmon harvested in the CI EEZ during 2024 made up 18% of the overall (State + Federal) commercial harvest in Upper Cook Inlet (31 of 171).

Tier 3 Aggregate coho salmon, Section 4.6: 75%; the SSC recommended buffer reflects the highest level of concern for any salmon stock harvested in the CI EEZ. Coho salmon are vulnerable to harvest based on their size and historical estimates of harvest in the CI EEZ. Coho salmon harvests throughout Upper Cook Inlet were at historically low levels during 2024 and, while weir data was incomplete during 2024, it is unlikely that spawning escapement targets were achieved for the indicator stocks. The 75% buffer is viewed by the NMFS SAFE Team as an extreme but justified attempt to ensure that this stock does not approach or enter an overfished condition.

Tier 3 Aggregate chum salmon, Section 4.7: 20%; the SSC recommended buffer reflects the NMFS SAFE Team recommendation that chum salmon are vulnerable to harvest in gillnets based on their size combined with State data suggesting there are few chum salmon spawning locations throughout Upper Cook Inlet relative to spawning locations for all other salmon species. Currently, no chum salmon stocks are listed as "Stocks of Concern" by the State of Alaska. Chum salmon harvested in the CI EEZ during 2024 made up 39% of the overall (State + Federal) commercial harvest in Upper Cook Inlet (28,805 of 73,905).

Tier 3 Aggregate pink salmon (odd-year), Section 4.8: 10%; the SSC recommended buffer reflects the lowest level of concern for any salmon stock harvested in the CI EEZ. The NMFS SAFE Team recommends that the small size of pink salmon makes them less vulnerable to harvest using gillnets than other salmon species. State data indicates that there are many pink salmon streams throughout Upper Cook Inlet and pink salmon are thought to be in a relatively high state of abundance throughout the North Pacific. Pink salmon harvested in the CI EEZ during 2024 made up 15% of the overall (State + Federal) commercial harvest in Upper Cook Inlet (6,250 of 41,679).

2024 Preliminary Postseason Summary of Stock Status in Relation to SDC and Catch relative to Harvest Specifications

Table 2 and Table 3 of this SAFE include the 2024 tiers, maximum fishing mortality threshold (MFMT), minimum stock size threshold (MSST), OFL_{PRE}, buffers, ABC, annual catch limits (ACLs), TACs, and the actual catch that occurred during the 2024 federal salmon fishery in the CI EEZ.

For the 2024 salmon fishing season in the CI EEZ, preliminary catch data indicate that harvests for all stocks were less than the preseason values for TAC, ABC/ACL, and OFL_{PRE} set in the final 2024 harvest specifications (89 FR 51448). Also, for Tier 1 stocks, since the preliminary postseason estimates of fishing mortality rates in the CI EEZ for the most recent generation (F_{EEZ}) were lower than the MFMT, it is the NMFS SAFE Team recommendation that overfishing did not occur for those stocks during 2024. Similarly, for the Tier 1 stocks, since the preliminary postseason estimates of cumulative escapement for the most recent generation ('Cum. Esc.' in Table 3) were substantially greater than the MSSTs, it is the NMFS SAFE Team recommendation that these stocks are not in or approaching an overfished condition. For Tier 3 stocks, since postseason estimates of cumulative harvests across the most recent generation ('Cum. Harv.' In Table 3) are less than the postseason OFLs, it is the NMFS SAFE Team recommendation that overfishing did not occur during 2024. Section 4.6.1 of this SAFE contains discussion regarding the extent to which the overfished status of the Tier 3 Aggregate coho salmon stock complex (COHO) can be assessed given missing and incomplete spawning escapements. The NMFS SAFE Team and the SSC recommends that the COHO stock complex is not in an overfished condition and recommends basing MSST and associated estimates of spawners only on indicator stocks for which there is considered to be a complete and reliable history of escapement monitoring (Section 4.6.1). As such, the NMFS SAFE Team recommends that all other Tier 3 stocks are also not in an overfished condition. The NMFS SAFE Team recommends that the Tier 3 COHO and Aggregate Chinook salmon stock complexes are not approaching an overfished condition, but that conservative buffers are warranted for the COHO salmon stock in particular to prevent overfishing.

Table 2. Stock status in relation to status determination criteria for the 2024 CI EEZ salmon fishery. For bolded stocks, MFMT and cumulative escapements (Cum. Esc.) were calculated using preliminary 2024 run size and escapement values, derived using estimated 2024 sport and personal use harvest, and will be updated in future CI SAFE reports pending final harvest counts from ADF&G.

Stock	Tier	MFMT	F_{EEZ}	MSST (000's)	Cum. Esc. (000's)	OFL (000's)	Cum. Harv.	OFL_{PRE}	TAC	Catch
KNSOCK	1	0.204	0.072	3,030	8,258	NA	NA	901,932		
KASOCK	1	0.495	0.036	555	4,008	NA	NA	541,084	492,100*	324,837*
AOSOCK	3	NA	NA	162.5	529.7	1,271	449,524	887,464		
ACHIN	3	NA	NA	44.2	70.8	3.072	406	2,697	240	31
COHO	3	NA	NA	38.6	24.4**	439	52,995	357,688	25,000	4,432
CHUM	3	NA	NA	NA	NA	561	147,622	441,727	99,400	28,832
PINK-EVEN	3	NA	NA	NA	NA	300	35,800	270,435	121,700	6,249

* Combined TAC and catch for Kenai Late-Run, Kasilof, and Aggregate "Other" sockeye salmon.

** For the 2024 postseason stock status assessment of the Aggregate coho salmon stock complex, the estimated cumulative escapement across a generation is based on incomplete weir counts for years (2021 – 2024); as such, the NMFS SAFE Team recommends that cumulative escapement does not reflect spawning escapements for this stock and should not be compared with MSST to assess overfished status. In this 2025 SAFE.

Table 3. 2024 preseason harvest specification in relation to catch for the 2024 CI EEZ salmon fishery. Stock level sockeye salmon catch was estimated from the total CI EEZ sockeye salmon catch using ADF&G 2024 genetic mixed stock analysis.

Stock	Tier	OFL_{PRE}	ABC/ ACL	TAC	Catch	Sockeye Catch
KNSOCK	1	901,932	431,123			189,380
KASOCK	1	541,084	375,512	492,100*	324,837*	77,960
AOSOCK	3	887,464	177,493			57,496
ACHIN	3	2,697	270	240	31	NA
COHO	3	357,688	35,769	25,000	4,432	NA
CHUM	3	441,727	110,432	99,400	28,832	NA
PINK-EVEN	3	270,435	135,218	121,700	6,249	NA

* Combined TAC and catch for Kenai Late-Run, Kasilof, and Aggregate "Other" sockeye salmon.

2025 Stock Assessment and Fishery Evaluation for the Cook Inlet EEZ Salmon Fishery: Overall Assessment Summary

The NMFS SAFE Team assesses that, based on SDC that are compliant with the MSA, National Standard Guidelines, and the approved Salmon FMP, there is available yield of Tier 1 sockeye salmon stocks that could reasonably be harvested in the Cook Inlet EEZ salmon fishery while still allowing harvests in all other (i.e., State) fisheries and achieving spawning escapement goals that have the highest probability of producing maximum sustainable yield (MSY) over the long term. The estimated amount of available yield that could be harvested in the CI EEZ is dependent upon estimates of the total run size and State harvests and applies conservative buffers recommended by the SSC. In addition, the estimated available yield also accounts for the deterministic value of a spawning escapement target ($S_{SMSY\text{-}POINT}$, SSC recommendations).

In order to prevent overfishing the Federal COHO stock complex, the NMFS SAFE Team recommends that for the 2025 fishing season, a precautionary buffer is warranted to reduce the preseason OFL to the resulting ABC. In future years, the NMFS SAFE Team will reassess the SSC recommended 2025 buffer (75%) and it is likely to pay particular attention to the extent to which spawning escapement targets for indicator stocks are achieved. The NMFS SAFE Team recommends research to estimate the total run size of the COHO stock complex in order to estimate harvest rates in the CI EEZ.

Within this 2025 SAFE, the NMFS SAFE Team has prioritized and implemented the vast majority of SSC recommendations following their review of the 2024 assessment and intends to implement remaining SSC recommendations and make other improvements on the CI EEZ during future years. Responses to 2024 SSC recommendations can be found in Section 2, a complete summary of all NMFS SAFE Team recommendations can be found in Section 8.

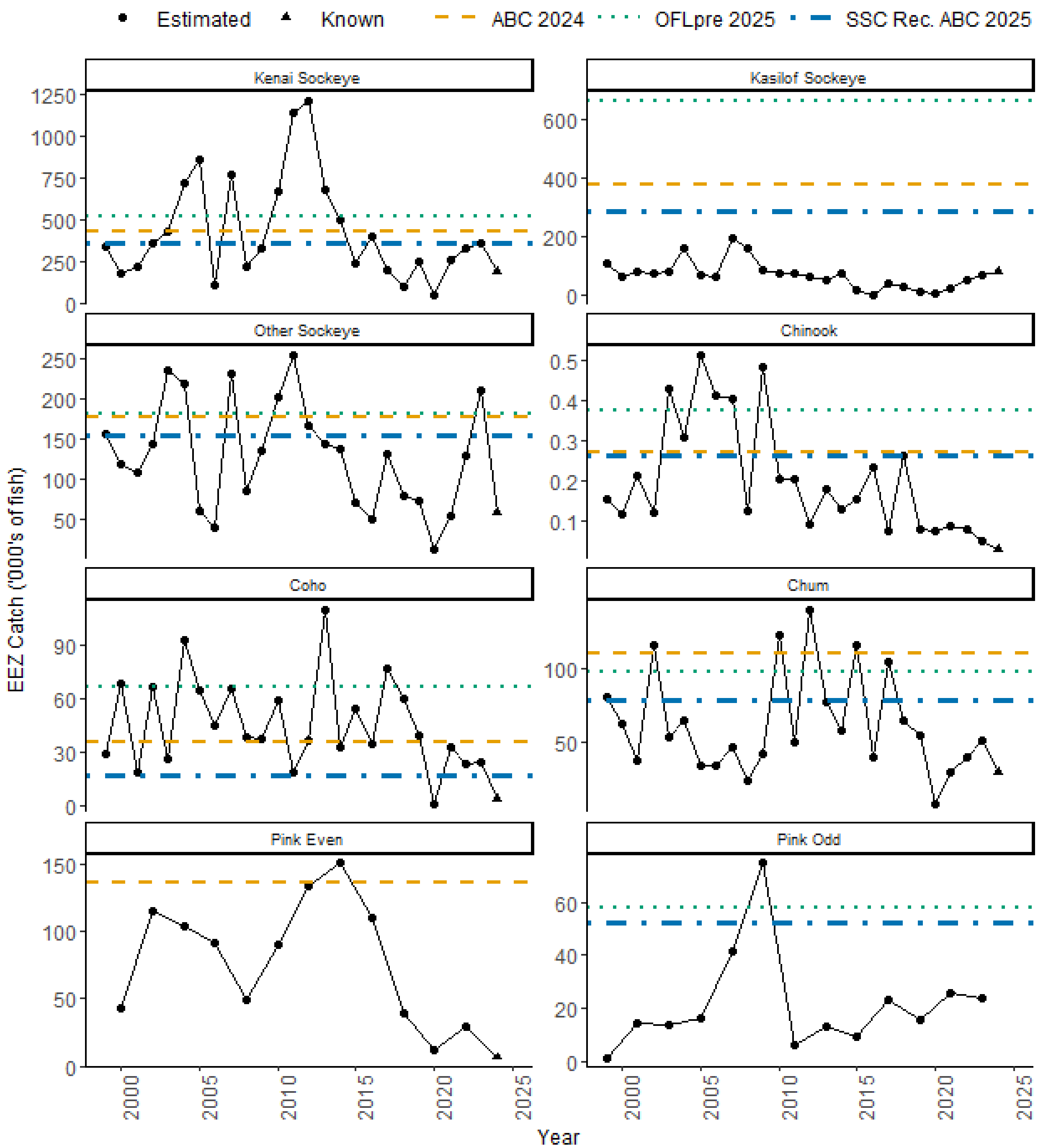

Figure 1. Timeseries of salmon catch in the CI EEZ. Note that the first Federal fishery occurred in 2024 and catch in prior years is estimated. For comparison with the historic CI EEZ catch, the 2025 OFL_{PRE} (green-dotted line) and SSC recommended ABC (blue-dashed line) are presented. Note that the Tier 1 2025 OFL_{PRE} and ABC were calculated using SSC recommended buffers and $S_{MSY\text{-}POINT}$ as the escapement target.

2 2024 Recommendations from the SSC

2.1 SSC recommendations for the 2024 harvest specifications.

2.1.1 For Tier 1 stocks:

The SSC recommends that OFL and MFMT calculations for Tier 1 stocks be based on the best available estimate for the spawning biomass that produces maximum sustainable yield over the long-term (S_{MSY}), as opposed to the lower bound of the escapement goal range, and that this be implemented for the preseason OFL and ABC specifications for the 2024 season.

*While the SSC acknowledges flexibility in the MSST definition relative to S_{MSY} in this context, it recommends defining MSST=0.5*S_{MSY} (summed over a generation) or half of the spawning abundance expected to produce MSY over the long term, for Tier 1 stocks. This approach is consistent with how the MSST is defined in the crab and groundfish fishery management plans (Salmon FMP).*

- **NMFS SAFE Team response:** This SSC recommendation was incorporated into the 2024 Final SAFE in which the Tier 1 OFL, MFMT, and MSST calculations for Tier 1 stocks were based on the point estimate of SMSY (SMSY-POINT) rather than the lower bound of the SSC-recommended spawning escapement goals. However, for the reasons outlined below, for the 2025 assessment the NMFS SAFE Team recommends that the lower bound of the State's spawning escapement goal ranges appropriately represents SMSY for the Tier 1 SDC and the resulting harvest specifications.
- For the Tier 1 stocks of Kenai and Kasilof sockeye salmon, the NMFS SAFE Team interprets and recommends that the State's escapement goal ranges (Hasbrouck et al. 2022; Mckinley et al. 2024), including the lower bound of the ranges, represent spawning escapements with the highest probability of producing maximum sustainable yield (MSY) while preventing overfishing over the long term and are consistent with National Standard 1 Guidelines (50 CFR 600.310(b)(2)(i)), including the N.S.1 Guidelines for defining B_{MSY}/ S_{MSY} (50 CFR 600.310(e)(1)(i)(C)). National Standard 1 Guidelines provide discretion for defining reference points (SDC, MSY, OY, ABC, and ACL) for species that have "alternative" life history characteristics (i.e. different from groundfish life histories) and specifically mention Pacific salmon in this regard (50 CFR 600.310(h)(2)). As discussed in the A16 EA/RIR (Section 3, Appendix 12, Appendix 14), using an escapement goal range (as opposed to a point estimate) to define the spawning escapement targets that are most likely to maximize yield while preventing overfishing over the long term is a necessary recognition of salmon ecology, management, and spawner-recruitment dynamics. As it is not possible to manage to a single point, escapement goal ranges are ubiquitous in salmon management because they provide managers with a practicable range (achievable from a management perspective) that has the highest probability of maximizing yield while being abundantly precautionary in preventing overfishing.

  To clarify, for the Tier 1 stocks, the NMFS SAFE Team wishes to distinguish the point estimate of the number of spawners expected to result in the median or mean value (model estimate) of maximum yield ($S_{MSY\text{-}POINT}$) vs. the State's escapement goal ranges for Kenai River late run and Kasilof River sockeye salmon stocks, which—after an independent review of the ADF&G stock assessments and State policies—it interprets as MSY ranges. As such, in keeping with the Section 3 (e.g., 3.1: *Sufficiencey of Sustainable Escapement Goals as Proxies for* S_{MSY}) and Appendix 12 (e.g., *Proxies for S_{MSY}*) of the A16 EA/RIR, the NMFS SAFE Team recommends that the lower bound of these ranges represent S_{MSY} for calculating SDC.

  For the Tier 1 sockeye salmon stocks, available data and analyses (Hasbrouck et al. 2022; Mckinley et al. 2024; Mckinley et al. 2020) suggest that the State's spawning escapement goal ranges, including the lower bound of the ranges, are well defined with respect to maximizing yields in future years while preventing overfishing. For the Kenai River late run sockeye salmon stock in particular, escapements well below the State's point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$) have resulted in some of the highest yields in the historical record (Hasbrouck et al. 2022). For that stock, eight of the top ten yields (yields of ~3.2-8.8 million fish) were the product of brood-year spawning escapements below the point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$), including several years for which spawning escapements were below the current lower bound of the goal range. All of the top ten brood-year productivities (recruits per spawner) for the Kenai River sockeye salmon stock were also from brood-year escapements that were below the point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$). Please also note the discussion from Hasbrouck et al. (2022) that for the Kenai River sockeye salmon stock, "estimates of S_{MSY} and S_{EQ} are imprecise and the estimates remain potentially sensitive to additional data." This latter point (imprecise parameter estimates) was likely a key consideration by Hasbrouck et al. (2022) to supplement the Kenai sockeye salmon spawner-recruitment analysis with a Markov yield analysis for the purpose of defining the range of escapements that are expected to maximize yield. For the Kasilof sockeye salmon stock, the highest yields in the historical record originated from a wide range of spawning escapements, including those above, near, and below the point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$) (Mckinley et al. 2024). For both Kenai and Kasilof sockeye salmon stocks, without exception, all historical spawning escapements within the current escapement goal ranges have produced harvestable yields with no indications of overfishing. For the Tier 1 stocks, escapements that are at the lower bound of the escapement goals have some the highest probabilities of maximizing yield in future years; as such, it is the recommendation of the NMFS SAFE Team that using the lower bound of the State's escapement goal ranges is consistent with the National Standard 1 Guidelines for defining S_{MSY} because escapements at these levels have historically prevented overfishing and ensured stocks will continue to produce MSY (50 CFR 600.310(e)(2)).

While the SSC could recommend Federal MSY escapement goal ranges that are different than those established by the State and recommended by the NMFS SAFE Team, having different escapement targets for Federal and State fisheries (1) would result in the inability for Federal managers to reasonably achieve an escapement target that is higher than the lower bound of the goal range since the nearshore and freshwater fisheries of Cook Inlet are managed by the State, which manages for the achievement of escapements throughout the goal range, including the lower bound; (2) could contribute to escapements of sockeye salmon that are in excess of the goals that have been vetted by the State's escapement goal committee and recommended by the NMFS SAFE Team to maximize future yields and prevent overfishing; (3) could result in a scenario whereby the State target is achieved while, at the same time, the preseason OFL is exceeded, overfishing is occurring, or a stock is determined to be in an overfished condition, based on Federal SDC; and, (4) would create a narrow management window between $S_{MSY\text{-}POINT}$ and the upper bound of the spawning escapement goals (e.g., for the Kenai late run sockeye salmon stock, based on the analysis of Hasbrouck et al. (2022),the point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$) is 1,212,000 while the upper bound of the goal is 1.3 million spawners, a difference of only ~88K fish).

In addition to being the primary option in the Salmon FMP to set SDC for Tier 1 stocks in the CI EEZ, the lower bound of escapement goal ranges are also described in the Salmon FMP to set SDC for the East Area (Chapter 3.3.1) and is used to set SDC for several West Coast salmon stocks (Pacific Coast Salmon FMP), including those managed under the Pacific Salmon Treaty (PFMC 2022; 16 U.S.C. §§ 3631 et seq.).

In summary, it is the recommendation of the NMFS SAFE Team that the lower bound of the State's escapement goal ranges for the Tier 1 Kenai and Kasilof sockeye salmon stocks are: based on the best scientific information available and a proven long-term record for preventing overfishing; based on the best scientific information available for maximizing yields over the long term (including accounting for scientific uncertainty) and are consistent with National Standard 1 Guidelines for producing MSY; consistent with the Salmon FMP for the Cook Inlet EEZ Area and the East Area off

Alaska; consistent with the West Coast's salmon FMP; achievable from a management perspective; and, are therefore the appropriate metric to use as MSY escapement targets in defining Federal SDC and the resulting harvest specifications. The NMFS SAFE Team suggests that caution is warranted in deviating from the use of the lower bound of the Tier 1 escapement goals to calculate SDC without first demonstrating that such a recommendation is based on the best scientific information available by including additional brood years into spawner-recruitment and/or yield analyses (beyond those considered by Hasbrouck et al. (2022) for Kenai late run sockeye salmon and by Mckinley et al. (2024) for Kasilof sockeye salmon), and until such time as the ecological, economic, and social implications of such a change can be more fully assessed.

For the 2024 SAFE, the aggregate coho salmon buffer should remain unchanged, the aggregate Chinook salmon buffer should be changed from 0.167 to 0.1, the aggregate pink salmon buffer should be changed from 0.9 to 0.5, and the aggregate chum salmon buffer should be changed from 0.5 to 0.25.

- **NMFS SAFE Team response:** This SSC recommendation was incorporated into the 2024 Final SAFE.

2.2 SSC recommendations pertinent to the 2025 harvest specifications.

- **Above, please see the NMFS SAFE Team recommendation to use the lower bound of the State's spawning escapement goal for Tier 1 SDC and harvest specifications, which is applicable to the 2025 assessment.**

The SSC recommends that a workshop, or series of workshops, focused on further development of the CI Salmon harvest specification and status determination methods in the context of continued in-season EEZ management would be valuable in further SAFE development.

- **NMFS SAFE Team response:** Council staff advised that such a workshop or Plan Team isn't likely to occur prior to the February Council meeting due to scheduling constraints. The NMFS SAFE Team fully supports holding a workshop when it is practicable, and preferably before the 2026 assessment cycle. Such workshops or a Plan Team could occur after the 2025 February Council meeting.

For the 2025 SAFE, a separate process should be used to define the preseason OFL and postseason overfishing determination, wherein the preseason OFL is based on either the maximum or average catch over a defensible period of the catch history rather than the maximum catch multiplied by species generation time. Accordingly, the SSC requests that new buffers be proposed for each of the Tier 3 stock aggregates. A starting place might be the 0.75 buffers used for Tier 6 average-catch stocks in the groundfish FMPs, though alternatives should be considered.

- **NMFS SAFE Team response:** The 2025 SAFE defines the Tier 3 preseason OFL as the largest average catch in the EEZ over a generation time in the timeseries under consideration (1999 - 2024). The Tier 3 OFL is used to assess overfishing postseason is defined as the largest rolling sum over a generation time. By using a rolling mean and rolling sum, preseason OFL and OFL estimates more reasonably reflect single-season (OFLpre) and multi-year (OFL) overfishing limits. New recommended buffers have been proposed for each of the Tier 3 stocks. Catch that remains at or below the preseason OFL ensures that overfishing will not occur relative to historic EEZ catch estimates.

For the 2025 SAFE, the <u>*postseason OFL*</u> *process should use the current methodology of evaluating across one generation to provide stability in status determination for the highly variable salmon life history.*

- **NMFS SAFE Team response:** The 2025 SAFE uses the final 2024 methodology of evaluating across one generation for Tier 1, 2, and 3 stocks.

For identifying the representative catch as the basis for both the preseason and postseason OFL definition, the SAFE team should consider and justify: (a) whether the average or maximum catch in the time series is most appropriate, and (b) determine the most representative portion of the recent catch history to use for defining the reference point based on considerations of any past changes to the prosecution of the EEZ portion of the drift gillnet fishery and recent trends in stock productivity.

- **NMFS SAFE Team response:** The 2025 SAFE defines the Tier 3 preseason OFL as the largest average catch in the EEZ over a generation time in the timeseries under consideration (1999 - 2024). The Tier 3 OFL to assess overfishing postseason is defined as the largest rolling sum over a generation time. By using a rolling mean and rolling sum, preseason OFL and OFL estimates are more comparable to actual harvests than the previous method and do not rely on buffers to bring the OFL estimates to a reasonable number. Catch that remains at or below preseason OFL ensures that overfishing will not occur relative to historic EEZ catch estimates.

Specific to the Tier 3 aggregate pink salmon stock, the SSC requests clarification on whether calculations were done separately for even-and odd-year brood lines or whether they were assumed to be the same stock for the purpose of determining maximum catch. The SSC highlights that they represent genetically distinct lines and likely exhibit differences in return abundance.

- **NMFS SAFE Team response:** Yes, the pink salmon brood lines were analyzed separately. We have attempted to make this clearer in the 2025 SAFE.

SSC requests that the SAFE include more information about the ARIMA analysis, such as significant model terms, model diagnostics, and plots of observed vs predicted values. The SSC also requests that the SAFE team provide a direct comparison of the retrospective performance of State of Alaska preseason forecasts for Tier 1 stocks with the ARIMA approach used in the SAFE.

- **NMFS SAFE Team response**: The 2025 SAFE reports the lag, coefficients, and significance of model terms for ARIMA models presented for Tier 1 stocks, as well as side-by-side plots of retrospective State and AR1 run size forecasts.

The SSC recommends that the SAFE team consider and propose alternative error metrics that scale the buffer according to the frequency that the preseason OFL exceeds the postseason OFL only

- **NMFS Safe Team response:** The 2025 SAFE Tier 1 stocks buffers are calculated using only the positive forecast errors (i.e. forecast exceeded the run) when calculating median symmetric accuracy used to buffer the OFL_{PRE} to the ABC.

Given the simple forecast framework, calculations using the P approach, in which analysts characterize forecast uncertainty and the Council expresses its policy toward risk by specifying an* *acceptable probability of exceeding the true but unknown OFL, would be feasible and should be explored.*

- **NMFS SAFE Team response:** The P* approach is not feasible for the 2025 SAFE and (in the absence of additional resources, such as a Salmon Plan Team) would require additional guidance from the SSC. However, a Bayesian approach has been developed where the preseason forecast and forecasted state harvest is estimated using STAN (a probabilistic language to implement Bayesian analysis). Under this framework, it is possible to fully integrate the uncertainty associated with both forecasts and calculate a posterior probability of a range of potential yield and OFL values. A buffer can be applied by retrospectively fitting the model using a one-step-ahead approach and assessing the probability of over-forecasting with different buffers, given the forecast methods. The different proposed ABCs can be associated with probabilities of observing an OFL greater than or equal to each respective ABC value. <u>This alternative Tier 1 approach has been presented in the 2025 SAFE in Appendix B</u>.

*The SSC recommends the SAFE team reconsider the definition of the 'buffer' as a multiplier (m) by which to scale the OFL to obtain the ABC, where ABC = m*OFL. For consistency with other SAFEs and with the common use of the term, the SSC suggests defining the buffer as b = 1-m, reflecting the relative reduction in OFL.*

- **NMFS SAFE Team response:** The 2025 SAFE has adopted the definition of buffer as the reduction from OFL to ABC (i.e. b = 1 - m).

SSC requests clear documentation of retrospective model performance for each stock or stock aggregate.

- **NMFS SAFE Team response:** The 2025 SAFE includes retrospective model performance using MAPE metrics for Tier 1 forecast models (run size and State harvest projections).

The SSC suggests that developing risk tables, or something similar, for future SAFE reports may provide a means of <u>organizing and tracking uncertainty that is not captured in the assessment or harvest policy for informing ABC determination</u>. This could be a potential item for consideration at a future workshop.

- **NMFS SAFE Team response**: A preliminary draft risk table for the Aggregate coho salmon stock complex is included in the 2025 SAFE (Appendix A). The NMFS SAFE Team will work to create more comprehensive risk tables for future SAFEs and welcomes SSC guidance and feedback for future risk table iterations.

Future SAFE reports should group all of the information relevant to a stock in the SAFE chapter for that stock, rather than placing tables and figures in an appendix. This will allow readers of the document to more readily access this information and follows more closely the structure of other Council SAFE documents.

- **NMFS SAFE Team response:** Relevant stock information is included within each stock assessment chapter.

As the CI EEZ management process matures, and consistent with NS2, the SSC looks forward to seeing a summary of scientific information concerning the most recent social and economic condition of the *relevant recreational and commercial fishing interests, fishing communities, and the fish processing industries incorporated into the SAFE.*

- **NMFS SAFE Team response:** Included along with this SAFE is a draft Environmental Assessment (EA) that contains economic and other information pertinent to the 2024 CI EEZ salmon fishery. In addition, the EA/RIR published in 2024 in conjunction with amendment 16 and implementing regulations does contain and extensive social and economic assessment. The SAFE Team will continue to work on addressing this request for future SAFE reports.

2.3 SSC recommendations pertinent to the Salmon FMP.

For the 2025 and future SAFEs, the SSC recommends continuing the use of the current year OFL calculation for Tier 1 stocks, rather than the multiyear calculation, because it reflects the best estimate of potential EEZ yield in the current year. It is clear that the implications of the Tier 1 OFL formula in the proposed Salmon FMP have not been fully considered, and, consequently, that consideration should be given to modifying the Salmon FMP to bring it into alignment with what was actually done this year.

- **NMFS SAFE Team response:** Consistent with the SSC recommendation and as described in equation 6 of the Salmon FMP and Section 3.3.2 of this SAFE, the OFL_{PRE} for Tier 1 stocks is a single-season (current year) value (not multi-year) that is based on the preaseason total run size forecast for the coming fishing season and accounts for harvests in other fisheries and the achievement of the spawning escapement target.

2.4 General Recommendations for all Assessments

This section is intentionally left blank and serves as a placeholder for general recommendations from the SSC or from a Salmon Plan Team, if such a group is formed in the future.

3 Background

This Stock Assessment and Fishery Evaluation (SAFE) report includes assessments of five *Oncorhynchus spp.* (Pacific salmon) harvested in the CI Exclusive Economic Zone (EEZ) Area. The following species and stocks are assessed in this SAFE:

- 1 Chinook salmon, *O. tshawytscha,* stocks (Aggregate Chinook salmon stock complex);
- 3 sockeye salmon, *O. nerka*, stocks (Kenai River Late-Run, Kasilof River, and Aggregate "Other" sockeye salmon stock complex);
- 1 coho salmon, *O. kisutch*, stock (Aggregate coho salmon stock complex);
- 1 chum salmon, *O. keta*, stock (Aggregate chum salmon stock complex); and
- 1 pink salmon, *O. gorbuscha*, stock (Aggregate pink salmon stock complex- divided into even- and odd-year broodlines).

This SAFE report is for the federally managed salmon fishery in the CI EEZ under the Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska (Salmon FMP), and a Federal requirement (50 CFR part 600). For 2025, this SAFE provides the best scientific information available on the biological condition of salmon stocks in CI and builds on the 2024 SAFE and the information and analysis in the Environmental Assessment/Regulatory Impact Review (EA/RIR) prepared for amendment 16 and the implementing regulations. The EA/RIR also provides information on the social and economic condition of the sport, subsistence, personal use, and commercial fisheries, the fish processing industries, and communities in CI and is incorporated here by reference.

The SAFE report summarizes the current biological status of fisheries, reference points, and analytical information used for the Federal assessment. Additional information on CI Salmon fisheries is available on the National Marine Fisheries Service web page at: https://www.fisheries.noaa.gov/action/amendment-16-fmp-salmon-fisheries-alaska. Information pertaining to the adjacent Upper Cook Inlet (UCI) commercial and recreational salmon fisheries managed by the State of Alaska is available on the ADF&G website at: https://www.adfg.alaska.gov.

The Salmon FMP defines those salmon stocks with evidence of historical harvests in the CI EEZ and this SAFE recommends classifying these stocks as belonging to one of three "tiers" based on the information available for the stock. Under the terms provided in the Salmon FMP and as further detailed in this SAFE, the tier level for each stock determines the methods used to set Federal status determination criteria (SDC) and harvests specifications. Each year, the SAFE Report will recommend the salmon stocks that belong in each tier for consideration by the Science and Statistical Committee (SSC) of the North Pacific Fishery Management Council (Council).

Currently, there are 43 salmon stocks defined by the State for its management of UCI salmon fisheries (Munro 2023). Broadly, the State has defined salmon stocks throughout Alaska, including UCI, based on the availability and specificity of spawning escapement, harvest, and other data and considerations; and manages for the achievement of long-term sustainable yields for each stock. When sufficient data are available to define stock recruitment characteristics, and it is practical and achievable to do so, the State's management approach also attempts to implement and manage for spawning escapement goals that have the greatest potential to result in maximum sustainable yield in future generations[1,2]. For the State's salmon management, escapement goal committees—consisting of fisheries scientists, biometricians, biologists, and other fisheries professionals from ADF&G—review data, model estimates, and associated escapement goal recommendations for all defined stocks, every three years; a schedule that aligns with the State's Board of Fisheries (BOF) cycle for each State management area. In recommending SDC and harvest specifications for salmon stocks in the CI EEZ for management under the scope of the MSA, this SAFE also considered data, analyses, and determinations from other sources. After thorough review by the National Marine Fisheries Service (NMFS) SAFE Team and for the purposes of recommending status determination criteria and harvest specifications, this SAFE adopts (with some aggregation) the stock definitions used by the State for its management in UCI. In its review, the NMFS SAFE Team found the State's stock definitions and the data, estimates, and analyses used to conduct stock assessment analyses:

- to be accurate, thorough, and complete (including documenting when escapement estimates were partial or missing due to various circumstances);
- to be based upon the best scientific information available, including a rigorous scientific stock assessment and review process;
- that, given the stock assessment results, the resulting escapement targets represent ranges that were likely to result in sustainable returns for all stocks, and maximum yield (at the stock level) for the Tier 1 stocks;
- and, as used within equations to propose SDC and harvest specifications for this SAFE, that these escapement targets conform to the intent of applicable Federal National Standards.

The Federal stock definitions are based on several considerations, including the availability and specificity of preseason forecasts (DeCino 2022; Erickson and Lipka 2023; Gatt and Erickson 2024); the practical limitations—including current genetics limitations—of monitoring and accounting for the harvest of specific stocks of the same species in a mixed-stock fishery; the relative quality of the historical harvest records estimated to have occurred in the CI EEZ during previous years; and other considerations. Assumptions of the analyses within this SAFE include: that Federal stock definitions align with the State's definitions for Kenai River Late Run sockeye salmon and Kasilof River sockeye salmon; that the Federal stock definitions are aggregations of the State stock definitions for Aggregate "Other" sockeye salmon, Aggregate Chinook salmon, and Aggregate coho salmon, with the Federal definitions including the harvest of salmon bound for many minor tributaries and drainages, for which the State may not have established escapement goals and does not monitor escapements. There is a single State chum salmon escapement goal in UCI and no State escapement goals for pink salmon; given that there are known to be many streams in UCI that contain chum and pink salmon (Giefer 2024), the Federal definitions for chum and pink salmon stocks also represent aggregations of many freshwater drainages and tributaries spread throughout the area. Annually, NMFS will review data and analyses available for each stock and, as determined by NMFS or as recommended by the SSC, propose new stocks, tier determinations, SDC, and harvest specifications for the SSC to consider.

The Salmon FMP and this SAFE describes the criteria and considerations used to propose assignments of the Federal salmon stocks to "tier" levels that determine the methods used to set SDC and harvest specifications. Some of the methods described to set these values propose the use of ADF&G's preseason forecasts for CI salmon stocks. However, due to the required time for ADF&G to collect and process samples for age composition and genetic stock composition estimates used to construct their preseason forecasts, at this time it is necessary for the SSC to recommend SDC and harvest specifications presented within this SAFE that rely on preliminary estimates and other forecast approaches in the absence of ADF&G's forecasts.

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[1] https://www.akleg.gov/basis/aac.asp#5.39.222

[2] https://www.akleg.gov/basis/aac.asp#5.39.223

Based upon the assessment frequency described in Table 4, NMFS provides recommendations on the OFL, acceptable biological catch (ABC), annual catch limits (ACL), and stock status specifications for review by the SSC in February. Additional information on the OFL and ABC determination process is contained in this report. The justification and options associated with each tier are intended to provide the SSC with the best scientific information available to inform their recommendations of appropriate tier placement and the methods used for the values for OFL and ABC.

The primary goal of this SAFE is to provide the information needed to manage salmon fishing in the CI EEZ, recommend harvest specifications, and prevent overfishing. A complete summary of NMFS SAFE Team recommendations to the SSC can be found in Section 8 of this SAFE.

The first Preliminary SAFE was posted in January of 2024 in preparation for the February Council meeting. At the February 2024 Council meeting, the SSC provided a number of recommendations which were incorporated into the revised 2024 Final SAFE. The NMFS SAFE Team has included a summary of the SSC recommendations in Section 2 of this 2025 Preliminary SAFE and has made every effort to highlight recommendations to the SSC throughout, including to the stock status summaries and accompanying SDC and harvest specifications.

Personnel from NOAA's Alaska Fisheries Science Center and Alaska Regional Office assembled this SAFE report. As, prior to 2024, direct Federal salmon management in the CI EEZ had not occurred since prior to Alaska's statehood in 1959, this SAFE report necessarily relies upon data, estimates, and modeling results from ADF&G and the scientific literature; the NMFS SAFE Team expresses its appreciation to ADF&G for providing data necessary to complete this 2025 SAFE. The 2025 Preliminary SAFE report will be posted on the Council website in January of 2025 and presented to the North Pacific Fishery Management Council in February 2025. To accommodate fishery timing and data availability needed to assess stock status and recommend SDC, the NMFS SAFE Team will review assessment data in the fall of each year as post-season harvest and escapement estimates become available.

Acknowledgements: J. Fortenbery, C. Tide, J. Mondragon, A. Oliver, A. Olson, ADF&G (non-Federal data and estimates); and other contributors.

Table 4. The UCI EEZ salmon stocks within this SAFE and review dates. Also included are the current schedule for review by NMFS and SSC and the assessment frequency. Recommendations for tier determination can be found within the Stock Status Summary for each stock.

Stock	***NMFS review and recommendations to SSC***	***SSC review and recommendations to Council***	***Assessment frequency***	***Year of the next Assessment****
Kenai River Late Run Sockeye Salmon (KNSOCK)	January	February	Annual	2026
Kasilof River Sockeye Salmon (KASOCK)	January	February	Annual	2026
Aggregate "Other" Sockeye Salmon (AOSOCK)	January	February	Annual	2026
Aggregate Chinook Salmon (ACHIN)	January	February	Annual	2026
Aggregate Coho Salmon (COHO)	January	February	Annual	2026
Aggregate Chum Salmon (CHUM)	January	February	Annual	2026
Aggregate Pink Salmon (PINK)	January	February	Annual	2026

*The 2026 Preliminary SAFE report will be provided to the SSC and Council at the 2026 February Council meeting.

3.1 Definitions for Status Determination Criteria and Harvest Specifications

ABC Control Rule is the specified approach in the three-tier system for setting the maximum permissible ABC for each stock as a function of the scientific uncertainty in the estimate of the preseason OFL (OFL_{PRE}) and any other specified scientific uncertainty.

Acceptable biological catch (ABC) is a level of catch of a stock that accounts for the scientific uncertainty in the estimate of the OFL_{PRE} and any other specified scientific uncertainty. The preseason ABC is set at or below the OFL and, similar to the OFL, represents potential yield in the EEZ for the current year.

Annual catch limit (ACL) is the level of annual catch of a stock that serves as the basis for invoking accountability measures. For all federally managed salmon stocks in the CI EEZ, the ACL will be set at or below the ABC.

Escapement goal (G) is the recommended spawning escapement goal for each stock of salmon.

F_{OFL} control rule is the method for making an overfishing determination (Tier 1 and 2 stocks). Should stock-specific actual harvest rate (F_{EEZ}) in the CI EEZ exceed the MFMT in any year, it will be determined that a stock is subject to overfishing.

F_{EEZ} is the realized fishing mortality rate in the EEZ for Tier 1 and 2 stocks, expressed as an exploitation rate, assessed over one generation [(sum of actual harvest for a generation)/ (sum of total run size for a generation)]. Preseason estimates of F_{EEZ} are based on actual harvests for the first T-1 years of the generation time plus maximum potential EEZ harvests for the coming fishing season; final, postseason estimates of F_{EEZ} are based on actual harvests for all years of the most recent generation.

Generation time (T) is the average total number of years in the life cycle of a salmon (from fertilized eggs until post-spawning morality) and is used in several equations to set SDC. The following average generation times are used in the SDC equations: sockeye salmon (5 yrs.), Chinook salmon (6 yrs.), coho salmon (4 yrs.), chum salmon (4 yrs.), pink salmon (2 yrs.).

Maximum Fishing Mortality Threshold (MFMT) is the maximum potential fishing mortality rate in the EEZ above which overfishing occurs for Tier 1 and 2 stocks, expressed as an exploitation rate, assessed over one generation [(sum of maximum potential harvest for a generation)/(sum of total run size for a generation)]. MFMT is the residual yield available to be harvested in the CI EEZ after accounting for non-EEZ harvests and the lower bound of the spawning escapement goal being achieved (or, as recommended by the SSC, $S_{MSY\text{-}POINT}$). MFMT is compared with the actual fishing mortality rate (F_{EEZ}) to assess whether overfishing has occurred (postseason estimates) or is approaching overfishing (preseason estimates).

Minimum stock size threshold (MSST) is defined for stocks with escapement goals as one half of the sum of the stock's spawning escapement target summed across a generation. MSST is compared with cumulative actual escapement summed across the most recent generation to assess whether a stock has been overfished (postseason estimates) or is approaching an overfished condition (preseason estimates). See "Overfished" definition.

OFL is the overfishing limit and the preseason basis for establishing ABC. For Tier 1 and 2 stocks, the preseason OFL (OFL_{PRE}) is based on the preseason total run size forecast and projected harvest in State waters (F_{STATE}) and is defined as the maximum stock-specific EEZ harvest (number of fish) that could occur during the coming fishing season while still achieving the spawning escapement target. For Tier 1 and 2 stocks, the OFL_{PRE} is not used to assess overfishing postseason (see "Overfishing" definition). For Tier 3 stocks, OFL_{PRE} is the basis for setting the preseason ABC while the OFL is the postseason basis for the assessment of overfishing. For Tier 3 stocks, based on recommendations from the SSC for the 2024 SAFE, the NMFS SAFE Team recommends that the 2025 OFL is the largest cumulative CI EEZ harvest (number of fish; rolling sum) across a generation in the timeseries under consideration and the

2025 OFL_{PRE} is the average harvest for the same years used to calculate the OFL. (In contrast, the 2024 OFL was calculated as the largest estimated historic harvest in the CI EEZ for the stock in a single year multiplied by the generation time of the species, and the 2024 preseason OFL (OFL_{PRE}) was the OFL minus harvests from the stock that occurred in the CI EEZ during the previous T-1 years of the current generation.)

Overfished status is determined postseason by comparing annual spawning estimates to the established MSST. For stocks where MSST (or proxies) are defined, should a stock's realized spawning escapement(s) summed across a generation fall below the MSST in any year, the stock would be declared overfished. Preseason projections of MSST are used to assess if a stock is approaching an overfished condition. For stocks or stock complexes without escapement goals or reliable estimates of escapement, it is not feasible to establish or assess the overfished status.

Overfishing is defined for Tiers 1 and 2 stocks as occurring when the final, postseason estimate of the actual fishing mortality rate (F_{EEZ}) exceeds the maximum fishing mortality rate (MFMT), with both F_{EEZ} and MFMT calculated across the most recent generation of the species being assessed (e.g., for sockeye salmon, the most recently completed five fishing seasons). For tier 3 salmon stocks, overfishing is defined as occurring when the sum of the stock's postseason EEZ harvests across a generation exceeds the Tier 3 OFL for that stock (See the *OFL* definition above), also calculated across a generation. Preseason projections are used to assess whether a stock is approaching a harvest rate (Tiers 1-2) or harvest level (number of fish; Tier 3) for which overfishing may occur.

Total allowable catch (TAC) is the annual catch target for the directed fishery for a stock, set to prevent exceeding the ACL(s) for a stock or stocks in accordance with the Salmon FMP.

3.2 Status Determination Criteria

The Salmon FMP defines the following SDC and the methods by which these are set.

SDC for salmon stocks are calculated using a three-tier system that accommodates varying levels of uncertainty and information. The three-tier system incorporates new scientific information and provides a mechanism to continually improve the SDC as new information becomes available. Under the three-tier system, overfishing and overfished criteria and ABC levels for stocks are annually formulated. As described below, the ACL for each stock is set at or below the ABC. Each salmon stock is annually assessed to determine its status and whether (1) the catch has exceeded the ABC/ACL, (2) overfishing is occurring or the rate or level of fishing mortality for the stock is approaching overfishing, and (3) the stock is overfished, or the stock is approaching an overfished condition.

For salmon stocks, the OFL_{PRE} provides a reference for managers to monitor overfishing inseason, while overfishing is officially assessed postseason in order to account for realized escapement and harvest in all fisheries. The OFL_{PRE} is derived through the annual assessment process, under the framework of the tier system. For Tiers 1 and 2, the OFL_{PRE} equals the stock-specific amount of maximum potential harvest available in the EEZ (number of fish) after accounting for the spawning escapement goal and likely harvests outside of the EEZ. For Tier 3 stocks, the OFL_{PRE} equals the largest average EEZ catch across a generation in the timeseries under consideration, unless an alternative catch value is recommended by the SSC on the basis of the best scientific information available. For all tiers, overfishing is officially assessed postseason when final harvest and escapement data are available to calculate stock level harvest, F_{EEZ}, and MFMT. For Tier 1, overfishing is assessed using F_{EEZ}, and MFMT for each stock, and for Tier 3 overfishing is assessed using the OFL (largest cumulative harvest for a stock across a generation time in the timeseries).

Overfished status for each stock is determined using the spawning escapement estimate, available following the end of each fishing year, and compares those with MSST. For stocks considered to have reliable estimates of escapements, MSST is defined. If the number of spawners drops below the MSST then the stock is considered to be overfished. For stocks without reliable estimates of escapement, MSST is not defined and overfished status cannot be assessed.

If overfishing has occurred or the stock is overfished, section 304(e)(3)(A) of the MSA requires the Council to immediately end overfishing and rebuild affected stocks.

The MSA requires that FMPs include accountability measures to prevent ACLs from being exceeded. TACs are the principal accountability measures to prevent ACLs from being exceeded for the management of the salmon fisheries in the CI EEZ. These are described in the Salmon FMP and below.

Annually, the Council, SSC, and NMFS will review (1) the stock assessment documents, (2) the OFLs, ABCs, ACLs, and TACs (3) NMFS's determination of whether overfishing occurred in the previous salmon fishing year, (4) NMFS's determination of whether any stocks are overfished and (5) NMFS's determination of whether catch exceeded any ACL or TAC in the previous salmon fishing year.

3.3 Three-Tier System

As described in the Salmon FMP and this SAFE, harvest specifications, OFL_{PRE} and ABC, are set prior to each fishing season using the three-tier system, detailed in Table 5. A stock is assigned to one of the three tiers based on the availability of information for that stock and model selection choices are made. Tier assignments and model choices are recommended by the NMFS SAFE Team to the SSC. The SSC recommends tier assignments, the stock assessment and model structure, including whether the best scientific information available is used for calculating the proposed OFL_{PRE} and ABC/ACLs based on the three-tier system, the buffers used to reduce OFL_{PRE} to proposed values of ABC and, if applicable, buffers considered for proposed values of ACL.

The NMFS SAFE Team prepares the stock assessment and calculates the proposed preseason OFLs (OFL_{PRE}). For Tier 1 and 2 stocks, OFL_{PRE} is calculated from the preseason total run size forecast and projected harvest in State waters. For Tier 3 stocks, the OFL_{PRE} is calculated from estimated historical harvests in the EEZ. The ABCs are set by applying a buffer to the OFL_{PRE} to account for scientific uncertainty.

Stock assessment documents shall:

- specify how the OFL_{PRE} is calculated for each stock; and
- specify the factors influencing scientific uncertainty that are accounted for in calculation of the preseason ABC.

The NMFS SAFE Team will annually review stock assessment documents, the most recent abundance estimates, the proposed OFL_{PRE}, ABCs, ACLs, and compile the SAFE. The NMFS SAFE Team then makes recommendations to the SSC on the OFL_{PRE}, ABCs, ACLs, and any other issues related to the salmon stocks.

The SSC annually reviews the SAFE report, including the stock assessment documents, recommendations from the NMFS SAFE Team, and the methods to address scientific uncertainty. In reviewing the SAFE, NMFS and the SSC shall evaluate and make recommendations, as necessary, on:

- the assumptions made for stock assessment models and estimation of OFL_{PRE}; and,
- the methods to appropriately quantify scientific uncertainty in the OFL_{PRE} when setting the ABC and ACL.

The SSC will then set the final OFL_{PRE}, ABCs, and ACLs for the upcoming salmon fishing year.

3.3.1 Accountability Measures

Section 4.2.8 of the Salmon FMP describes accountability measures and provides preseason and postseason measures that could be implemented. If total harvest is determined to be above the postseason ACL, NMFS will report on the harvest overages in the SAFE report and make any recommendations on accountability measures to the SSC. If it is necessary to improve the science used in the assessment or methods used to manage TAC in the EEZ, such changes can be considered during the SSC and Council review process. Repeated overages of ACL will trigger NMFS to evaluate and address any systemic bias for the overages. Possible accountability measures could include increasing the buffer of the OFL_{PRE} (to result in a lower ABC and resulting ACL and TAC) to account for scientific or management uncertainty. If implementation error is important in causing the overages, a review and revision of in-season management procedures may also be warranted.

3.3.2 Tier 1

Tier 1 is applicable to salmon stocks that have reliable estimates of annual spawning escapements and stock-specific harvests. Stocks assigned to Tier 1 also have data that is of high quality and complete, with reliable estimates of the spawners and associated brood-year recruits to inform spawning escapement goals; age estimates for harvest and escapement components; and, preseason forecasts of total run size.

The Salmon FMP, Table 5, and the text below provide description and equations for the calculations of MSST, MFMT, F_{EEZ}, F_{OFL}, OFL, OFL_{PRE}, ABC, and ACL for Tier 1 stocks.

For Tier 1, whether a stock is approaching or is in an overfished state is determined using MSST. The MSST reference point is calculated as half of the escapement target multiplied by the generation time. If a stock's total EEZ harvest summed across a generation time is less than the MSST, the stock will be determined to be overfished.

For Tier 1 stocks, overfishing is assessed by comparing the stock-specific fishing mortality rate in the EEZ (F_{EEZ}) with MFMT. The MFMT reference point is established based on stock-specific potential yield available in the CI EEZ after accounting for required spawning escapement and harvest of salmon from that stock in non-EEZ (State managed) fisheries. For this tier, overfishing is assessed with postseason estimates and deemed to occur if F_{EEZ} exceeds MFMT. As described in the Salmon FMP, SDC are established based on estimates of harvest and escapement across the most recent generation. For example, for sockeye salmon, the generation time is the most recent 5 years.

Preseason harvest estimates ($\hat{F}_{EEZ}$ and $\hat{F}_{STATE}$): The NMFS SAFE Team recommends to the SSC that the preseason estimate of likely harvests in State waters ($\hat{F}_{STATE}$) in the coming fishing season be based on an autoregressive integrated moving average (ARIMA) model of past State harvest rates using the auto.arima R package to identify the optimal combination of AR and MA lags. The potential harvest rate in the EEZ (F_{EEZ}) in the upcoming season can then be estimated by subtracting expected State harvest from the forecasted run size (minus the escapement target) and dividing by the total forecasted run size. At the discretion of the SSC, future SAFE analyses can compare other approaches (e.g., a 'default' AR-1) with the model selected by the auto.arima function or other alternatives, as well as the retrospective accuracy (and resulting buffer factor) of each method used to inform SAFE recommendations.

OFL_{PRE}: The preseason OFL (OFL_{PRE}) in the EEZ is the estimated maximum harvest that could occur in the EEZ during a single season while still meeting the spawning escapement target and allowing for harvests in other fisheries. The OFL_{PRE} is calculated from the preseason total run size forecast and accounts for likely harvests in other fisheries (*i.e.* those occurring in State waters) and the escapement target. OFL_{PRE} = (forecasted run size) - (escapement target) - (non-EEZ harvest estimate).

ABC_{PRE}: Similar to the OFL_{PRE}, the preseason ABC represents predicted potential yield in the EEZ for the coming fishing season after accounting for scientific uncertainty. The sources of uncertainty in the current model include the positive errors (over-forecasting) in one-year-ahead forecasts of run size and non-EEZ harvests.

Scientific buffers: In reducing OFL_{PRE} for the purpose of setting ABC, the buffer acknowledges the uncertainty in preseason values for SDC. In the case of Tier 1 stocks, the buffer takes into consideration the retrospective positive error (over-forecasting) in OFL_{PRE} and potential yield (based on preseason run size forecasts and predicted State harvests) designations relative to realized postseason values. Specifically, the median symmetric accuracy (Morley et al. 2018) is calculated for preseason estimates of OFL and potential yield relative to postseason (realized) values over a ten-year window. The median symmetric accuracy is interpretable as a measure of percent error in preseason estimates relative to postseason values. A bound of 90% was imposed such that if the calculated median symmetric accuracy indicated use of a buffer above 90%, a 90% buffer would be used instead. Thus, in setting preseason management targets, OFL_{PRE} and potential yield are reduced by the percentage indicated by the median symmetric accuracy to result in the ABC and ACL.

The NMFS SAFE Team has presented the following options to calculate SDC and harvest specifications for Tier 1 stocks.

Tier 1, Option 1 (**T1**): The T1 approach assumes the availability of the ADF&G sibling model-based preseason total run size forecasts to be used in this SAFE with SDC and harvest specifications as described in the Salmon FMP and this SAFE. However, as ADF&G's preseason salmon forecasts were not available in time to be used in this SAFE, this option will not be considered for this SAFE.

Tier 1, Option 2 (**AR**): This approach assumes that an ADF&G preseason total run size forecast will not be available in time to set SDC and harvest specifications. Thus, total run size for the coming fishing season is based on autoregressive integrated moving average (ARIMA) models fitted to available adult return data. The optimal combination of autoregressive (AR) and/or moving average (MA) lags for the ARIMA models was determined by evaluating a range of alternatives via the auto.arima() function of the *forecast* package (Hyndman et al. 2024). With the AR approach, all SDC and harvest specifications would be set using the same equations as the T1 approach, but the estimates would necessarily be more uncertain because they are not informed by sibling returns.

Tier 1, Option 3 (**2025 New Bayesian approach**): The new proposed Bayesian approach is similar to Option 2 above, except that AR forecasts are fit using RStan (Stan Development Team 2024), a Bayesian probabilistic programming language. The key difference is that the preseason run size forecast is fit using an AR1 model, and the preseason forecasted state harvest (F_{STATE}) is fit using either a moving average (Kasilof River sockeye salmon) or a white noise model (Kenai River late run sockeye salmon), which are the auto.arima function selected models for the current year. A range of buffers will be proposed to reduce the OFL to ABC and can be selected by the SSC with guidance from the NMFS SAFE Team using retrospective one-step-ahead testing for the years 2015 – 2024 to calculate the probability of over-forecasting the preseason OFL. The benefit of this approach is that uncertainty associated with the preseason run size and state harvest forecasts are directly incorporated when calculating the OFL by using the posterior distributions of probable run sizes ($\hat{R}_y$) and state harvest rates ($\hat{F}_{state,y}$) in year y, where:

$$\widehat{OFL}_y = \hat{R}_y - G_y - \left(\hat{F}_{state,y} * \hat{R}_y\right).$$

This process results in a distribution of OFL values with associated relative probabilities of occurring given the uncertainty associated with the aforementioned forecasts.

3.3.3 Tier 2

Tier 2 is for salmon stocks managed as a complex, with specific tributaries or drainages as indicator stocks and stock-specific estimates of harvests. Indicator stocks are stocks for which sufficient data exists to allow for the development of measurable and objective SDC and can be used as a proxy to manage and evaluate data poor stocks within the stock complex.

For Tier 2 stock complexes, F_{EEZ}, MFMT, F_{OFL}, and MSST for indicator stocks will be set using the same equations as Tier 1 stocks with overfishing and overfished determinations also assessed in the same way as Tier 1 stocks.

For Tier 2 stocks, the OFL_{PRE}, ABC, ACL, and the buffer to reduce OFL_{PRE} and potential yield will be set for a stock complex in the same way as Tier 1 stocks.

ACL < or = ABC.

For the 2025 SAFE, NMFS SAFE Team does not recommend designating any CI EEZ salmon stock as Tier 2. An additional consideration for setting SDC and harvest specifications for stock complexes is that, while there is assumed to be a relatively thorough accounting of all harvests for the stock, there may be many tributaries for which spawning escapements are not assessed or are assessed with methods for which the total numbers of spawners cannot be estimated with high precision. As such, the escapement goals and annual spawning escapement estimates for stock complexes may represent an index of spawners that is an unknown portion of the overall escapements. Because of this, compared to

Tier 1 stocks, the calculated MFMT value for Tier 2 stocks may be inflated relative to F_{EEZ} and an overfishing determination may be less likely to occur (vs. a Tier 1 stock) as a result, meaning, an overfishing designation may not be triggered for Tier 2 stock complexes, even if such a designation were warranted.

Explained in more detail at the equation level, the numerator of MFMT represents maximum potential yield after subtracting non-EEZ harvests and the lower bound of the escapement goal. However, since the escapement goals for Tier 2 stocks are only *indices* of abundance, and not *actual* numbers of fish, subtracting this index value (and non-EEZ harvests) from the total run size would result in potential yield that would necessarily be larger than the actual yield available. Therefore, applying Tier 1 methods for SDC and harvest specifications to Tier 2 stock complexes may be less precautionary with respect to overfishing than using these methods to assess Tier 1 stocks.

An alternative consideration for stock complexes, is that, if there is incomplete monitoring of indicator stocks, then an overfishing or overfished determination could be made when it is not warranted for the larger stock complex.

As was recommended during 2024, for the 2025 assessment, the NMFS SAFE Team again recommends that, because the estimates of overall total escapement and associated total run size estimates are not "reliable," these stocks be classified as Tier 3 for establishing SDC and harvest specifications for 2024, and until sufficient information is available to form consensus on the tradeoffs associated with a Tier 2 vs. Tier 3 determination.

Note that, compared with Tiers 1 and 2, the method for establishing ABC and ACL for Tier 3 stocks (below) also provides a larger range of buffers for the SSC to consider.

Recommendation: The NMFS SAFE Team recommends additional research to refine estimates of total run sizes and associated components (escapements and mortality) for CI salmon stocks; particularly for stocks where such estimates do not currently exist. These estimates will facilitate improved management.

3.3.4 Tier 3

Tier 3 is for salmon stocks without reliable estimates of escapement. Stocks in this tier may have at least one tributary monitored to assess spawning escapements, but, relative to Tier 1 and 2 stocks, any escapement goals or associated inseason assessment of escapement represent a coarse and/or unknown index of abundance rather than a true number of fish. For stocks in this tier, because there are no reliable estimates of the total number of spawners, total run size, F_{EEZ}, and MFMT for Tier 3 stocks cannot be verifiably estimable and the F_{OFL} control rule is not applicable. As described in the Salmon FMP, historical harvest data is used to set the OFL and OFL_{PRE} for this tier. To assess an overfished determination, MSST is only estimable if the stock or stock complex has at least one tributary with a spawning escapement goal, in which case an overfished determination would be the same as for Tier 1 stocks.

OFL: The OFL is the largest cumulative EEZ catch of the stock in the timeseries under consideration across a generation of the species (*T* years), unless an alternative catch value is recommended by the SSC on the basis of the best scientific information available. This definition of overfishing assumes that the maximum catch in the historical record is analogous to the Tier 1 definition of MSY for the stock. As such, any harvest greater than the maximum historical catch represents harvest in excess of maximum potential yield in the EEZ (harvest in excess of that necessary to achieve adequate spawning escapement and harvests in other fisheries). Similar to the Tier 1 definition, if harvest of a Tier 3 stock was in excess of maximum potential yield for an entire generation, then the stock would be subject to overfishing.

OFL_{PRE}: The OFL_{PRE} represents the number of fish from a Tier 3 stock that could be harvested during a single year without exceeding the OFL. The OFL_{PRE} is the largest average harvest from the stock that occurred in the EEZ across a generation in the timeseries under consideration.

ABC: The preseason ABC is the OFL_{PRE} reduced by a buffer to account for uncertainty. ABC would be set each year during the annual stock status determination process based on the best available information.

Scientific buffer: Stocks assigned a Tier 3 designation lack sufficient data for a scientifically-informed buffer such as that used for Tier 1 stocks. As such, a range of naive buffers from 0.1 to 0.9 will be applied and the resulting management quantities under each buffer value will be presented and compared for SSC consideration. The range of buffers available for Tier 3 stocks provides additional flexibility for the SSC to consider, with recommendations by the NMFS SAFE Team based on comparisons of the buffered ABC values with past EEZ harvests and other stock attributes relative to status quo harvests under State management. For stocks that are considered to be a management, yield, or conservation concern by the SSC, a more conservative buffer could be recommended in order to reduce OFL_{PRE} by a larger amount.

ACL: The preseason ACL is equal to ABC for Tier 3 stocks. For Tier 3 stocks, because the OFL is based solely on historical harvests, there is limited data on which to base uncertainty estimates for a buffer. The NMFS SAFE Team recommends that no distinction be made between ABC and ACL.

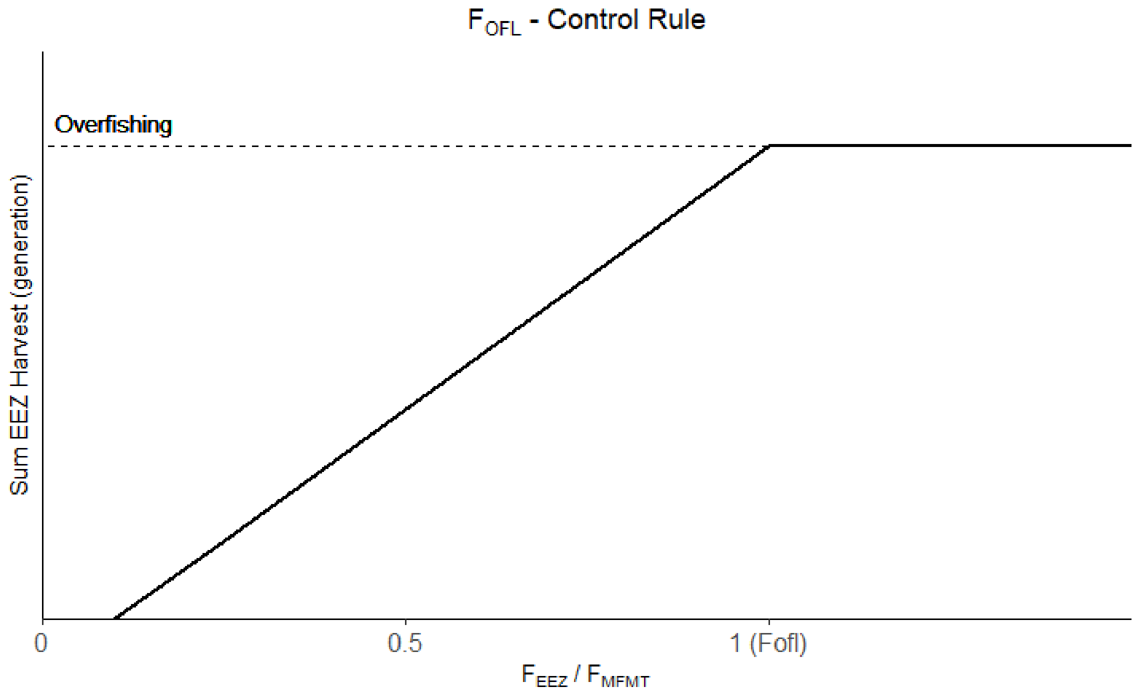

Figure 2. An illustration of the F_{OFL} control rule for Tier 1 and 2 salmon stocks. SDC will allow for acceptable biological catch of a stock in the EEZ until the actual fishing mortality rate (F_{EEZ}) reaches parity with the maximum fishing mortality threshold (MFMT), the largest amount of EEZ harvest that the stock can sustain over a generation while still achieving the spawning escapement target. At parity with MFMT, $F_{EEZ} = F_{OFL}$. Overfishing occurs when the actual fishing mortality rate exceeds the maximum fishing mortality rate (above a F_{EEZ}:F_{MFMT} ratio of 1), the spawning escapement goal is not being achieved across a generation. F_{EEZ} and MFMT are normalized to total run size and assessed over a generation using postseason (final) estimate

Table 5. Three-Tier System for setting OFLs, ABCs, and ACLs for salmon stocks. The tiers are listed in descending order of information availability.

Tier	Information Available	F_{OFL}	ABC control rule*	Buffers considered	ABC
1	**Escapement goal** Spawning escapement Stock-specific harvests across fisheries Total run size estimates	F_{OFL}: harvest rate such that F_{EEZ} = MFMT; where: $F_{EEZ,t} = \frac{\sum_{i=t-T+1}^{t} C_{EEZ,i}}{\sum_{i=t-T+1}^{t} R_i}$ $MFMT_t = \frac{\sum_{i=t-T+1}^{t} Y_{EEZ,i}}{\sum_{i=t-T+1}^{t} R_i}$;	$ABC \leq OFL_{PRE}$	Median Symmetric Accuracy buffer based on positive errors (over-forecasting) of OFL_{PRE}	$ABC_t = [(\widehat{R}_t - \hat{C}_{state,t} - G_t) * (1 - B_t)$
2	**Escapement goal for indicator stock(s)** Spawning escapements for indictor stock(s) Stock-specific harvests across fisheries Total run size estimates	F_{OFL}: harvest rate such that F_{EEZ} = MFMT; where: $F_{EEZ,t} = \frac{\sum_{i=t-T+1}^{t} C_{EEZ,i}}{\sum_{i=t-T+1}^{t} R_i}$ $MFMT_t = \frac{\sum_{i=t-T+1}^{t} Y_{EEZ,i}}{\sum_{i=t-T+1}^{t} R_i}$;	$ABC \leq OFL_{PRE}$	Median Symmetric Accuracy buffer based on accuracy of OFL_{PRE}	$ABC_t = [(\widehat{R}_t - \hat{C}_{state,t} - G_t) * (1 - B_t)$
3	**Harvests** Any escapement goals	Overfishing assessed with the OFL	$ABC \leq OFL_{PRE}$	(1) range of 0.1 0.9 considered (2) Additional buffer considerations for “weak” stocks	$ABC_t = OFL_{PRE,t} * (1 - B_t)$

The following descriptions are associated with the equations provided in Table 5:

- F_{EEZ}
    - T = generation time expressed as years
    - t = run year
    - R_t = annual run size
    - C_{EEZ} = annual EEZ catch of stock in year t
- MFMT
    - $Y_{EEZ,t} = max(0, R_t - G_t - C_{state,t})$
        - $Y_{EEZ,i}$ = potential yield in the EEZ
    - R_t = annual run size
    - $C_{state,t}$ = realized harvest in State waters in year t
    - G = escapement target for stock
- ABC
    - $\widehat{R}_t$ = total run size
    - $\hat{C}_{state,t}$ = harvest in State waters
    - G = escapement target for stock
    - *Buffer (B)* = Tier 1&2: median symmetric accuracy, Tier 3: range of 0.1-0.9
- OFL
    - $OFL_{PRE} = \widehat{R}_t - \hat{C}_{state,t} - G_t$ (Tier 1)
    - $\hat{R}_t$ = preseason total run size forecast
    - $\hat{C}_{state,t}$ = State harvest forecast
    - G_t = escapement target for stock

4 2025 Stock Assessments

4.1 Data and assessments for all stocks

Existing estimates of escapement and stock assessments used for this SAFE originate from the State of Alaska with data available through its website (www.adfg.alaska.gov) and associated publications (https://www.adfg.alaska.gov/sf/publications/); additional details are provided below in the assessments for each stock. 2024 salmon harvests in the EEZ were obtained from eLandings/EEZ landed fish tickets. The most recent stock assessments and escapement goal recommendations for Kenai River late-run sockeye salmon (Hasbrouck et al. 2022), Kenai Late Run Large Chinook salmon (Fleischman and Reimer 2017), Susitna River Chinook salmon (Reimer and DeCovich 2020), and assessments for other stocks (Mckinley et al. 2024) can be found through the ADF&G publications page (ADF&G 2024a) and the State's Board of Fisheries website (ADF&G 2024b). Additional data, estimates, and other relevant information can be found within, or referenced in, annual management reports (Lipka and Stumpf 2024), season summaries (Stumpf 2024), preseason forecasts (Gatt and Erickson 2024), the Sport Fish harvest survey website (ADF&G 2024c), the statewide escapement goal reports (Munro 2023), the CI Area commercial salmon fishing regulations (ADF&G 2024d), and other publications.

Future SAFEs may incorporate some or all of the ADF&G's UCI preseason salmon forecasts; however, whether this occurs is largely determined by the extent to which such forecasts are available in time to be reviewed by NMFS and the SSC. For the 2025 SAFE, an AR1 model described previously was used to generate preseason forecasts of run size for Tier 1 stocks.

Methods used by the NMFS SAFE Team to estimate historical harvests within the CI EEZ are described in the EA/RIR prepared for amendment 16 and the implementing regulations (NOAA Fisheries 2024). Of note is that, while there is now a Federal salmon fishery in the CI EEZ, these historical estimates continue to be used in SDC for the stocks. In summary, these estimates were made by considering the geographical overlap between the Federal CI EEZ and the State statistical areas where salmon landings were reported by fishers to have occurred, combined with professional judgment of managers regarding the distribution of the drift fleet. Because there was not a wholly-Federal salmon fishery confined to the CI EEZ prior to 2024, the accuracy of the historical EEZ harvest proportion estimates are unknown and treated deterministically in this 2025 SAFE. At the discretion of the SSC, future analyses could incorporate some measure of agreed-upon uncertainty into the historical EEZ estimates from stock composition studies (Barclay 2020, 2024; Barclay and Chenowith 2021; Barclay et al. 2019) and other sources.

The analyses and data estimates used for the stock status summaries in this SAFE, including versions of model updates, are available through the following GitHub repository: https://github.com/afsc-assessments/Cook-Inlet-SAFE.

The NMFS SAFE Team welcomes feedback on the analyses, either through GitHub or by contacting the NMFS SAFE Team authors directly via e-mail or phone.

4.2 Kenai River Late Run Sockeye Salmon

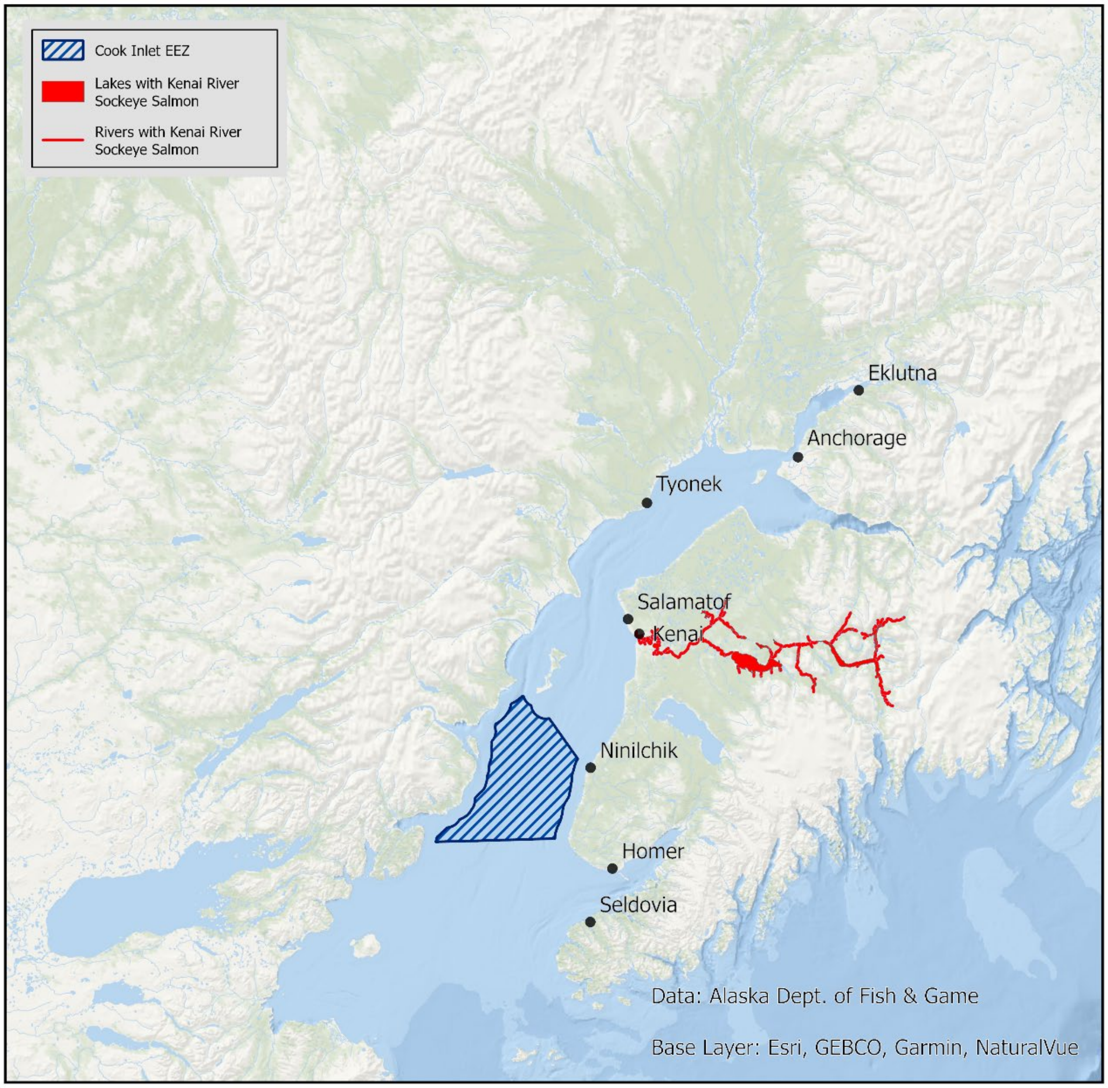

Figure 3. Map showing the CI EEZ and the Kenai River watershed located in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Kenai River Late Run sockeye salmon (KNSOCK) stock is defined as the Kenai Late Run sockeye salmon harvest in the CI EEZ. The Federal definition for this stock also includes spawning escapements and associated spawning escapement targets that are necessary to produce sustainable yields in future years.

4.2.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

The 2024 estimated total harvests, spawning escapements, and total run size of the KNSOCK are still preliminary (Table 6 and Table 7). Based on the ADF&G 2024 genetic mixed stock analysis, approximately 58.3% of the sockeye salmon harvested in the CI EEZ were from the KNSOCK stock. Using this mixed stock analysis, during 2024, an estimated 189K fish from this stock were harvested in the CI EEZ; which was less than the 2024 preseason OFL (902K), ABC/ACL (431K), and the KNSOCK proportion of TAC (265K; Table 2).

Because the estimated KNSOCK harvest rate in the EEZ over the most recent generation (F_{EEZ}) of 0.072 was substantially lower than the estimated MFMT of 0.204 and the cumulative escapement (8.26M) over the most recent generation was larger than MSST (3.03M), it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 and that the stock is not overfished.

4.2.2 Data and assessment methodology

4.2.2.1 Data input changes for 2025

The 2025 SAFE includes catch data from the 2024 federally managed CI EEZ fishery. These data represent the first year during which the catch from the EEZ was known, as opposed to being estimated during previous years in the timeseries (Table 7).

Additionally, ADF&G provided the NMFS SAFE Team with estimates of the 2024 genetic mixed stock analysis proportions of KNSOCK and Kasilof sockeye salmon stock contributions to the UCI drift gillnet fishery. These data allow for more accurate estimates of the individual stock contributions to the harvest in the EEZ, compared to the 2024 SAFE that used a historical average genetic mixed stock analysis proportion of KNSOCK and Kasilof River sockeye salmon stocks.

4.2.2.2 Changes in assessment methodology for 2025

Relative to the method used for the 2024 assessment, as described previously, the 2025 assessment methodology uses a different buffer calculation to reduce the OFL_{PRE} to ABC. In the 2025 SAFE, based on a recommendation from the SSC, only positive errors (over-forecasting) were considered when calculating the buffer using mean symmetrical accuracy.

4.2.2.3 Changes in assessment results for 2025

The 2025 SAFE calculates the Tier 1 buffer using positive errors (over-forecasting), which resulted in a larger KNSOCK buffer (0.673) compared to the 2024 buffer (0.522). The larger buffer results in a smaller 2025 ABC (Table 8).

4.2.2.4 Existing data and assessment

The ADF&G data and stock assessment sources used for the Federal assessment of the KNSOCK are described in this section (Section 4.2), with the additional consideration that Appendix 14 of the A16 EA/RIR includes an examination of density-dependent effects for this stock.

The data used to assess KNSOCK are considered to be complete and of high quality with estimates of stock-specific harvests, spawning escapements, the resulting recruits from those spawners, and age estimates for harvests and escapements. Historical juvenile (freshwater) and smolt data also exists for this stock.

The complete spawner and recruitment data for this stock enabled the use of Ricker models and yield analyses to evaluate spawner-recruitment relationships and inform the bounds of the State spawning escapement goal range.

Sibling model relationships for the dominant age classes inform ADF&G's pre-season estimates of total run size, with forecasted returns of minor age classes based on recent average returns.

4.2.2.5 Federal data and assessments

After review by NMFS and unless otherwise stated, this SAFE incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 harvest estimates from the EEZ), escapement, age, sex, and other data (Table 7). However, because of the timeline necessary to produce this SAFE and prosecute the Federal salmon fishery in the CI EEZ in 2025, this SAFE estimated inriver harvests (e.g., sportfish and personal use) for 2024.

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 1 stocks. In the absence of ADF&G's preseason run size forecast, the NMFS SAFE Team recommends using the AR approach to predict run size and State harvest levels, and the resulting buffers to account for scientific uncertainty in reducing the preseason OFL to the recommended ABC. The annual Federal assessment of stocks in the CI EEZ salmon fishery may, in the future, incorporate some or all of the ADF&G's UCI preseason salmon forecasts; however, whether this occurs is largely determined by whether they are available in time to be reviewed by NMFS and the SSC and be incorporated into the annual SAFE report.

4.2.3 *Stock size and recruitment trends*

Stock overview: Based on historical estimates, KNSOCK is the dominant stock of sockeye salmon harvested in the CI EEZ drift gillnet fishery and the largest stock of any salmon species harvested in the CI EEZ. During the most recent five-year period (2020 – 2024), an average of ~66% of the drift gillnet sockeye salmon harvested in the CI EEZ is estimated to have been from KNSOCK (Table 7), with a range of drift gillnet EEZ harvests of ~50 – 362K during this period. Total run size during the 2020 – 2024 period ranged from 2.39 –3.72M fish. As such, the recent CI EEZ harvest rate, F_{EEZ}, has been a minor portion of the overall run size (0.06–0.08) and well below the MFMT (0.1 – 0.2).

Escapement goals: The State of Alaska's KNSOCK spawning escapement goals (2012–2019: 700,000–1.2M; 2020–present: 750,000–1.3M) have been consistently achieved or exceeded during recent years (Table 9 and Figure 4). From 2020 – 2024, an average of approximately 1.7 million sockeye salmon were estimated to have spawned in the Kenai River system with a range of ~1.2 – 2.0M).

Spawner-recruitment and yield trends: When examining data from the 1979 – 2012 brood years, spawner-recruitment analyses conducted by ADF&G suggest that approximately 1.2M spawners would result in the point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$) for this stock, with a range of 774,000 – 1.74M resulting in 90% of MSY. The ADF&G point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$; 1.212M) was corroborated by an analysis in Appendix 14 of the EA/RIR. KNSOCK has poorly defined density dependent characteristics (Figure 4), which also result in estimates of S_{MSY} ($S_{MSY\text{-}POINT}$) that are imprecise and variable across modeling methods. Possible reasons for poorly defined density dependence and the large range of escapements to result in $S_{MSY\text{-}POINT}$ could include: (1) the paucity of large escapements during past years to parameterize spawner-recruitment models, combined with the dynamic nature of (2) harvests in other areas across years (Shedd et al. 2016); (3) the productive capacity for the Kenai River and ocean environment to spawn and rear sockeye salmon (i.e., time-varying productivity); and/or (4) the variability of inriver and marine survival trends across years.

The current upper bound of the State's escapement target (1.3M fish) has been exceeded several times during recent years. At present, there does not appear to be strong evidence for density dependent effects resulting from these large escapements (EA/RIR Appendix 14)—such as fewer returning adults or substantially reduced yield. This suggests that the overall watershed has some capacity to absorb more spawners than the current goal range. Returns from recent large escapements will provide additional information to better define density dependent effects in the coming years. However, it is the recommendation of the NMFS SAFE Team that the State's spawning escapement goal range for this stock represents the best scientific information available for achieving MSY over the long term

4.2.4 *Tier determination and resulting OFL and ABC determination for 2025*

Consistent with the 2024 SAFE, the NMFS SAFE Team recommends a Tier 1 determination for KNSOCK during 2025. This recommendation is based on the availability of a long history of escapement data believed to represent actual numbers of spawners (rather than an index), spawner-recruitment model estimates and yield analyses that inform the State's escapement goal range, stock-specific harvest data, age composition data for all stock components, complete brood tables, and a preseason forecast of total run size that is informed by sibling model relationships.

This SAFE uses the AR approach to predict the 2025 run size and State harvest rate ($\hat{F}_{STATE}$), which are the main factors in determining the preseason OFL and the resulting ABC/ACL. An AR1 model was fit to past (1999 – 2024) Kenai River total run sizes, and an autoregressive zero mean white noise model (AR(0,0,0)) was fit to historic (1999 – 2024) estimated State harvest rates. The best fit AR1 model forecasts a 2025 Kenai River total run size of 3,453,522 sockeye salmon ($\alpha = 3{,}312{,}306, P_\alpha =$

$0.046;\ \beta = 1.43,\ P_{\beta} = 2x10^{-16};\ \sigma^2 = 1.12$; Figure 5), and predicts a State harvest rate of 0.5 ($\sigma^2 = 0.53$; Figure 5), meaning that approximately half of the total run is predicted to be harvested in State fisheries during 2025. The forecasted run size and State harvest rate are used to estimate preseason values of SDC and potential yield (which is the OFL_{PRE} for the coming fishing season). The NMFS SAFE Team recommendations for OFL_{PRE}, buffer (the median symmetric accuracy buffer described previously in Section 3.3.2) and the resulting ABC are in Table 6 and Table 8). The recommended ABC incorporates the achievement of the biologically-based spawning escapement target, is reduced from a level that represents maximum potential yield for a single year, and is buffered to account for scientific uncertainty. The AR approach was necessary given that ADF&G's preseason total run size forecast for this stock was not available in time for the SAFE. The median symmetric accuracy buffer accounts for model uncertainty and is, based on model results over the long term, sufficiently precautionary to result in the escapement target being achieved. As described previously and in the Salmon FMP, the preseason values of OFL and ABC represent the potential yield of this stock in the CI EEZ. In other words, these values represent what could be harvested for the coming fishing season in the CI EEZ while still meeting spawning escapement targets and estimated harvests outside of the EEZ. To be clear, the AR total run size forecast model will not always be correct in allowing sufficient escapement each year, but the scientific uncertainty applied to the OFL to result in the ABC should, according to the model, result in escapement targets (lower bound of the goal range or $S_{MSY\text{-}POINT}$) being achieved over the long term.

For Tier 1 stocks, the actual harvest rate (F_{EEZ}) and the OFL_{PRE} and ABC represent different approaches to assessing this stock (Table 6 and Table 7). F_{EEZ} is the actual harvest rate averaged across the most recent generation. As F_{EEZ} is currently much smaller than the maximum harvest rate for the most recent generation (MFMT), the ratio of these two rates describes a stock and associated ecosystem that, in recent years, has produced an abundance of harvestable (surplus) yield. These two rates are also used to define overfishing (MFMT) and provide the relative status to assess overfishing (F_{EEZ}) for the stock. At present, given the comparatively small actual harvest rate, it would take many years of harvest in excess of the spawning escapement target for overfishing to occur. In contrast to the multiyear rates used to assess SDC, the OFL_{PRE} and ABC represent potential yield in the CI EEZ specifically for the upcoming fishing season and are not multiyear in nature. The OFL_{PRE} represents the potential yield after accounting for the achievement of the spawning escapement target and estimated non-EEZ harvests for the coming fishing season. The NMFS SAFE Team acknowledges that this stock is estimated to have a sustainable abundance of surplus yield as defined by the Salmon FMP, while also acknowledging that not achieving the spawning escapement target during any single year has ramifications for future yield that the SAFE model did not consider. Thus, while a generational approach is appropriate for defining and assessing SDC (overfishing and overfished status), and for providing an indicator of past performance for this and other salmon stocks, cumulative yield across a generation may not be an appropriate metric for setting acceptable biological catch for a semelparous species.

As previously mentioned and discussed in the amendment 16 EA/RIR, the lack of evidence for density dependence is an important consideration for assessing necessary escapements, the allowable harvests that will facilitate the achievement of those escapements, and the estimation of potential yield for KNSOCK. Available data indicates that spawning escapements in excess of the upper bound of the escapement goal have resulted in a harvestable surplus of returning fish in future years (Table 10). The NMFS SAFE Team recommends that the State's escapement goal range for this stock represents the best scientific information available for maximizing yield and preventing overfishing in future years. At the same time, as discussed in the A16 EA/RIR and Hasbrouck et al. (2022), at present there is not a well-defined upper threshold of spawners that would result in reduced future yield. The Kenai River ecosystem components responsible for spawning, rearing, migration, and other life stages have shown sufficient capacity to absorb spawners well in excess of the State escapement goal while also producing harvestable yield. While it is not necessarily rare for sockeye salmon stocks that are the focus of fisheries to have poorly defined density-dependent characteristics, it is rare for a major, exploited, sockeye salmon stock to exhibit only positive yields throughout its entire history. The relatively large and consistent escapements to this system during recent years (Table 7) may help to define the capacity of the ecosystem to produce yield, but given the lack of existing data, it may be many years before such data are informative to management. At high spawning escapements, Ricker-type density dependence can be assumed; however, the central tendency of the spawner-recruitment trend may be obscured due to the lognormal variance around the mean—high spawning escapements could result in a wide range of outcomes (from high yields to very low yields). As such, we reiterate that it could take many years of spawning escapements above the current upper bound of this goal in order to better elucidate density dependent effects, including the yields of large spawning abundances.

The 2025 NMFS SAFE Team recommendations for the Tier 1 KNSOCK stock are provided in Table 6. Given the considerations discussed above, it is the recommendation of the NMFS SAFE Team that the KNSOCK stock is healthy based on SDC. Model results suggest there is potential yield available to be harvested in the CI EEZ. Based on recommendations from the SSC to use $S_{MSY\text{-}POINT}$ in calculations of SDC and for estimating potential yield (OFL_{PRE}), and based on the methods that were described previously, the 2025 preseason ABC for KNSOCK would be set at 168,485 sockeye salmon (Table 6). However, the NMFS SAFE Team reiterates its recommendation that yield and SDC for this stock be based on the lower bound of the State's spawning escapement goal target of 750K, which would result in a 2025 preseason ABC of 710K sockeye salmon (Table 6). The NMFS SAFE Team recommends that the lower bound of the State's escapement goal range for the KNSOCK stock represents the best scientific information available for maximizing yield and preventing overfishing over the long term, in fulfillment of National Standard 1 Guidelines. Regarding the calculation of MSST to define an overfished determination, in addition to the primary recommendation that MSST be based on the lower bound of the State's escapement goal and be set at 1.875 million spawners (which assumes the equivalent of 375,000 or fewer spawners per year over a generation represents an overfished condition); we have also provided a more precautionary alternative recommendation that the equivalent of 450,000 or fewer spawners over a generation (lower bound of 750,000 × **0.6** ×5) represents an overfished condition, resulting in an MSST of 2,250,000.

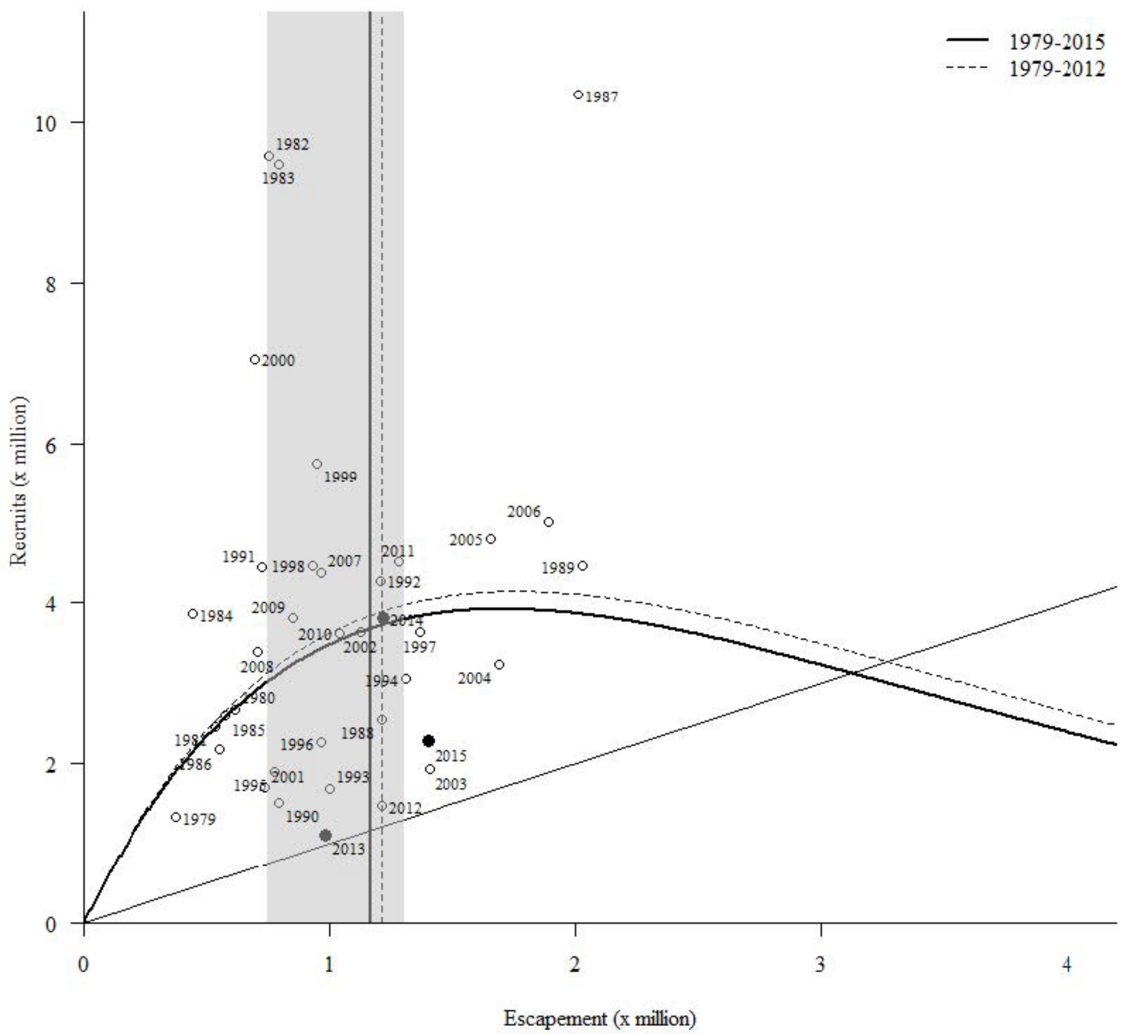

Figure 4. Classic Ricker model fit to Kenai River late-run sockeye salmon. Spawner-recruit data from 1979–2015 (solid line) and 1979–2012 (dashed line). From Mckinley et al. (2024), the most recent ADF&G stock assessment for Kenai Late Run sockeye salmon. Vertical lines represent $S_{MSY\text{-}POINT}$ for each model. The shaded area is the current escapement goal (750,000–1,300,000)

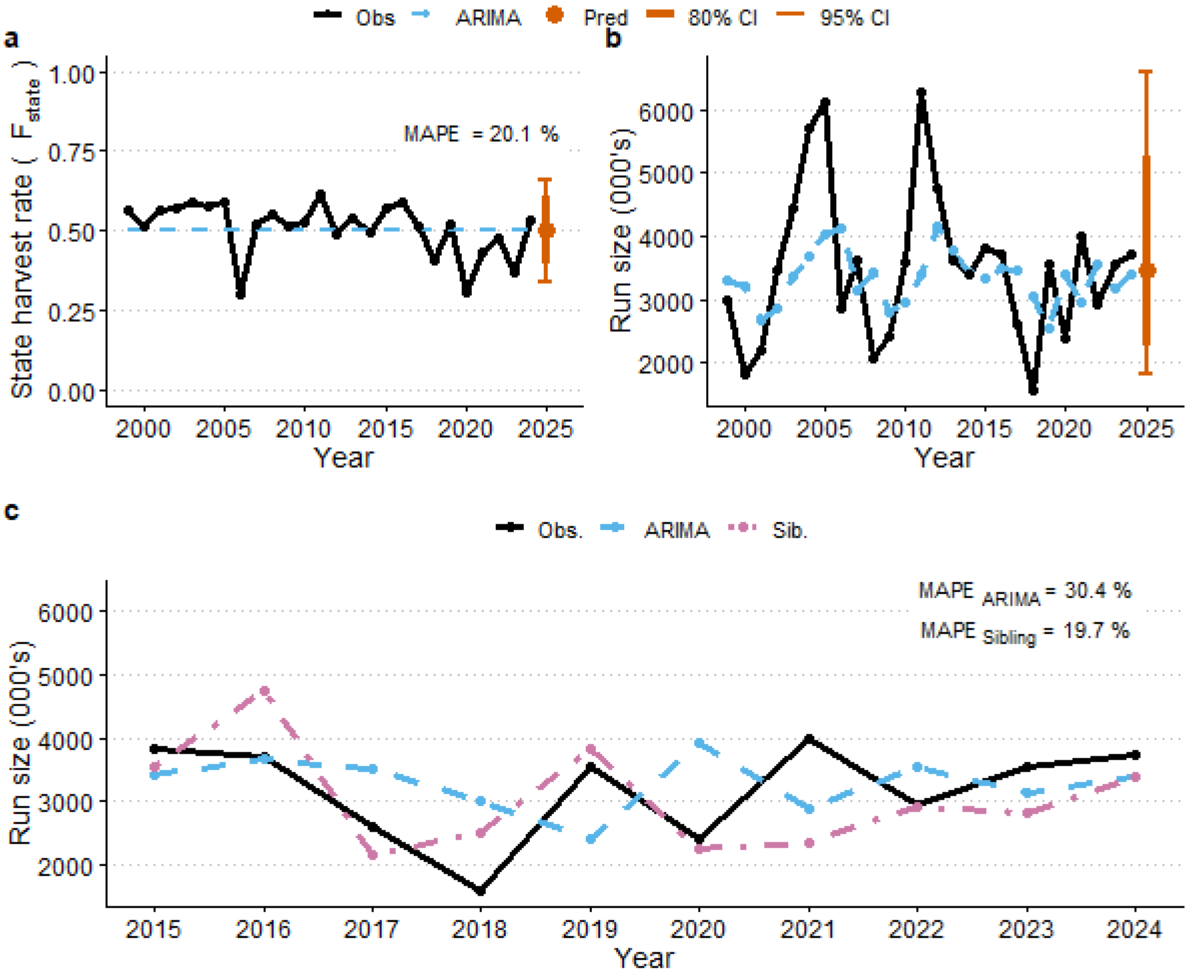

Figure 5. Kenai River Late Run sockeye salmon preseason ARIMA model fits to timeseries. (a) ARIMA white noise model fit (AR(0,0,0);blue dashed line) to historic estimated drift gillnet harvest proportions (black solid line) occurring in State waters for years 1999 -2024 and the 2025 predicted State harvest proportion (red) and the associated 80 and 95% confidence intervals. (b) AR1 model fit (blue dashed line) to historic Kenai River late sockeye salmon total run size (black solid line) and the predicted 2025 run size (red) and the 80 and 95% confidence intervals. (c) Retrospective one-step-ahead predictions for ARIMA (blue line), the ADF&G sibling forecast (purple line) and the observed run size (black). ARIMA models were fit using the auto.ARIMA function in R using the timeseries from 1999 to the year prior to each year's prediction. Mean absolute percent error (MAPE) was calculated for ARIMA and sibling forecasts and presented in the plot ($MAPE_{ARIMA}$*= 30.4% and *$MAPE_{SIBLING}$*=19.7%*

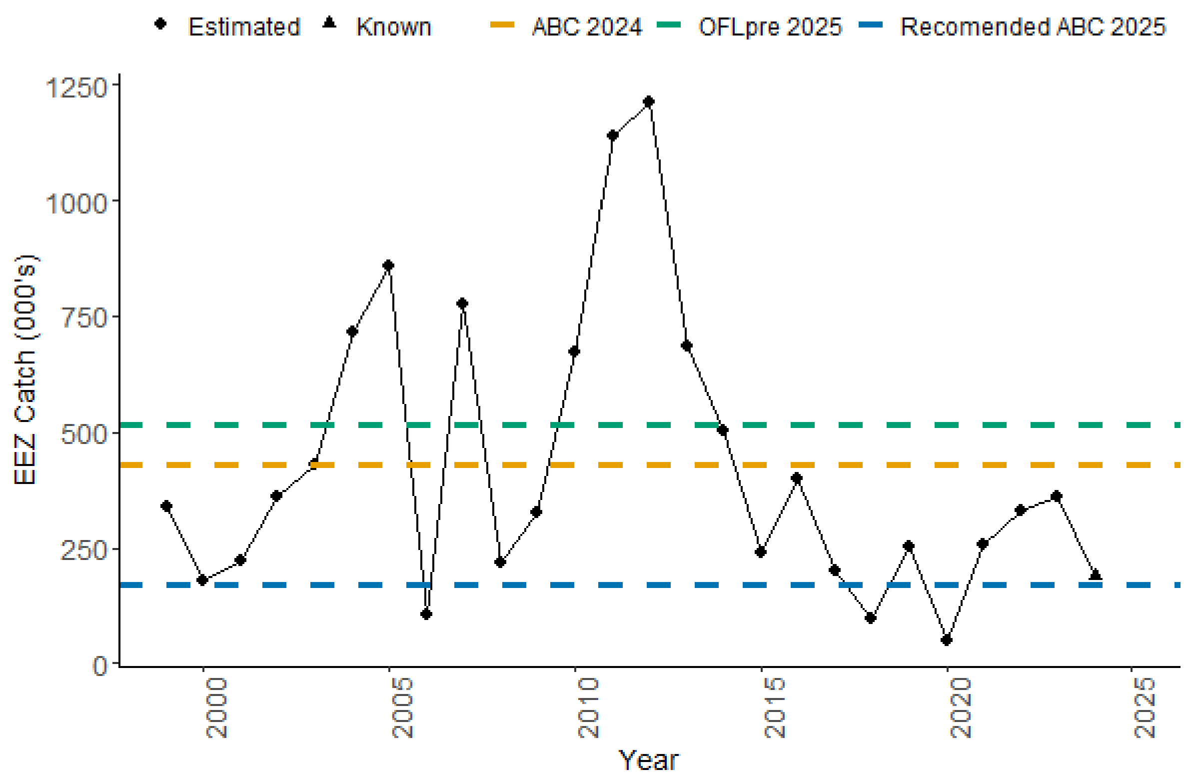

Figure 6. Timeseries of Kenai River late run sockeye salmon harvest in the EEZ for years 1999 - 2024. For 2025, the OFL_{PRE} is 514,761 and the NMFS SAFE Team recommends a buffer of 67.3%, resulting in an ABC of 168,485. EEZ harvest estimates prior to 2024 are based on methods and assumptions are described in section 4.1 of this SAFE report. The Kenai River late run sockeye salmon stock catch is estimated from the total CI EEZ catch using genetic mixed stock analysis.

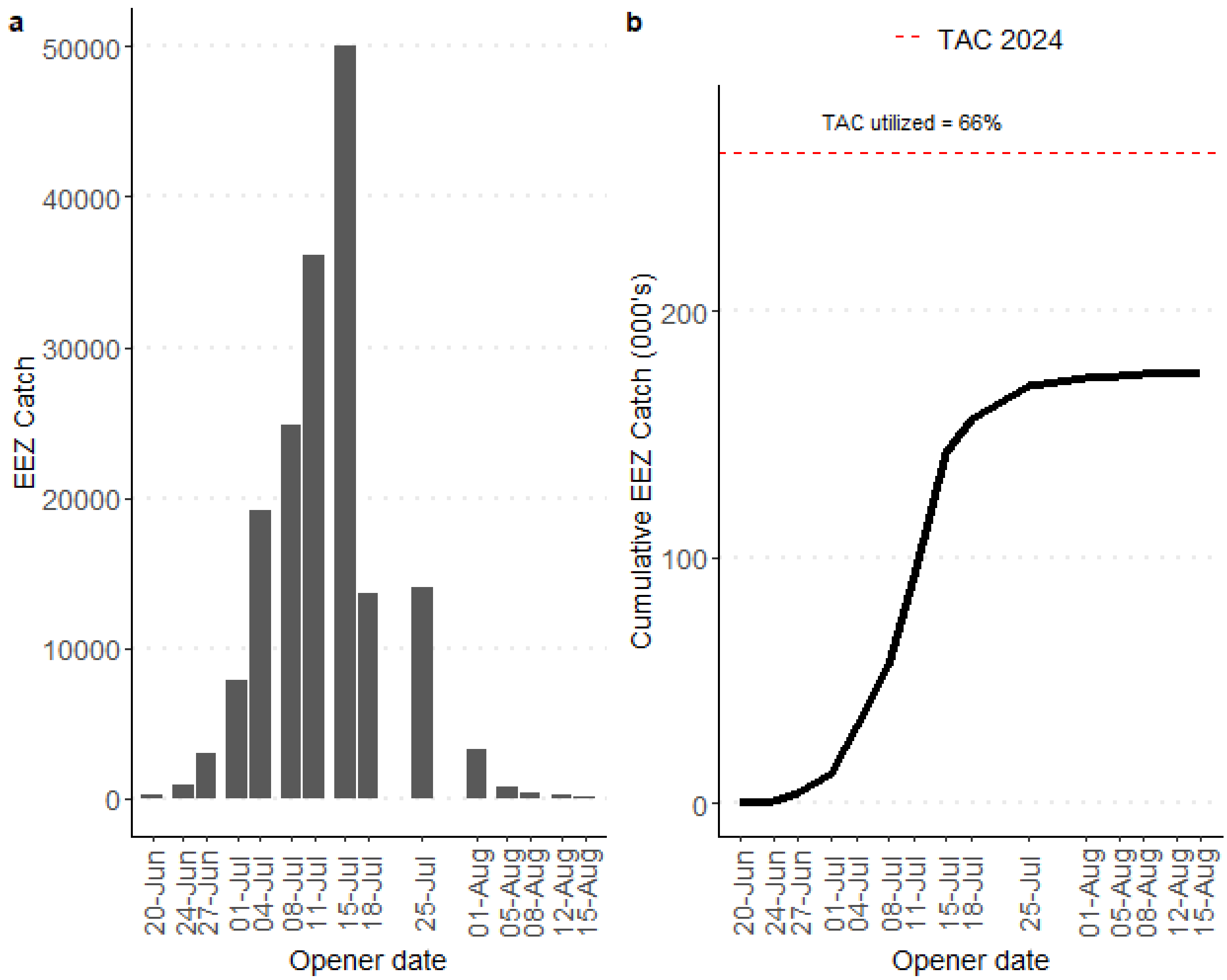

Figure 7. Kenai River Late Run sockeye salmon EEZ (a) catch by day and (b) cumulative catch compared to the 2024 TAC. Note that the Kenai River Late Run sockeye salmon catch is estimated from the total CI EEZ sockeye salmon catch using genetic mixed stock analysis.

*Table 6. Status and recommended catch specifications for Tier 1 Kenai River Late Run sockeye salmon. For 2025, the NMFS SAFE Team recommends a buffer of 0.673 be used to reduce the preseason OFL (potential yield in the CI EEZ) to the recommended ABC of **168K** sockeye salmon. **Values for MSST, MFMT, OFL, and ABC have been presented to reflect the recommendation by the SSC to use $S_{MSY\text{-}POINT}$ (1,212,000 spawners) as the escapement target. Additionally, for comparison, these values are also presented using the lower bound of the State's escapement goal (750K spawners; NMFS SAFE Team Recommendation).** An overfished determination is assessed postseason by comparing the minimum stock size threshold (**MSST**), one half of the sum of the stock's spawning escapement target summed across a generation, with actual cumulative escapement summed across a generation (**Cum. Escap**.). For Tier 1 stocks, overfishing is assessed postseason by comparing the maximum fishing mortality threshold (**MFMT**), the largest potential harvest rate in the EEZ while still achieving the spawning escapement target and non-EEZ harvests, with the actual estimated harvest rate assessed over a generation (**F_{EEZ}**). Rates are normalized to total run size. Shaded values are new estimates or projections based on the current assessment, the projected EEZ Cum. Escap. for the coming fishing season only including the first four years (T-1) of the current generation. Note that estimates for EEZ harvests prior to 2024 were calculated as described in section 4.1. Note that bolded values were calculated using preliminary estimates of run size and escapement which include the five-year average harvest above the river mile 19 sonar station, and will be updated in future CI SAFE reports when final estimates are available from ADF&G.*

Esc. Target	Year	MSST	Cum. Escap.	MFMT	F_{EEZ}	Total Run	EEZ Harvest	OFL_{PRE}	ABC
S_{MSY}	2020	3,030	6,069	0.094	0.073	2,394	50	NA	NA
	2021	3,030	6,957	0.145	0.061	3,992	256	NA	NA
	2022	3,030	7,106	0.161	0.068	2,929	330	NA	NA
	2023	3,030	8,160	0.204	0.076	3,553	362	NA	NA
	2024	3,030	**8,258**	**0.204**	0.072	**3,724**	189	901.9	431*
	2025	3,030	**6,652**	**0.196**	0.094	**3,454**		**514.8**	**168**
Lower Bound	2020	1,775	6,069	0.255	0.073	2,394	50	NA	NA
	2021	1,800	6,957	0.299	0.061	3,992	256	NA	NA
	2022	1,825	7,106	0.308	0.068	2,929	330	NA	NA
	2023	1,850	8,160	0.348	0.076	3,553	362	NA	NA
	2024	1,875	**8,258**	**0.343**	0.072	**3,724**	189	1,165	---*
	2025	1,875**	**6,652**	**0.337**	0.012	**3,454**		**976.8**	**710**

* ABC was calculated using the 2024 buffer method that considered positive and negative errors, whereas the new 2025 buffer only considers the positive errors (over-forecasting). Because of the change in buffer methodology, a 2024 ABC using the lower bound of the escapement goal is not presented.

****** Calculated as (Lower Bound of 750,000 sockeye salmon × **0.5** × 5 years), which assumes that 375,000 spawners per year over a generation represents an overfished condition. A somewhat more precautionary approach assumes that 450,000 spawners per year over a generation (Lower Bound of 750,000 × **0.6** × 5) represents an overfished condition, resulting in an MSST of 2,250,000. The NMFS SAFE Team recommends that the lower bound of the escapement goal represents S_{MSY} for this and other SDC.

Table 7. Historical data for Tier 1 Kenai River Late Run sockeye salmon used to inform the SDCand harvest specifications. The table includes year of the salmon run, the estimate of total run size (000's), the spawning escapement (000's), the Federal spawning escapement target ($S_{MSY-POINT}$; 000's), the total catch across all fisheries (000's), the estimate State waters catch (000's), the fraction of the catch estimated to have occurred in State waters, the estimated EEZ catch (000's), the fraction of the total catch estimated to have occurred in the EEZ, the maximum fishing morality threshold, and the potential yield in the EEZ (000's), cumulative escapement (000's), and minimum stock size threshold (MSST; 000's). For this SAFE, MFMT and Potential Yield in the EEZ reflect the 2024 SSC recommendation that these be based on a point estimate of S_{MSY} ($S_{MSY-POINT}$) for this stock of 1,212,000 spawners. The lower bound of the State escapement goal is 750K sockeye salmon (2017 - 2024). For this table, MFMT and Potential Yield in the EEZ reflect the 2024 SSC recommendation that these be based on a point estimate of S_{MSY} ($S_{MSY-POINT}$) for this stock of 1.212 million spawners. Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Year	Run size	Esc.	Esc. Target ($S_{MSY-POINT}$)	Total catch	State catch	F_{STATE}	EEZ Catch	F_{EEZ}	MFMT	Potential Yield EEZ	Cum. Esc.	MSST
1999	2985	949	1212	2035	1694	0.568	341	NA	NA	79	NA	NA
2000	1815	697	1212	1118	937	0.516	181	NA	NA	0	NA	NA
2001	2190	738	1212	1451	1230	0.562	221	NA	NA	0	NA	NA
2002	3467	1127	1212	2340	1980	0.571	360	NA	NA	275	NA	NA
2003	4440	1402	1212	3037	2606	0.587	431	0.103	0.066	622	4913	3030
2004	5705	1691	1212	4015	3299	0.578	716	0.108	0.119	1194	5655	3030
2005	6109	1654	1212	4455	3598	0.589	857	0.118	0.155	1299	6612	3030
2006	2849	1892	1212	957	850	0.298	107	0.109	0.185	787	7766	3030
2007	3602	964	1212	2638	1864	0.517	774	0.127	0.195	526	7603	3030
2008	2082	709	1212	1374	1154	0.554	220	0.131	0.187	0	6910	3030
2009	2430	848	1212	1582	1254	0.516	328	0.134	0.153	0	6067	3030
2010	3596	1038	1212	2558	1886	0.524	672	0.144	0.124	498	5451	3030
2011	6263	1281	1212	4982	3842	0.613	1140	0.174	0.124	1209	4840	3030
2012	4770	1213	1212	3557	2343	0.491	1214	0.187	0.153	1215	5089	3030
2013	3628	980	1212	2648	1965	0.542	683	0.195	0.163	451	5360	3030

Year	Run size	Esc.	Esc. Target ($S_{MSY\text{-}POINT}$)	Total catch	State catch	F_{STATE}	EEZ Catch	F_{EEZ}	MFMT	Potential Yield EEZ	Cum. Esc.	MSST
2014	3404	1218	1212	2186	1682	0.494	504	0.194	0.179	510	5730	3030
2015	3819	1400	1212	2419	2181	0.571	238	0.173	0.174	426	6092	3030
2016	3712	1118	1212	2594	2194	0.591	400	0.157	0.15	306	5929	3030
2017	2596	1057	1212	1539	1337	0.515	202	0.118	0.101	47	5773	3030
2018	1566	831	1212	735	638	0.407	97	0.095	0.085	0	5624	3030
2019	3542	1457	1212	2085	1833	0.518	252	0.078	0.084	497	5863	3030
2020	2394	1606	1212	788	738	0.308	50	0.072	0.094	444	6069	3030
2021	3992	2006	1212	1986	1730	0.433	256	0.061	0.145	1050	6957	3030
2022	2929	1206	1212	1723	1393	0.476	330	0.068	0.161	324	7106	3030
2023	3553	1885	1212	1668	1306	0.368	362	0.076	0.204	1035	8160	3030
2024*	3724	1555	1212	2169	1980	0.532	189	0.072	0.204	532	8258	3030

*Note that run size, escapement (Esc.), total catch, F_{STATE}, MFMT, potential yield EEZ, and cumulative escapement (Cum. Esc.) calculations include preliminary estimates of total run size, escapement, and State harvest, which were calculated using the five-year historical average harvest occurring above RM19 sonar station. Final values will be presented in future CI SAFE reports pending finalized estimates from ADF&G.

*Table 8. Tier 1 Kenai River Late Run sockeye salmon 2025 ARIMA model forecasted run size, State harvest proportion ($\hat{F}_{STATE}$), and resulting OFL, buffer, ABC, forecasted F_{EEZ}, and MFMT. For this preliminary SAFE, Potential Yield, Buffer, MFMT, OFL, the preseason ABC, F_{EEZ}, and MFMT reflect the 2024 SSC recommendation that these be based on a point estimate of S_{MSY} ($S_{MSY-POINT}$) for this stock of 1,212,000 spawners (**top row**). The values in the **bottom row** are calculated using the lower bound of the escapement goal (2025 NMFS SAFE Team Recommendation).*

Target	Run Size ($\hat{R}$)	$\hat{F}_{STATE}$	Potential yield EEZ	Buffer	OFL_{PRE}	ABC	Forecasted F_{EEZ}	MFMT
$S_{MSY-POINT}$	3,453,522	0.5	514,761	0.673	514,761	168,485	0.094	0.196
Lower Bound	3,453,522	0.5	976,761	0.273	976,761	709,954	0.12	0.327

*Note that values presented in this table were calculated using preliminary 2024 run size and escapement estimates, which include estimated inriver harvest occurring above the river mile 19 sonar station using the five-year historical average.

Table 9. Kenai River late-run sockeye salmon observed escapements (2014 - 2024) and current escapement targets ($S_{MSY-POINT}$ and Lower bound) in thousands of fish.

Year	Federal escapement target ($S_{MSY-POINT}$)	Lwr. Bound	Escapement
2014	1,212	700	1,218
2015	1,212	700	1,400
2016	1,212	700	1,118
2017	1,212	700	1,057
2018	1,212	700	831
2019	1,212	700	1,457
2020	1,212	750	1,606
2021	1,212	750	2,006
2022	1,212	750	1,206
2023	1,212	750	1,885
2024	1,212	750	1,555*

*Estimated using five-year average inriver harvest occurring above above Kenai River RM19 sonar station.

Table 10. Kenai River Late Run sockeye salmon escapement goal analysis data. This table is recreated from Mckinley et al. (2024) Appendix D5 and the data were used for the escapement goal analysis and Figure 4.

Brood Year	Escapement	Returns	Yield	Recruits per Spawner
1968	115,545	960,169	844,624	8.31
1969	72,901	430,947	358,046	5.91
1970	101,794	550923	449,129	5.41
1971	406,714	986,397	579,683	2.43
1972	431,058	2,547,851	2,116,793	5.91
1973	507,072	2,125,986	1,618,914	4.19
1974	209,836	788,067	578,231	3.76
1975	184,262	1,055,373	871,111	5.73
1976	507,440	1,506,012	998,572	2.97
1977	951,038	3,112,620	2,161,582	3.27
1978	511,781	3,785,040	3,273,259	7.4
1979	373,810	1,321,039	947,229	3.53
1980	615,382	2,673,295	2,057,913	4.34
1981	535,524	2,464,323	1,928,799	4.6
1982	755,672	9,587,700	8,832,028	12.69
1983	792,765	9,486,794	8,694,029	11.97
1984	446,297	3,859,109	3,412,812	8.65
1985	573,761	2,587,921	2,014,160	4.51
1986	555,207	2,165,138	1,609,931	3.9
1987	2,011,657	10,356,627	8,344,970	5.15
1988	1,212,865	2,546,639	1,333,774	2.1
1989	2,026,619	4,458,679	2,432,060	2.2
1990	794,616	1,507,693	713,077	1.9
1991	727,146	4,436,074	3,708,928	6.1
1992	1,207,382	4,271,576	3,064,194	3.54
1993	997,693	1,689,779	692,086	1.69
1994	1,309,669	3,052,634	1,742,965	2.33
1995	776,847	1,899,870	1,123,023	2.45
1996	963,108	2,261,757	1,298,649	2.35
1997	1,365,676	3,626,402	2,260,726	2.66
1998	929,090	4,465,328	3,536,238	4.81
1999	949,276	5,755,063	4,805,786	6.06
2000	696,899	7,058,333	6,361,435	10.13
2001	738,229	1,697,957	959,728	2.3
2002	1,126,616	3,628,712	2,502,096	3.22
2003	1,402,292	1,919,813	517,521	1.37
2004	1,690,547	3,236,600	1,546,053	1.91
2005	1,654,003	4,804,018	3,150,015	2.9
2006	1,892,090	5,006,280	3,114,190	2.65
2007	964,243	4,378,678	3,414,435	4.54
2008	708,805	3,380,397	2,671,592	4.77
2009	848,117	3,809,455	2,961,339	4.49
2010	1,038,302	3,625,388	2,587,086	3.49
2011	1,280,733	4,512,033	3,231,301	3.52
2012	1,212,921	1,468,110	255,189	1.21
2013	980,208	1,108,445	128,238	1.13
2014	1,218,342	3,809,669	2,591,328	3.13

Brood Year	Escapement	Returns	Yield	Recruits per Spawner
2015	1,400,047	2,272,980	872,932	1.62
2016	1,118,155	NA	NA	NA
2017	1,056,773	NA	NA	NA
2018	831,096	NA	NA	NA
2019	1,457,031	NA	NA	NA
2020	1,605,627	NA	NA	NA
2021	2,006,290	NA	NA	NA
2022	1,206,003	NA	NA	NA

4.3 Kasilof River Sockeye Salmon

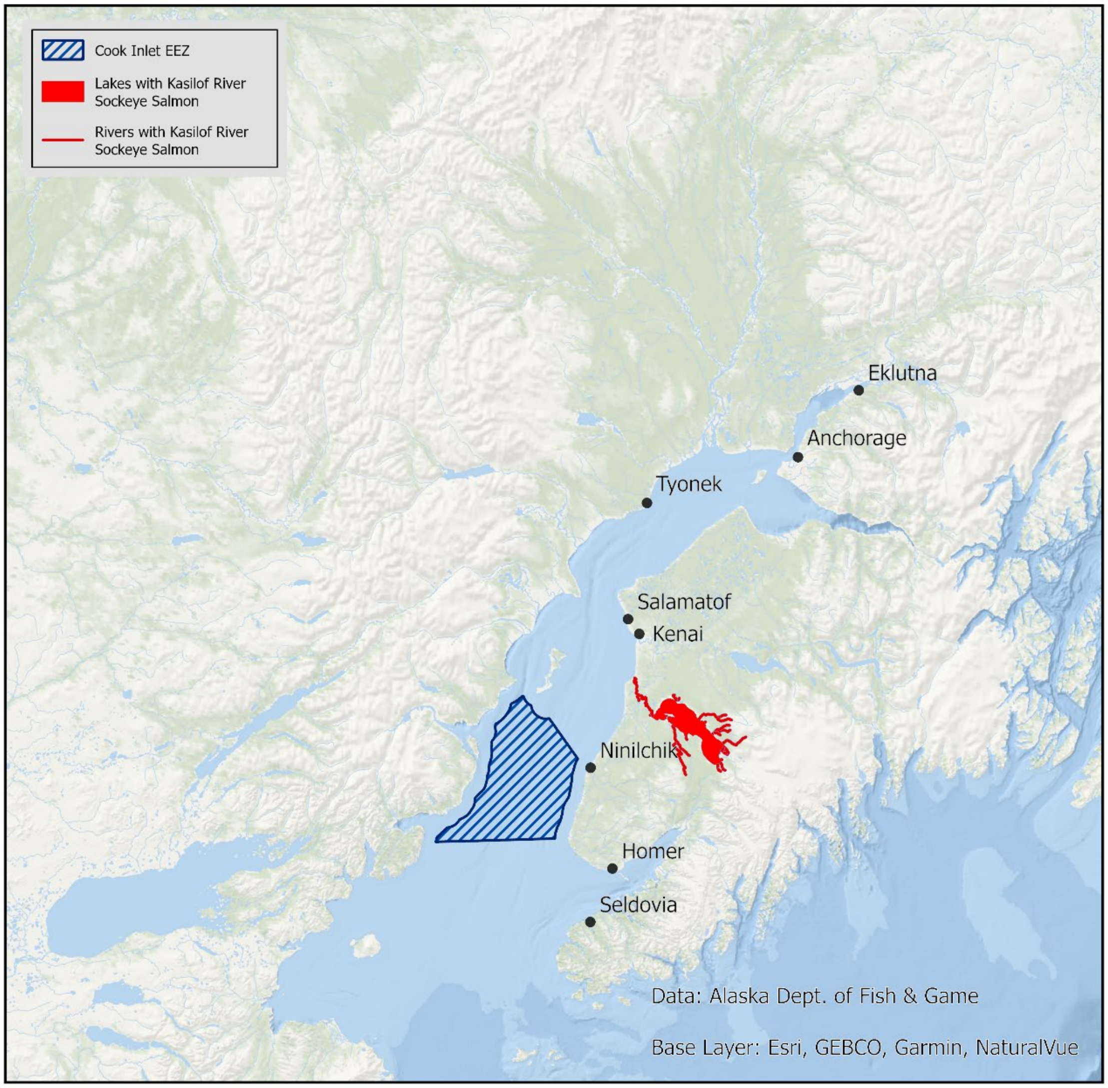

Figure 8 Map showing the CI EEZ and the Kasilof River watershed located in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Kasilof River sockeye salmon stock (KASOCK) is defined as the Kasilof River sockeye salmon harvest in the CI EEZ. The Federal definition for this stock also includes spawning escapements and associated spawning escapement targets that are necessary to produce sustainable yields in future years.

4.3.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

The 2024 estimated total harvests, spawning escapements, and total run size of the KASOCK are still preliminary (Table 11 and Table 12). Based on the ADF&G 2024 genetic mixed stock analysis, approximately 24% of the sockeye salmon harvested in the CI EEZ were from the KASOCK stock. Using this mixed stock analysis, during the 2024, and estimated 78K fish from this stock were harvested in the CI EEZ; which was less than the 2024 preseason OFL (541K), ABC/ACL (376K), and the KASOCK proportion of the TAC (118K; Table 2).

Because the estimated harvest rate in the EEZ over the most recent generation (F_{EEZ}) of 0.036 was substantially lower than the estimated MFMT of 0.495 and the cumulative escapement over the most recent generation (4.0M) was larger than MSST (555K), it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 and that the stock is not in or approaching an overfished condition.

4.3.2 Data and assessment methodology

4.3.2.1 Data input changes for 2025

The 2025 SAFE includes catch data from the 2024 federally managed UCI fishery. These data represent the first year during which the catch occurring in the EEZ are known, as opposed to the estimated as occurred for years prior to 2024 (Table 12).

Additionally, ADF&G provided the NMFS SAFE Team with 2024 estimates of proportions of KSOCK and KASOCK salmon stock contributions to the UCI drift gillnet fishery based on genetic mixed stock analysis. These data allow for more accurate estimates of the individual stock contributions to the harvest in the EEZ compared to the 2024 SAFE that used a historical median symmetric accuracy proportion of KSOCK and KASOCK salmon stock to determine the 2023 stock contributions to the CI EEZ harvest.

4.3.2.2 Changes in assessment methodology for 2025

Following the 2024 SSC recommendations to the NMFS SAFE Team, the 2025 SAFE calculates the Tier 1 buffer (used to reduce OFL_{PRE} to ABC) using the retrospective positive error (2024 buffer uses positive and negative errors) in preseason estimates of potential yield designations relative to realized postseason values over a ten-year window.

4.3.2.3 Changes in assessment results for 2025

The 2025 SAFE calculates the Tier 1 buffer using positive errors (over-forecasting), which resulted in a larger KASOCK buffer (0.803) compared to the 2024 buffer (0.306). The larger buffer resulted in a smaller recommended 2025 ABC (Table 13).

4.3.2.4 Existing data and assessment

The ADF&G data and stock assessment sources used for the Federal assessment of the KASOCK are described in this section (Section 4.3), with the additional consideration that the amendment 16 EA/RIR includes an examination of density-dependent effects for this stock.

The data used to assess KASOCK is considered to be complete and of high quality with estimates of stock-specific harvests, spawning escapements, the resulting recruits from those spawners, and age estimates for harvests and escapements. Smolt data also exists for the Kasilof River system.

The complete spawner and recruitment data for this stock enabled the use of Ricker models and yield analyses to inform the bounds of the State spawning escapement goal.

Historically, sibling model and smolt-to-adult survival relationships for the dominant age classes inform ADF&G’s pre-season estimates of total run size, with forecasted returns of minor age classes based on recent average returns.

4.3.2.5 Federal data and assessments

After review by NMFS and unless otherwise stated, this SAFE incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 harvest), escapement, age, sex, and other data (Table 12).

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 1 stocks. In the absence of ADF&G’s preseason run size forecast, the NMFS SAFE

Team recommends using the AR approach to predict run size and State harvest levels, and the resulting buffers to account for scientific uncertainty in reducing the preseason OFL to the recommended ABC. The annual Federal assessment of stocks in the CI EEZ salmon fishery may, in the future, incorporate some or all of ADF&G's UCI preseason salmon forecasts; however, whether this occurs is largely determined by whether they are available in time to be reviewed by NMFS and the SSC and be incorporated into the annual SAFE report.

4.3.3 Stock size and recruitment trends

Stock overview: During the most recent five-year period (2020 – 2024), an average of 12% of the EEZ drift gillnet sockeye salmon harvest is estimated to have been from KASOCK with a range of harvests of harvests of this stock in the EEZ of 6 – 71K fish during this period. Total run size during the 2020 – 2024 period ranged from 613K – 1.45M.

Escapement goals: The State's Kasilof River sockeye salmon spawning escapement goals (2012–2019: 160,000–340,000; 2020–present: 140,000–320,000) have been consistently achieved or exceeded during recent years (Munro 2023)(Table 14). From 2020 – 2024, an average of approximately 802K sockeye salmon were estimated to have spawned in the Kasilof River system (range of 542K – 1.048M). The current upper bound of the escapement goal has been exceeded several times during recent years.

Spawner-Recruitment and yield trends: When examining data from the 1968–2012 brood years, the best fit model from the spawner-recruitment analyses (AR1 Ricker model) conducted by ADF&G suggests that approximately 222,000 spawners would result in the point estimate of maximum sustainable yield for this stock ($S_{MSY\text{-}POINT}$), with a range of 140,000–320,000 resulting in 90% of MSY (Figure 9). Similar to many sockeye salmon stocks with relatively high historical harvest rates, this stock has poorly defined density dependent spawner-recruitment characteristics at larger escapements, with only a single brood year (1985) having returns that were below replacement (Table 15) and no strong evidence for density dependent effects (Figure 9; EA/RIR Appendix 14). Returns from recent large escapements will provide additional information to better define density dependent effects and $S_{MSY\text{-}POINT}$.

4.3.4 Tier determination and resulting OFL and ABC determination for 2025

Consistent with the 2024 SAFE, the NMFS SAFE Team recommends to the SSC a Tier 1 determination for KASOCK during 2025. This recommendation is based on the availability of a long history of escapement data believed to represent actual numbers of spawners (rather than an index), spawner-recruitment model estimates and yield analyses that inform escapement goals, stock-specific harvest data, age composition data for all stock components, and a sibling model-based preseason forecasts to estimate total run size for the coming year.

This SAFE uses the AR approach to predict the 2025 run size and state harvest rate (F_{STATE}). An AR1 model was fit to past Kasilof River sockeye salmon total run size and an autoregressive moving average model (AR(0,1,1)) was fit to historic estimated State harvest rates. The 2025 forecasted Kasilof River sockeye salmon run size is 1,313,268 fish ($\alpha = 971{,}500,\ P_\alpha = 0.005;\ \beta = 1.64,\ P_\beta = 2.2x10^{-16};\ \sigma^2 = 1.11$; Figure 10) and the State harvest rate is predicted to be 0.325 ($\mu = 0.377,\ P = 0.003, \sigma^2 = 0.551$; Figure 10).

The forecasted run size and State harvest rate are used to set SDC and harvest specifications with a buffer of 0.803 (based on mean symmetric accuracy described previously) applied to preseason OFL (664.3K) to result in the ABC of 131K (Table 13). The forecasted run size and State harvest rate are used to estimate preseason values of SDC and potential yield (which is the preseason OFL (OFL_{PRE}) for the coming fishing season. The NMFS SAFE Team recommendations for preseason OFL, buffer (the median symmetric accuracy buffer described previously in Section 3.3.2) and the resulting ABC are in Table 11 and Table 13Table 12). The recommended ABC incorporates the achievement of the biologically-based spawning escapement target, is reduced from a level that represents maximum potential yield for a single year, and is buffered to account for scientific uncertainty. The AR approach was necessary given that ADF&G's preseason total run size forecast for this stock was not available in time for the SAFE. The median symmetric accuracy buffer accounts for model uncertainty and is, based on model results over the long term, sufficiently precautionary to result in the target escapement goal being achieved. As described previously and in the Salmon FMP, the preseason values of OFL and ABC represent the potential yield of this stock in the CI EEZ. In other words, these values represent what could be harvested for the coming fishing season in the CI EEZ while still meeting spawning escapement targets and estimated harvests outside of the EEZ. To be clear, the AR total run size forecast model will not always be correct in allowing sufficient escapement each year, but the scientific uncertainty applied to the OFL to result in the ABC should, according to the model, result in escapement targets being achieved over the long term.

Similar to the Kenai Late Run sockeye salmon stock, and as discussed in the amendment 16 EA/RIR, KASOCK also has poorly defined density dependent characteristics (but perhaps not as poorly defined as for Kenai River sockeye salmon). Many of the same considerations discussed for KNSOCK are applicable to KASOCK, such as there being a lack of precision in defining the upper limits of escapement that would result in reduced yield for the stock, while acknowledging that estimates of potential yield are dependent upon the attributes of the spawner-recruitment relationship.

For the KASOCK stock, spawning escapement estimates have consistently been achieved and often exceeded during recent years, and SDC and model results suggest there is residual yield that could reasonably be harvested in the CI EEZ. Based on a buffer of 80.3%, the NMFS SAFE Team recommends that the 2025 preseason ABC could be set at 130,701 sockeye salmon. However, the NMFS SAFE Team reiterates its recommendation that yield and SDC for this stock be based on the lower bound of the State's spawning escapement goal target of 140K, which would result in a buffer of 57% and a 2025 preseason ABC of 321K sockeye salmon (Table 11). The NMFS SAFE Team recommends that the lower bound of the State's escapement goal range for the KNSOCK stock represents the best scientific information available for achieving MSY and preventing overfishing over the long term in fulfillment of National Standard 1. Regarding the calculation of MSST to define an overfished determination, in addition to the primary recommendation that MSST be based on the lower bound of the State's escapement goal and be set at 350,000 spawners (which assumes the equivalent of 70,000 or fewer spawners per year over a generation represents an overfished condition); we have also provided a more precautionary alternative recommendation that the equivalent of 84,000 or fewer spawners over a generation (lower bound of 140,000 × **0.6** ×5) represents an overfished condition, resulting in an MSST of 420,000.

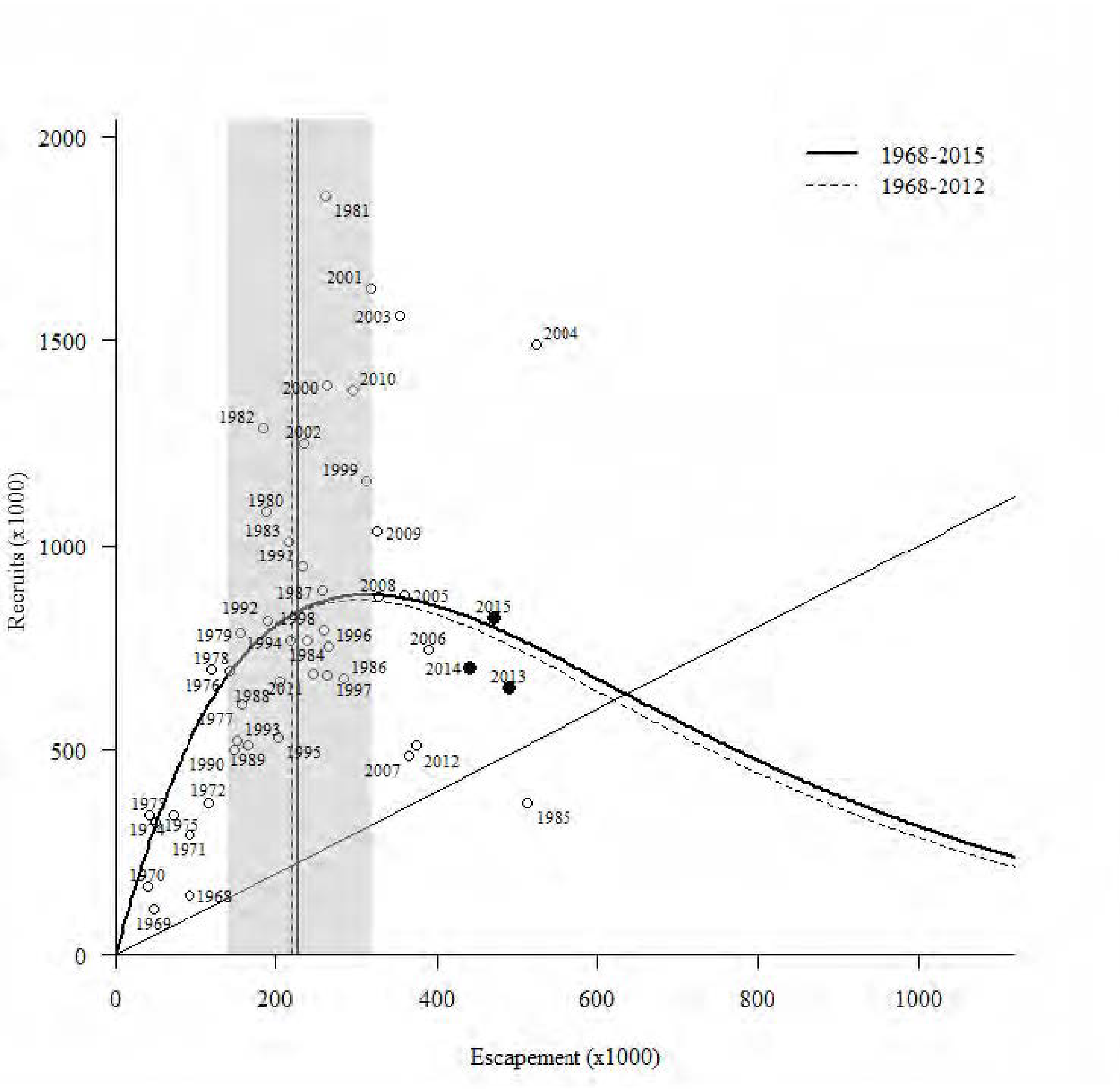

Figure 9. Spawner-recruit curve for Kasilof River sockeye salmon. From Mckinley et al. (2024), the most recent ADF&G stock assessment for Kasilof River sockeye salmon. Autoregressive lag-1 (AR1) Ricker model of spawning escapements (x-axis) and recruits (y-axis) from brood years 1968–2012 (dashed line) and 1968 – 2015 (solid line). The line represents the modeled recruits and the shaded area is the State's current biological escapement goal (BEG) range of 140–320K spawners

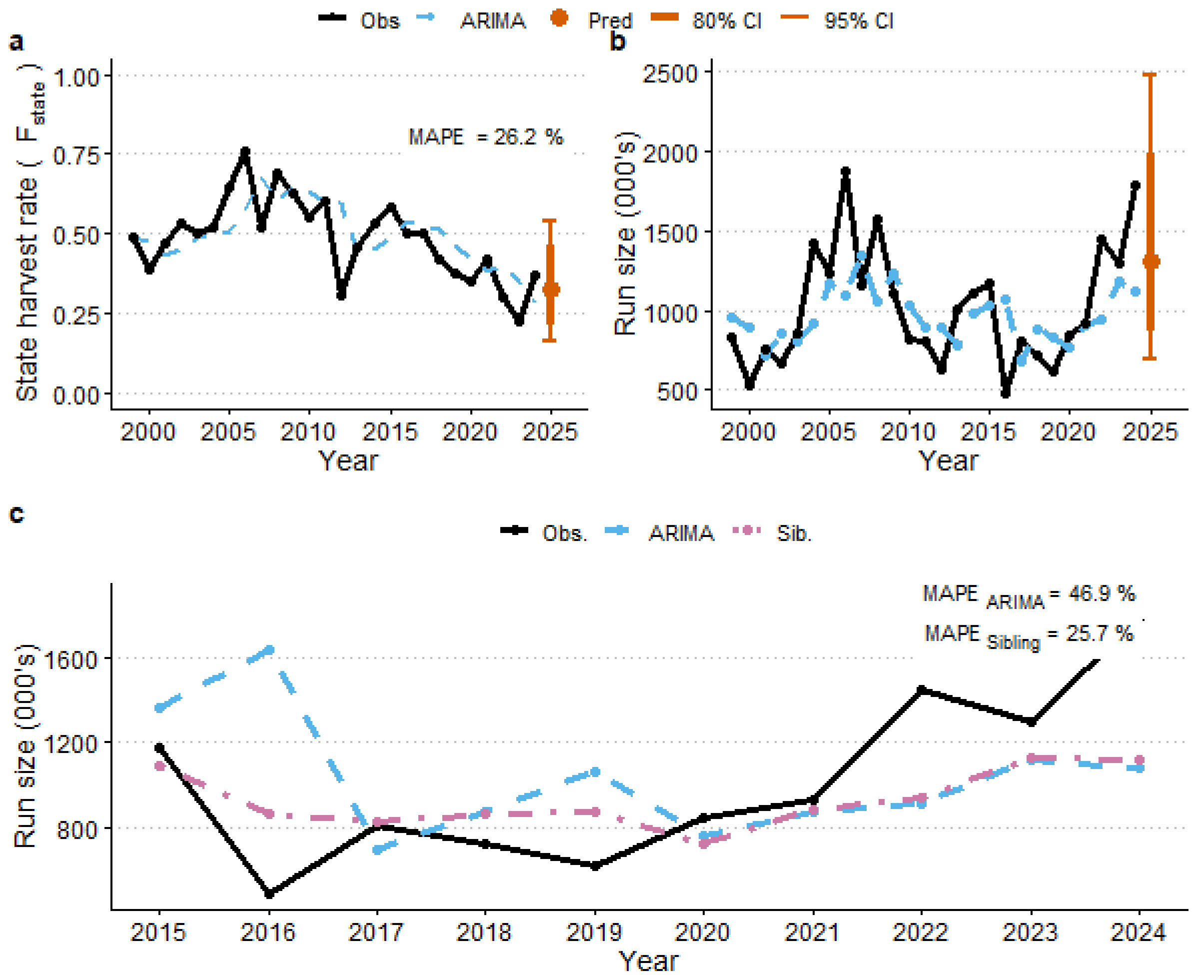

Figure 10. Kasilof River sockeye preseason ARIMA model fits to timeseries. (a) ARIMA model fit (AR(0,1,1);blue dashed line) to historic estimated drift net harvest proportions (black solid line) occurring in State waters for years 1999 -2024 and the 2025 predicted state harvest proportion (red) and the associated 80 and 95% confidence intervals. (b)AR1 model fit (blue dashed line) to historic Kenai River late sockeye salmon total run size (black solid line) and the predicted 2025 run size (red) and the 80 and 95% confidence intervals. (c)Retrospective one-step-ahead predictions for ARIMA (blue line), the ADF&G sibling forecast (purple line) and the observed run size (black). ARIMA models were fit using the auto.ARIMA function in R using the timeseries from 1999 to the year prior to each year's prediction. Mean absolute percent error (MAPE) was calculated for ARIMA and sibling forecasts and presented in the plot ($MAPE_{ARIMA}$=46.9% and $MAPE_{Sibling}$=25.7%).

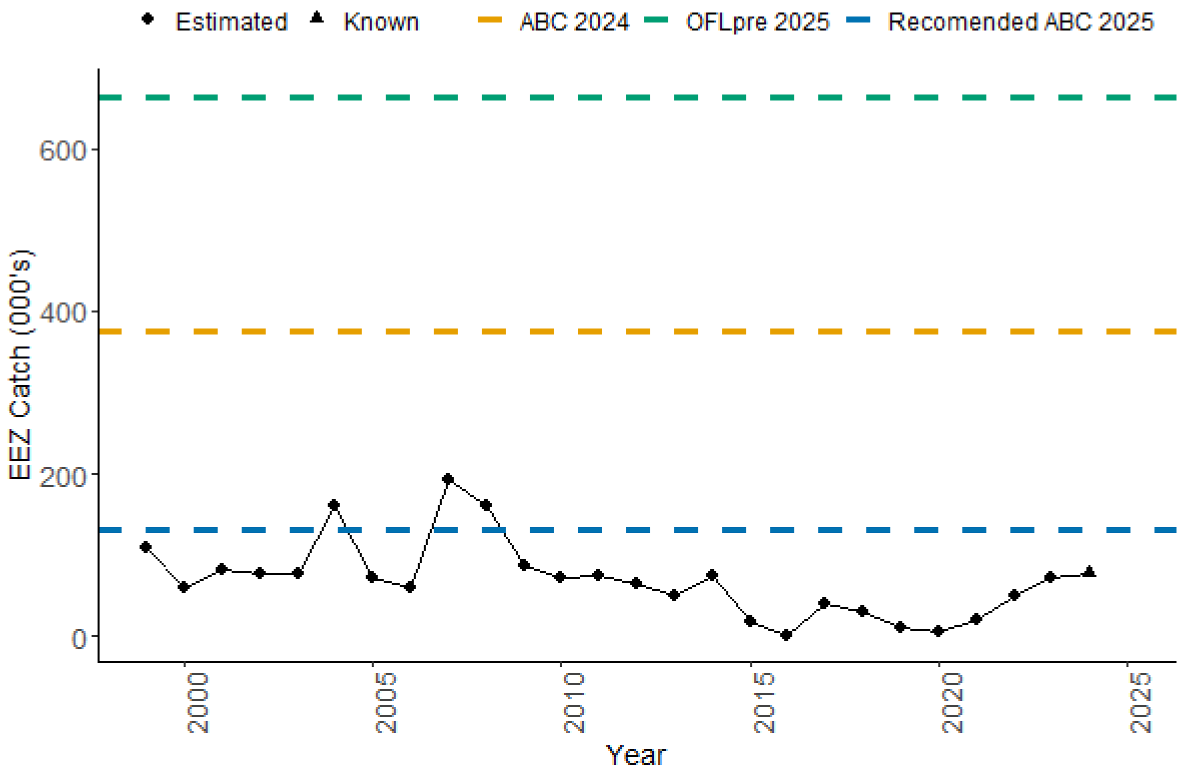

Figure 11. Timeseries of Kasilof River sockeye harvest in the EEZ for years 1999 - 2024. For 2025, the OFL_{PRE} is 664,294 and the NMFS SAFE Team recommends a buffer of 80.3%, resulting in an ABC of 130,701. EEZ harvest estimates prior to 2024 are based on methods and assumptions are described in section 4.1 of this SAFE report. The Kasilof River sockeye salmon stock catch is estimated from the total CI EEZ catch using genetic mixed stock analysis.

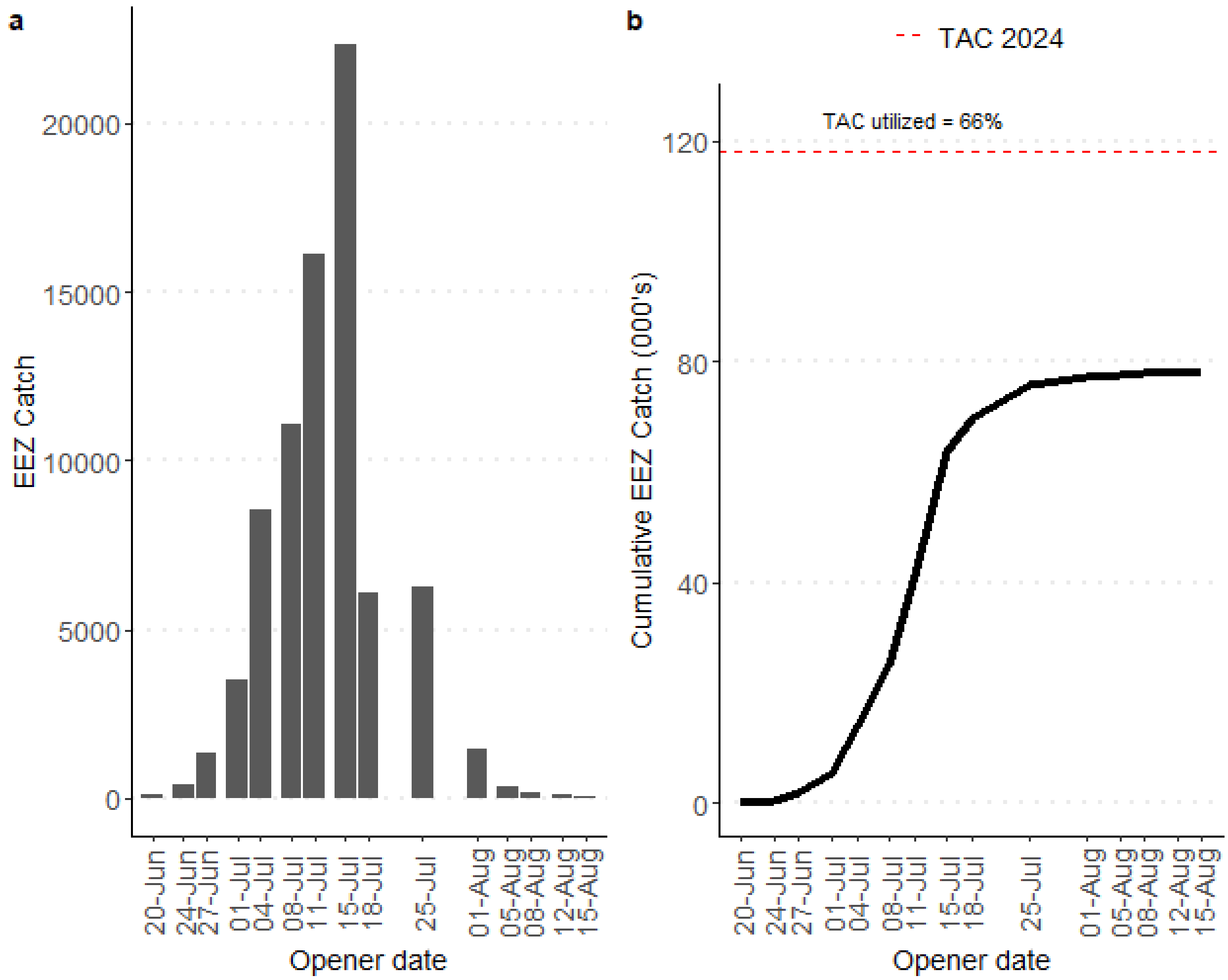

Figure 12. Kasilof River sockeye salmon (a) EEZ catch by day and (b) cumulative catch compared to the 2024 TAC. Note that the Kasilof River sockeye salmon catch is estimated from the total CI EEZ sockeye salmon catch using genetic mixed stock analysis.

*Table 11. Status and catch specifications for Tier 1 Kasilof River sockeye salmon. For 2025, the NMFS SAFE Team recommends a buffer of 0.673 be used to reduce the preseason potential yield ("preseason OFL") to the recommended single-year ABC of **131K** sockeye salmon.* ***Values for MSST, MFMT, OFL, and ABC have been presented to reflect the recommendation by the SSC to use $S_{MSY\text{-}POINT}$ (222,000 spawners) as the escapement target. Additionally, for comparison, these values are also presented using the lower bound of the State's escapement goal (NMFS SAFE Team Recommendation).*** *An ovverfished determination is assessed postseason by comparing the minimum stock size threshold (**MSST**), one half of the sum of the stock's spawning escapement target summed across a generation, with actual cumulative escapement summed across a generation (**Cum. Escap**.). For Tier 1 stocks, overfishing is assessed postseason by comparing the maximum fishing mortality threshold (**MFMT**), the largest potential harvest rate in the EEZ while still achieving the spawning escapement target and non-EEZ harvests, with the actual estimated harvest rate assessed over a generation (**F_{EEZ}**). Rates are normalized to total run size. Shaded values are new estimates or projections based on the current assessment, the projected EEZ Cum. Escap. for the coming fishing season only including the first four years (T-1) of the current generation. Note that EEZ harvest estimates prior to 2024 are estimated as described in section 4.1. Note that bold values were calculated using preliminary estimates of run size and escapement, which incorporate 2024 sport and personal use harvest, and will be updated in future CI SAFE reports when final estimates are available from ADF&G.*

Target	Year	MSST	Cum. Escap.	MFMT	F_{EEZ}	Total Run	EEZ Harvest	OFL_{PRE}	ABC
$S_{MSY\text{-}POINT}$	2020	555	1,902	0.254	0.05	845	6	NA	NA
	2021	555	2,179	0.301	0.027	925	21	NA	NA
	2022	555	2,788	0.395	0.026	1,450	50	NA	NA
	2023	555	3,333	0.464	0.031	1,299	71	NA	NA
	2024	555	**4,008**	**0.495**	0.036	**1,787**	78	541	375.5*
	2025	555		**0.51**	0.131	**1,313**		**664**	**131**
Lower Bound	2020	390	1,902	0.349	0.025	845	6	NA	NA
	2021	380	2,179	0.391	0.027	925	21	NA	NA
	2022	370	2,788	0.476	0.026	1,450	50	NA	NA
	2023	360	3,333	0.540	0.031	1,299	71	NA	NA
	2024	350	**4,008**	**0.560**	0.036	**1,787**	78		---*
	2025	350**		**0.572**	0.143	**1,313**		**746**	**321**

* ABC was calculated using the 2024 buffer method that considered positive and negative errors, whereas the new 2025 buffer only considers the positive errors (over-forecasting). Because of the change in buffer methodology, a 2024 ABC using the lower bound of the escapement goal is not presented.

** Calculated as (Lower Bound of 140,000 × **0.5** × 5 years), which assumes that 70,000 spawners per year over a generation represents an overfished condition. A somewhat more precautionary approach assumes that 84,000 spawners per year over a generation (Lower Bound of 140,000× **0.6** × 5) represents an overfished condition, resulting in an MSST of 420,000. The NMFS SAFE Team recommends that the lower bound of the escapement goal represents S_{MSY} for this and other SDC.

Table 12. Historical data for Tier 1 Kasilof River sockeye salmon used to inform the SDC and harvest specifications. The table includes year of the salmon run, the estimates of total run size (000's), the spawning escapement (000's), the Federal spawning escapement target ($S_{MSY-POINT}$; 000's), the total catch across all fisheries (000's), the estimate State waters catch (000's), the fraction of the catch estimated to have occurred in State waters, the estimated EEZ catch (000's), the fraction of the total catch estimated to have occurred in the EEZ, the maximum fishing morality threshold, and the potential yield in the EEZ (000's), cumulative escapement (000's), and minimum stock size threshold (MSST; 000's). For this SAFE, MFMT and Potential Yield in the EEZ reflect the 2024 SSC recommendation that these be based on a point estimate of $S_{MSY-POINT}$ for this stock of 222,000 spawners. The lower bound of the State's escapement goal is 140K sockeye salmon (2020 – 2024). Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Year	Run size	Escap.	Escap. target	Total catch	State catch	F_{STATE}	EEZ Catch	F_{EEZ}	MFMT	Potential Yield EEZ	Cumulative Esc.	MSST
1999	826	312	222	514	404	0.489	110	NA	NA	200	NA	NA
2000	531	264	222	267	207	0.39	60	NA	NA	102	NA	NA
2001	751	319	222	432	351	0.467	81	NA	NA	178	NA	NA
2002	667	236	222	432	356	0.534	76	NA	NA	89	NA	NA
2003	862	354	222	509	431	0.5	78	0.111	0.214	209	1485	555
2004	1421	524	222	897	737	0.519	160	0.108	0.246	462	1697	555
2005	1227	360	222	867	796	0.649	71	0.095	0.233	209	1793	555
2006	1880	390	222	1490	1429	0.76	61	0.074	0.198	229	1864	555
2007	1157	365	222	792	599	0.518	193	0.086	0.221	336	1993	555
2008	1575	327	222	1248	1088	0.691	160	0.089	0.207	265	1966	555
2009	1105	326	222	779	692	0.626	87	0.082	0.177	191	1768	555
2010	819	295	222	523	450	0.549	73	0.088	0.179	147	1703	555
2011	810	246	222	564	489	0.604	75	0.108	0.19	99	1559	555
2012	632	375	222	258	193	0.305	65	0.093	0.186	217	1569	555
2013	1003	490	222	513	462	0.461	51	0.08	0.223	319	1732	555
2014	1103	440	222	663	589	0.534	74	0.077	0.246	292	1846	555
2015	1175	471	222	704	686	0.584	18	0.06	0.253	267	2022	555
2016	481	240	222	241	240	0.499	1	0.048	0.254	19	2016	555

Year	Run size	Escap.	Escap. target	Total catch	State catch	F_{STATE}	EEZ Catch	F_{EEZ}	MFMT	Potential Yield EEZ	Cumulative Esc.	MSST
2017	802	359	222	443	404	0.504	39	0.04	0.235	176	2000	555
2018	717	388	222	329	299	0.417	30	0.038	0.222	196	1898	555
2019	613	373	222	240	230	0.375	10	0.026	0.216	161	1831	555
2020	845	542	222	303	297	0.351	6	0.025	0.254	326	1902	555
2021	925	517	222	409	388	0.419	21	0.027	0.301	315	2179	555
2022	1450	968	222	482	432	0.298	50	0.026	0.394	796	2788	555
2023	1299	933	222	365	294	0.226	71	0.031	0.464	783	3333	555
2024*	1787	1048	222	739	661	0.37	78	0.036	0.495	904	4008	555

*Note that run size, escapement (Esc.), total catch, F_{STATE}, MFMT, potential yield EEZ, and cumulative escapement (Cum. Esc.) calculations include preliminary estimates of total run size, escapement, and State harvest, derived using estimates of 2024 sport and personal use harvest. Final values will be presented in future CI SAFE reports pending finalized estimates from ADF&G.

*Table 13. Tier 1 Kasilof River sockeye salmon 2025 ARIMA model forecasted run sizeState harvest proportion ($\hat{F}_{STATE}$), and resulting OFL, buffer, ABC, forecasted F_{EEZ}, and MFMT. For this preliminary SAFE, Potential Yield, Buffer, MFMT, OFL, the preseason ABC, F_{EEZ}, and MFMT reflect the 2024 SSC recommendation that these be based on a point estimate of S_{MSY} ($S_{MSY\text{-}POINT}$) for this stock of 222,000 spawners (**top row**). The values in the **bottom row** are calculated using the lower bound of the escapement goal (2025 NMFS SAFE Team Recommendation).*

Target	Run Size ($\widehat{R}$)	$\hat{F}_{STATE}$	Potential yield EEZ	Buffer	OFL_{PRE}	ABC	Forecasted F_{EEZ}	MFMT
$S_{MSY\text{-}POINT}$	1,313,268	0.325	664,294	0.803	664,294	130,701	0.131	0.511
Lower Bound	1,313,268	0.325	746,294	0.57	746,294	320,841	0.143	0.572

*Note that values presented in this table were calculated using preliminary 2024 run size and escapement estimates, which include estimated 2024 personal use and sport harvest.

Table 14. Kasilof River sockeye salmon observed escapements (2014 – 2024) and current escapement targets ($S_{MSY\text{-}POINT}$ and Lower Bound)in thousands of fish.

Year	Federal escapement target ($S_{MSY\text{-}POINT}$)	Lower bound	Escapement
2014	222	160	440
2015	222	160	471
2016	222	160	240
2017	222	160	359
2018	222	160	388
2019	222	160	373
2020	222	140	542
2021	222	140	517
2022	222	140	968
2023	222	140	933
2024	222	140	1,048*

*Calculated using estimates of 2024 sport and personal use harvest.

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Table 15. Kasilof River sockeye salmon escapement goal analysis data. This table is recreated from Mckinley et al. (2024) Appendix D4 and the data were used for the escapement goal analysis and Figure 9.

Brood year	Escapement	Returns	Yield	Recruits per Spawner
1968	90,958	145,853	54,895	1.6
1969	46,964	110,919	63,955	2.36
1970	38,797	168,239	129,442	4.34
1971	91,887	295,083	203,196	3.21
1972	115,486	372,639	257,153	3.23
1973	40,880	341,734	300,854	8.36
1974	71,540	342,896	271,356	4.79
1975	48,884	321,500	272,616	6.58
1976	142,058	691,693	549,635	4.87
1977	158,410	610,171	451,761	3.85
1978	119,165	695,679	576,514	5.84
1979	155,527	783,821	628,294	5.04
1980	188,314	1,082,721	894,407	5.75
1981	262,271	1,853,442	1,591,171	7.07
1982	184,204	1,287,592	1,103,388	6.99
1983	215,730	1,008,308	792,578	4.67
1984	238,413	766,694	528,281	3.22
1985	512,827	369,740	-143,087	0.72
1986	283,054	674,252	391,198	2.38
1987	256,707	887,782	631,075	3.46
1988	204,336	665,176	460,840	3.26
1989	164,952	512,385	347,433	3.11
1990	147,663	501,812	354,149	3.4
1991	233,646	946,237	712,591	4.05
1992	188,819	815,919	627,100	4.32
1993	151,801	521,361	369,560	3.43
1994	218,826	765,529	546,703	3.5
1995	202,428	530,599	328,171	2.62
1996	264,511	751,566	487,055	2.84
1997	263,780	682,580	418,800	2.59
1998	259,045	792,308	533,263	3.06
1999	312,481	1,158,888	846,407	3.71
2000	263,631	1,388,432	1124,801	5.27
2001	318,735	1,627,669	1308,934	5.11
2002	235,732	1,250,022	1014,290	5.3
2003	353,526	1,560,304	1206,778	4.41
2004	523,653	1,491,097	967,444	2.85
2005	360,065	878,678	518,613	2.44
2006	389,645	744,647	355,002	1.91
2007	365,184	484,387	119,203	1.33
2008	327,018	873,640	546,622	2.67
2009	326,283	1,035,630	709,347	3.17
2010	295,265	1,377,594	1,082,329	4.67
2011	245,721	686,373	440,652	2.79
2012	374,523	509,565	135,042	1.36
2013	489,654	649,852	160,198	1.33
2014	440,192	700,251	260,059	1.59

Brood year	Escapement	Returns	Yield	Recruits per Spawner
2015	470,677	820,766	350,089	1.74
2016	239,981	NA	NA	NA
2017	358,724	NA	NA	NA
2018	388,009	NA	NA	NA
2019	374,109	NA	NA	NA
2020	540,872	NA	NA	NA
2021	521,859	NA	NA	NA
2022	968,149	NA	NA	NA

4.4 Aggregate "Other" Sockeye Salmon, stock complex

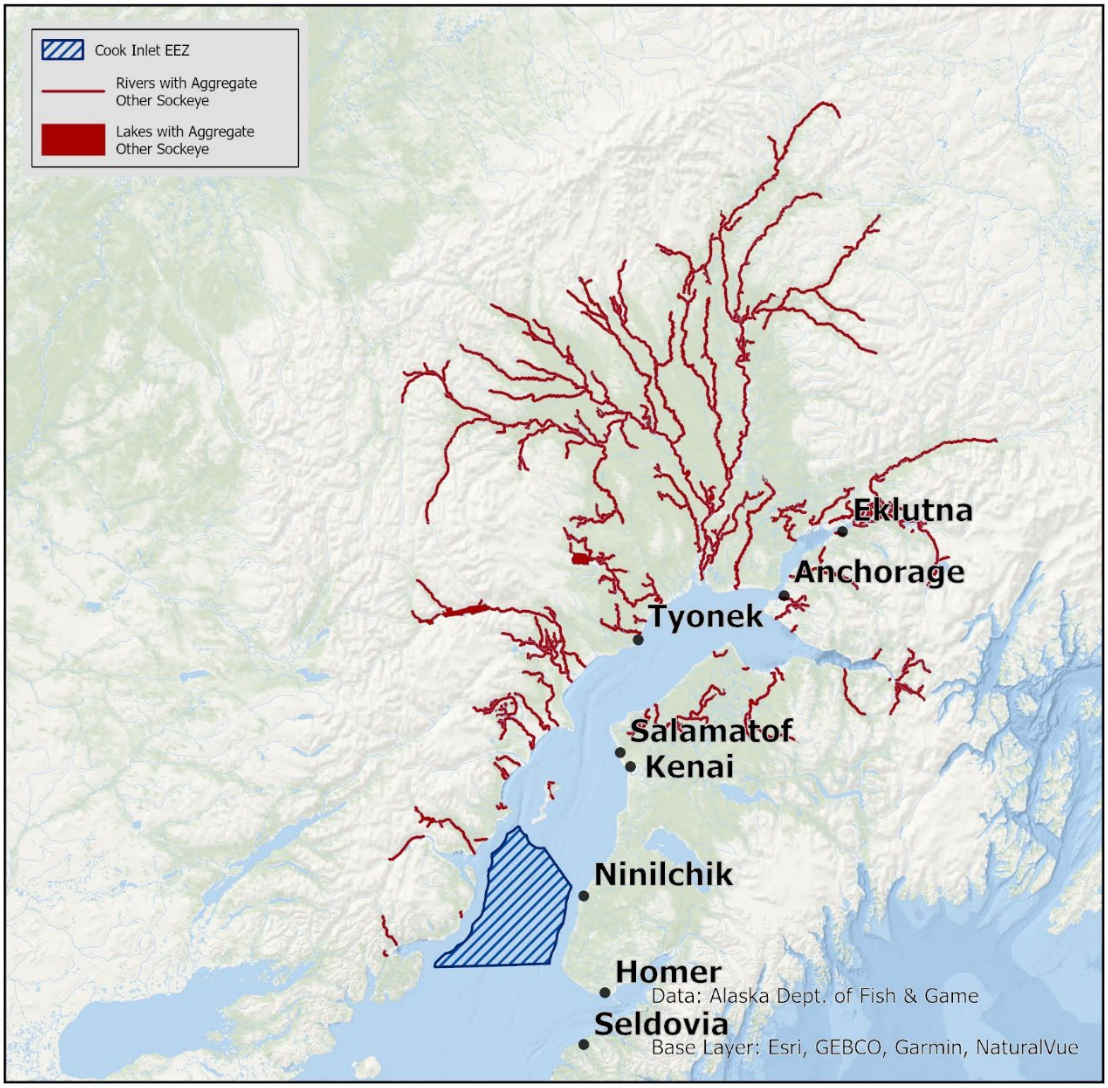

Figure 13. Map showing the CI EEZ and AOSOCK watersheds located in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Aggregate "Other" sockeye salmon stock complex (AOSOCK) is defined as all sockeye salmon harvested in the CI EEZ except for Kenai Late Run and Kasilof River sockeye salmon, with Fish Creek, Chelatna Lake, Judd Lake, and Larson Lake as indicator stocks that may be used to assess applicable SDC. The Federal definition for this stock also includes spawning escapements of sockeye salmon throughout UCI necessary to produce sustainable yield in future years.

4.4.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

The 2024 estimated total harvests, spawning escapements, and total run size of AOSOCK are still preliminary (Table 16). Based on the ADF&G 2024 genetic mixed stock analysis, approximately 18% of the sockeye salmon harvested in the CI EEZ were from AOSOCK. Using this mixed stock analysis, during 2024, an estimated 57K AOSOCK were harvested from the CI EEZ; which was less than the 2024 preseason OFL (887K), ABC/ACL (177K), and the AOSOCK proportion of the TAC (109K; Table 2). Because the estimated cumulative harvest for this stock across the most recent generation (463K; Table 17) is below the 2024 OFL of 1,271K sockeye salmon and the combined cumulative spawning escapements (529K) for the most recent generation (five years) is larger than the MSST (162.5K), it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 and that the stock is not in or approaching an overfished condition (Table 17).

4.4.2 Data and assessment methodology

4.4.2.1 Data input changes for 2025

The 2025 SAFE includes Federal catch data from the 2024 federally managed CI EEZ salmon fishery. These data represent the first year of known catch occurring in the EEZ, as opposed to the catch estimates presented for years prior to 2024.

4.4.2.2 Changes in assessment methodology for 2025

Following the 2024 SSC recommendations, the 2025 assessment uses the largest total EEZ harvest over a generation (five years for sockeye salmon) to calculate the OFL, and the average harvest over that same period to calculate the preseason OFL (OFL_{PRE}). Estimated harvests during the years 2007 – 2011 represent the highest cumulative harvest in the timeseries and were therefore used to calculate the OFL (sum of harvests across those years) and OFL_{PRE} (average harvest across those years).

4.4.2.3 Changes in assessment results for 2025

Given the new 2025 methodology outlined above and in previous sections, relative to the 2024 SAFE report, OFL_{PRE} values in this 2025 SAFE are smaller and considered to be more representative of amounts that could reasonably be harvested in the EEZ during a single season (changed from the multi-year methodology used in the 2024 SAFE). Based on this change, a smaller 2025 buffer (relative to the 2024 buffer) is likely warranted to reduce the OFL_{PRE} to the resulting ABC.

Additionally, using the largest sum of EEZ harvest across a generation (as opposed to the largest observed EEZ harvest multiplied by the generation time used in the 2024 SAFE) results in a smaller OFL, which is used postseason to assess overfishing for Tier 3 stocks.

4.4.2.4 Existing data and assessment

The ADF&G data and stock assessment sources used for the Federal assessment of the AOSOCK are described in Section 4.4, with the Mckinley et al. (2024) containing the most recent ADF&G stock assessment and escapement goal review. Recent escapement goals, estimates, and many additional references pertaining to assessments of this stock can be found in Munro (2023).

EEZ harvest estimates for AOSOCK are considered to be relatively complete, with the Federal definition for harvest of this stock in the EEZ generally meaning those sockeye salmon not attributable to either KNSOCK or KASOCK

Spawning escapement data for stocks in the stock complex exists for several tributaries and drainages (described below).

Age data and genetics data and associated stock composition estimates exist for commercial harvests (Barclay 2020; Barclay and Chenowith 2021). Age estimates also exist for several tributaries and drainages within the stock complex.

Historically, the total run size for the Susitna River drainage portion of AOSOCK has been forecasted using mean values of productivity (recruit per spawner) and estimates of spawner abundance-based mark-recapture studies (DeCino 2022). However, beginning with ADF&G's 2023 preseason total run size forecast, the Susitna River and Fish Creek forecasts relied on the recent 5-year average estimated total run sizes to these systems rather than forecasts that incorporated productivity and spawner abundance (Donnellan and Munro 2023).

4.4.2.5 Federal data and assessments

After review by NMFS and unless otherwise stated, this SAFE incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 EEZ and State harvest) and escapement, data (Table 16 and Table 17). However, because of the timeline necessary to produce this SAFE and implement the Federal salmon management in the CI EEZ in 2025, this SAFE estimated: sportfish and personal use harvests in 2024; and, subsistence and education harvests in 2022, 2023, and 2024. Estimates for these values were made using 5-year averages and will be updated in future years as data become available.

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 3 stocks.

The Tier 3 OFL was calculated as the largest cumulative EEZ harvest in the timeseries (1999 - 2024) across the generation time (five years), while the OFL_{PRE} was calculated as the largest average harvest across the same five years used to calculate the OFL. A range of buffers from 0.10 to 0.90 were considered to account for scientific uncertainty in reducing the OFL_{PRE} to the resulting ABC.

4.4.3 Stock size and recruitment trends

Stock overview: During the most recent five-year period (2020-2024), an average of 22% of the drift gillnet sockeye salmon harvest is estimated to have been from AOSOCK, with a range of harvests from 13-183K from the EEZ during this period. The estimated total run size (escapements from indicator stocks plus any sockeye salmon harvest not attributed to the Kenai or Kasilof sockeye salmon stocks) during the 2020 – 2024 period ranged from 303 – 846K, with the caveat, described below, that these estimates are likely missing substantial numbers of spawners due to unmonitored tributaries and drainages and incomplete escapement monitoring during some years. For example, based on 2024 estimates provided in ADF&G's UCI commercial salmon season summary report, the total run size of AOSOCK is estimated at approximately 1.22 million fish, which is slightly larger than the total run size of the KASOCK stock (1.11 million fish (Stumpf 2024). Previously published reports by ADF&G also suggest that the federally defined AOSOCK stock complex is of similar or larger size than the KASOCK stock

Escapement goals: The Federal definition of this stock complex includes four indicator stocks for which the State has spawning escapement goals (goal ranges in parentheses):

Fish Creek (15,000–45,000); Chelatna Lake (20,000–45,000); Judd Lake (15,000–40,000); and Larson Lake (15,000–35,000).

The sum of the lower bounds of these escapement goals for the stock complex is 65,000, which, except for 2024, has been consistently achieved during recent years (Table 16) despite escapement monitoring (via weirs) not occurring on the Chelatna River since 2019 and Judd Lake in 2023 and 2024 (Lipka 2023; Munro 2023; Stumpf 2024). From 2020–2024, an average minimum escapement of approximately 106K sockeye salmon were estimated to have spawned in the tributaries that have been monitored (range of 54–171K).

Escapement goals for some of the four indicator stocks in the stock complex have not been achieved during recent years (Munro 2023); however, none of these stocks are classified as "Stocks of Concern" by the State and, as all escapement goals in the stock complex were developed based on the "Percentile Approach" (Clark et al. 2014); not achieving the lower bound of an escapement goal during some years is an expected product of that approach. For example, if the lower bound of an escapement goal is set at the 15th percentile of historical escapements, then escapements less than that level fall below the lower bound of the goal during approximately 15% of the years.

There are many other tributaries and drainages in UCI where sockeye salmon are known to spawn, but which lack escapement goals and active monitoring. Notably, there was a State escapement goal on the Crescent River (west side of CI), but this goal no longer exists and the escapement monitoring no longer occurs. Other unmonitored systems where sockeye salmon are known to spawn in UCI include (Gatt and

Erickson 2024): Big River, McArthur River, Chilligan River, Coal Creek, Cottonwood Creek, Wasilla Creek, and Eagle River.

Spawner-Recruitment and yield trends: Spawner-recruitment trends for the four index systems in the stock complex were not presented in the most recent ADF&G stock assessment and escapement goal review (Mckinley et al. 2024). The NMFS SAFE Team did not further investigate historical records of spawner-recruitment relationships for the index systems and a full accounting of such relationships is likely to be hampered by the number of systems that are unmonitored and the inability to attribute harvests to specific streams. Thus, while genetic analyses are being used by ADF&G to actively monitor the stock contributions of commercial harvests, the lack of escapement data makes it difficult to attribute these harvests to a given number of spawners in order to estimate the productivity (recruit per spawner) of the stock complex with a level of precision that can be used to inform spawning escapement goals or preseason forecasts. However, the Clark et al. (2014) description of the Percentile Approach for informing the bounds of spawning escapement goals provides a variety of model results that justify the choice of percentiles based on the likelihood of maximizing future yield (proxy for S_{MSY}-based goal range). As such, considerations for maximizing yield are inherent with the approach.

4.4.4 Tier determination and resulting OFL and ABC determination for 2025

For tier determination and the resulting method used to calculate SDC and harvest specifications, the NMFS SAFE Team considered the extent to which the stock complex has an estimate of escapement that it deems to be "reliable" and the extent to which the assigned tier level is precautionary with respect to protecting the stock from overfishing. The NMFS SAFE Team concluded that the indicator systems only estimated a small but unknown fraction of the overall spawning escapements, resulting in estimates of total run size that are not considered to be a reliable index of the actual total run size. As such, only a Tier 3 determination was considered for this 2025 assessment. However, as mentioned previously, there are State estimates which could be used to establish an approximate total run size, making the AOSOCK the most likely to be considered for a Tier 2 designation in the future if additional escapement estimates were available for unmonitored systems for the larger stock complex.

Based on the considerations provided above and consistent with the 2024 SSC recommendation, the NMFS SAFE Team recommends to the SSC a Tier 3 determination for AOSOCK.

Status and catch specifications for AOSOCK based on a Tier 3 determination are provided in Table 18 with a range of buffers from 0.1 to 0.9 to reduce the OFL_{PRE} to ABC. The 2025 OFL_{PRE} is calculated as the largest average harvest over a generation time (five years; 2007 - 2011) in the timeseries (Table 17).

For Tier 3 AOSOCK, the NMFS SAFE Team recommends that the 2025 OFL_{PRE} (181,351) be reduced by a 15% buffer to the resulting ABC of 154.1K. A buffer range of 10 – 30% was considered, where a 10% buffer would result in an ABC (163K) that is in the 75th percentile of past EEZ harvest and a 30% buffer would result in an ABC that is approximately equal to the mean historical EEZ harvest (128K) and slightly less than the median (130K) historic EEZ harvest. A relatively small 15% buffer compared the considered AOSOCK buffer range and to COHO (90%; Section 4.6.5) and ACHIN (30%; Section 4.5.4) is recommended because:

1. The 2025 Tier 3 method for calculating the OFL_{PRE} is more representative of a reasonable single season harvest amount compared to the 2024 OFL_{PRE} (2024 buffer = 80%).
2. The AOSOCK monitored indicator stocks escapement goals have been met in recent years (Table 16).
3. As discussed above (section 4.4.3), the approximate AOSOCK total run size is likely comparable in magnitude to the KASOCK, suggesting that the overall harvest rate on this stock in the CI EEZ would be similar to the harvest rates for the Tier 1 stocks.
4. There are no AOSOCK stocks that are listed as "Stocks of Concern" by the State of Alaska and the NMFS SAFE Team considers the AOSOCK stock to be healthy.

5. However, as with other Tier 3 stocks, the total run size cannot be precisely determined and the NMFS SAFE Team recommends that a 15% buffer (as opposed to a 10%) accounts for uncertainty to ensure that the OFL is not exceeded.

Given the above considerations, the NMFS SAFE Team recommends that a 15% buffer is sufficiently precautionary to ensure that the OFL is not exceeded, while still allowing for a level of harvest (ABC/ACL = 154.1K) that has only been exceeded eight times in the timeseries under consideration (1999 – 2024; Figure 14).

While this stock can be declared overfished if cumulative spawning escapements of the indicator stocks are determined to be below MSST (similar to Tier 1 and 2), as total run size is not estimable in this tier, MFMT and F_{EEZ} are not calculable and therefore overfishing will be assessed based on a comparison of the OFL with the cumulative harvest across the most recent generation (five years).

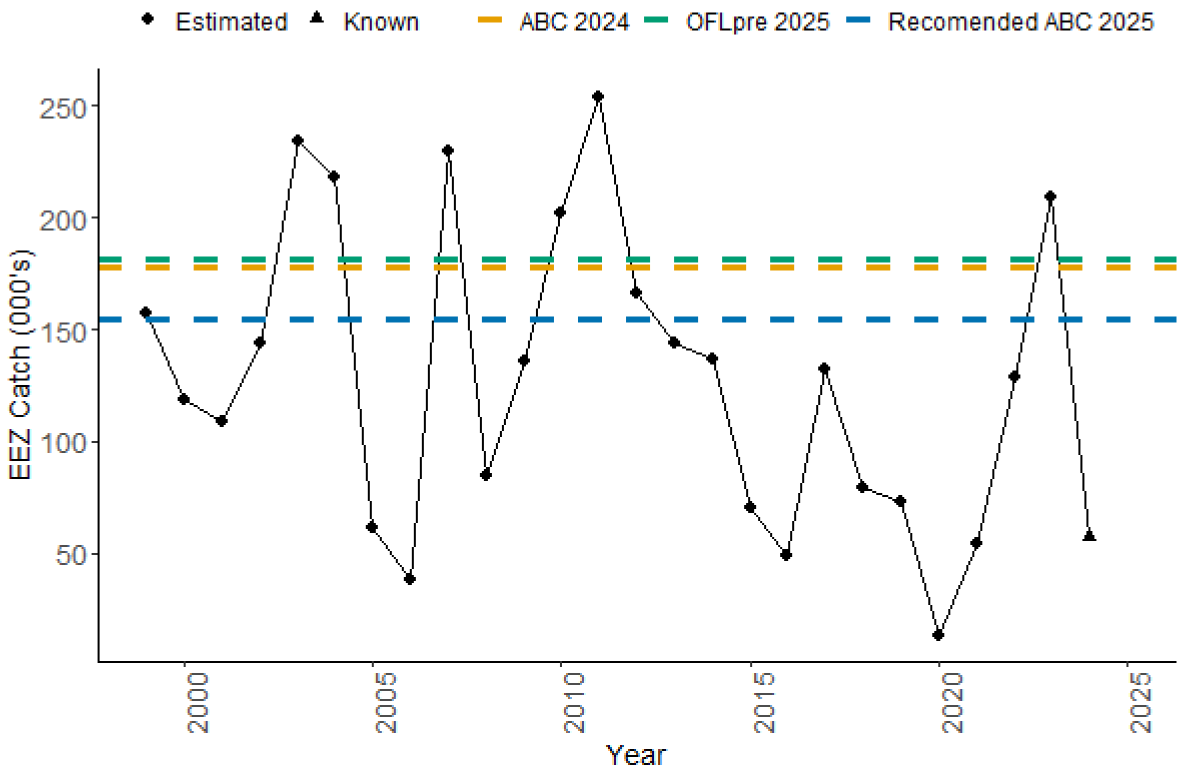

Figure 14. Timeseries of Aggregate "Other" sockeye salmon stock complex harvests in the CI EEZ for years 1999 – 2024. For 2025, the OFL_{PRE} is 181,351 and the NMFS SAFE Team recommends a buffer of 15%, resulting in an ABC of 154,148. EEZ harvest estimates prior to 2024 are based on methods and assumptions are described in section 4.1 of this SAFE report. Aggregate "Other" sockeye salmon stock complex catch is estimated from the total CI EEZ catch using genetic mixed stock analysis.

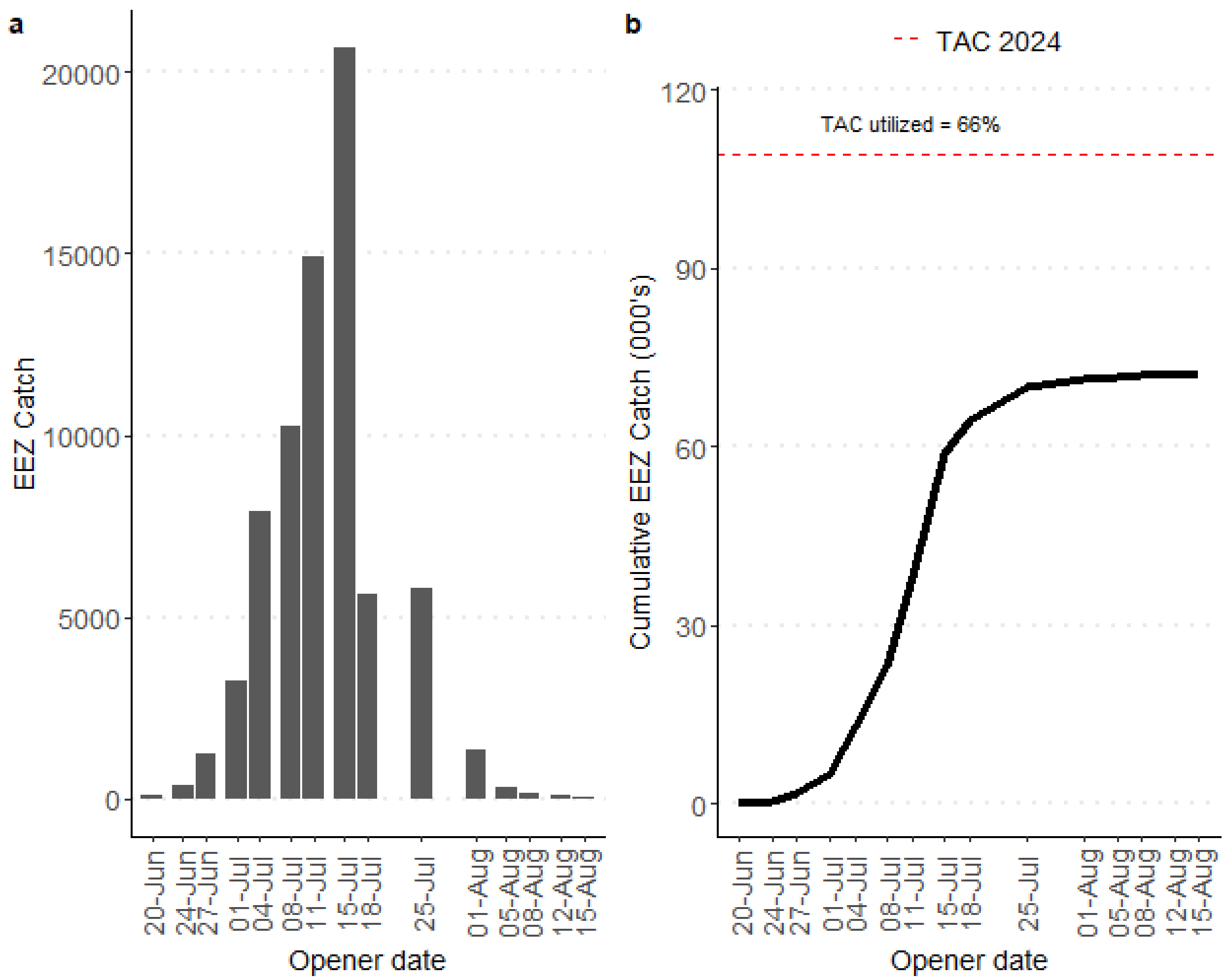

Figure 15. "Other" sockeye salmon (a) EEZ catch by day and (b)cumulative catch compared to the 2024 TAC. Note that the catch of Aggregate "Other" sockeye salmon is estimated by subtracting the estimated Kenai Late Run and Kasilof sockeye salmon catch from the total sockeye salmon catch.

Table 16. Aggregate "Other" sockeye salmon indicator stocks sum of observed escapements and sum of lower bound (L.B.) of current escapement index goals for years 2014 - 2024 in thousands of fish. Bolded values are escapements that did not meet the lower bound of the goal.

	Chelatna Lk.		Judd Lk.		Larson Lk.		Fish Ck.			
Year	L.B	Esc.	L.B.	Esc.	L.B	Esc.	L.B.	Esc.	Sum of L.B.	Sum Esc.
2014	20	26	15	22	15	**12**	15	44	65	105
2015	20	70	15	48	15	23	15	102	65	243
2016	20	61	15	NA	15	**14**	15	46	65	121
2017	20	27	15	36	15	32	15	61	65	156
2018	20	20	15	31	15	24	15	71	65	146
2019	20	26	15	44	15	**10**	15	75	65	156
2020	20	NS	15	31	15	**12**	15	64	65	108[a]
2021	20	NS	15	49	15	22	15	99	65	171[a]
2022	20	NS	15	38	15	17	15	59	65	115[a]
2023	20	NS	15	**NS**	15	38	15	45	65	83[a,b]
2024	20	NS	15	NS	15	16	15	38	65	54[a,b]

[a]Chelatna Lake weir not operated in these years
[b]Judd Lake counts not determined in these years
NS = no survey

Table 17. Status and catch specifications for Tier 3 Aggregate "Other" sockeye salmon stock complex. An overfished determination is assessed postseason by comparing the minimum stock size threshold (MSST; one half of the sum of the indicator stock's spawning escapement goal summed across a generation, with actual cumulative escapement of the indicator stocks summed across a generation (Cum. Escap.). Overfishing is assessed postseason by comparing the actual harvest summed across a generation (EEZ Cum. Harvest) with the postseason overfishing limit (OFL). Unless otherwise noted, values are in the thousands of fish. Shaded values are new estimates or projections based on the current assessment, the projected EEZ Cum. Harvest for the coming fishing season only including the first four years (T-1) of the current generation. Bolded EEZ Harvest values are used to calculate OFL and OFL_{PRE}. Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Year	MSST[a]	Cum. Esc.[a]	Total Comm. Harvest	State Drift Gillnet Harvest	EEZ Harvest	EEZ Cum. Harvest	OFL	OFL_{PRE}
1999	NA	NA	649	208	157	NA	NA	NA
2000	NA	NA	435	98	119	NA	NA	NA
2001	NA	NA	456	116	109	NA	NA	NA
2002	NA	NA	634	195	144	NA	NA	NA
2003	335	848	620	268	234	763	NA	NA
2004	315	815	759	286	218	824	NA	NA
2005	295	714	676	95	61	766	NA	NA
2006	275	711	256	108	39	695	NA	NA
2007	275	650	651	120	**230**	781	NA	NA
2008	275	487	424	95	**85**	633	NA	NA
2009	260	580	540	103	**136**	551	NA	NA
2010	245	732	637	136	**202**	691	NA	NA
2011	230	797	835	300	**254**	907	NA	NA
2012	215	780	473	170	166	843	NA	NA
2013	200	795	507	129	144	902	NA	NA
2014	200	714	469	150	136	902	NA	NA
2015	200	754	505	148	70	771	NA	NA
2016	200	686	308	89	49	566	NA	NA
2017	193	751	656	180	132	532	NA	NA
2018	185	772	362	74	79	467	NA	NA
2019	177	822	449	90	73	404	NA	NA
2020	170	686	331	40	13	346	NA	NA
2021	163	736	132	85	54	352	NA	NA
2022	163	695	234	97	129	348	NA	NA
2023	163	631	763	236	209	478	NA	NA
2024	163	529	331	241	57	463	1,271[b]	888[b]
2025	163	422	---	---	---	450	907	181

[a]Calculated based on escapements and escapement targets for indicator stocks (Fish Creek, Chelatna Lake, Judd Lake, and Larson Lake)

[b]For the 2024 SAFE, a different method was used to calculate the Tier 3 OFL and OFL_{PRE}. See the Final 2024 CI EEZ SAFE for additional details.

Table 18. 2025 recommended Tier 3 SDC for the aggregate "Other" sockeye salmon stock complex and a range of buffers to reduce the preseason OFL to ABC.

Buffer	OFL_{PRE}	ABC	OFL
10%	181,351	163,216	906,757
20%	181,351	145,081	906,757
30%	181,351	126,946	906,757
40%	181,351	108,811	906,757
50%	181,351	90,676	906,757
60%	181,351	72,541	906,757
70%	181,351	54,405	906,757
80%	181,351	36,270	906,757
90%	181,351	18,135	906,757

4.5 Aggregate Chinook Salmon, stock complex

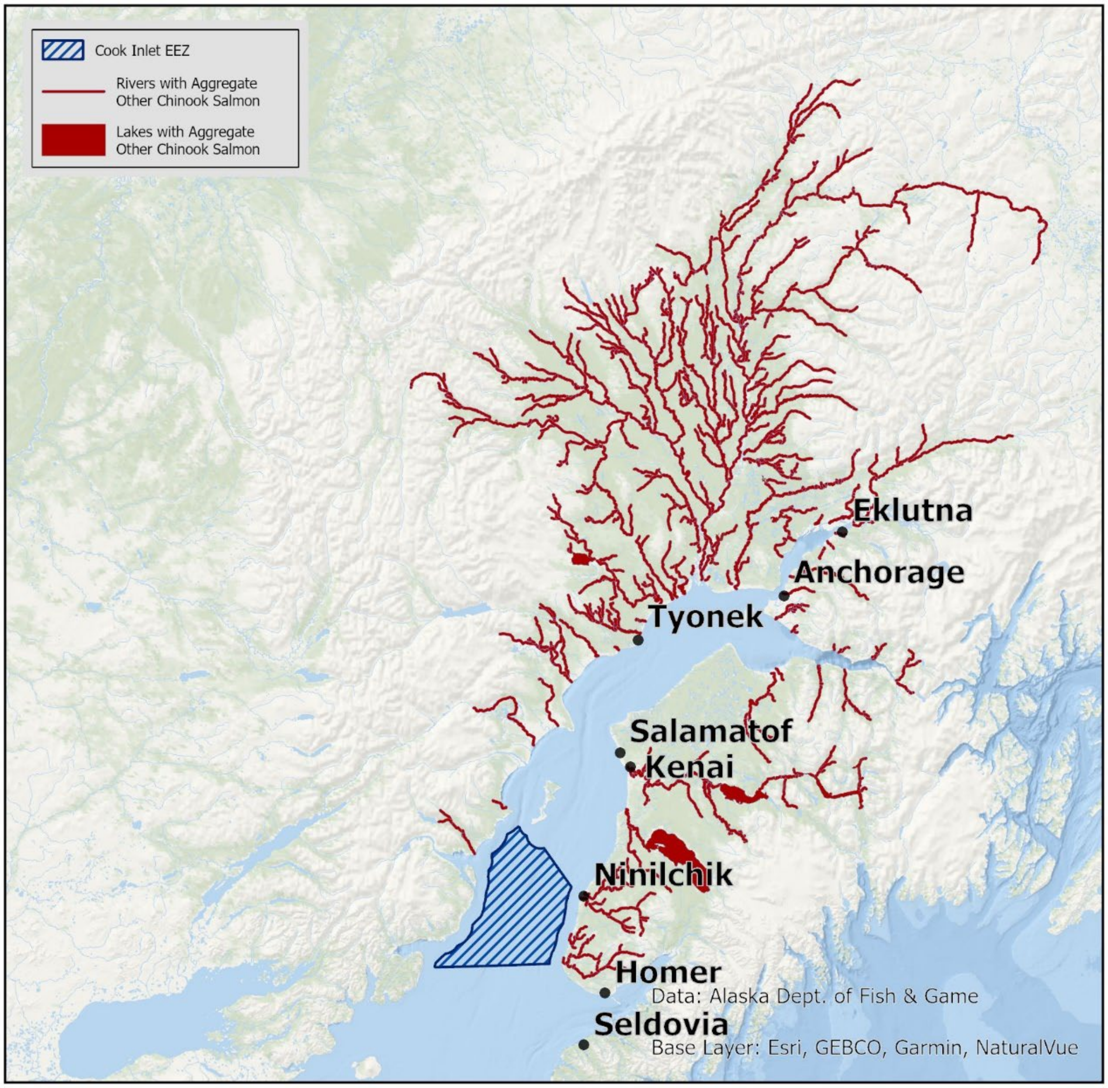

Figure 16. Map showing the CI EEZ and watersheds with Chinook salmon in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Aggregate Chinook salmon stock complex (ACHIN) is defined as all Chinook salmon harvested in the CI EEZ with Kenai Late Run Large Chinook salmon as an indicator stock that may be used to assess applicable SDC. The Federal definition for this stock also includes spawning escapements of Chinook salmon throughout UCI necessary to produce sustainable yield in future years.

4.5.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

During the 2024 fishery, 31 Chinook salmon from ACHIN were harvested in the CI EEZ; which was less than the 2024 preseason OFL (2,697), ABC/ACL (270) and TAC (240; Table 2). Because the estimated postseason cumulative harvest across a generation time (406) was less than the 2024 OFL (3,072) for this stock, and the indicator stock's (Kenai River late run Chinook salmon) cumulative escapement (70.8K) was greater than the MSST (44.2K), it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 and that the stock is not in an overfished condition.

4.5.2 Data and assessment methodology

4.5.2.1 Data input changes for 2025

The 2025 SAFE includes Federal catch data from the 2024 federally managed CI EEZ salmon fishery. These data represent the first year of known catch occurring in the EEZ, as opposed to the catch estimates presented for years prior to 2024.

4.5.2.2 Changes in assessment methodology for 2025

Following the 2024 SSC recommendations to the NMFS SAFE Team, the 2025 assessment uses the largest total EEZ harvest over a generation (six years for Chinook salmon) to calculate the OFL, and the average harvest over that same period to calculate the preseason OFL (OFL_{PRE}). For the 2024 assessment, harvests during the years 2004 – 2009 had the highest cumulative harvest in the timeseries and were therefore used to calculate the OFL (sum of harvests across those years) and OFL_{PRE}. (average harvest across those years).

4.5.2.3 Changes in assessment results for 2025

Given the new 2025 methodology outlined above and in previous sections, relative to the 2024 SAFE report, preseason OFL values in this 2025 SAFE are smaller and considered to be more representative of amounts that could reasonably be harvested in the EEZ during a single season (changed from the multi-year methodology used in the 2024 SAFE). Based on this change, the NMFS SAFE Team may recommend a smaller 2025 buffer (relative to the 2024 buffer) to reduce the OFL_{PRE} to the resulting ABC.

Additionally, using the largest sum of EEZ harvest across a generation, as opposed to the largest observed EEZ harvest multiplied by the generation time used in the 2024 SAFE, results in a smaller OFL value used postseason to assess overfishing for Tier 3 stocks.

4.5.2.4 Existing data and assessments

The ADF&G data and stock assessment sources used for the Federal assessment of the ACHIN are described in this section (Section 4.5).

Harvest in the CI EEZ occurring in 2024 (the first federally managed fishery in UCI EEZ) is considered to be known (rather than estimated as for pre-2024) and complete.

The data used to assess the Chinook salmon stocks in this section include estimates of harvests in the CI drift gillnet fishery attributed to Kenai Late Run Chinook salmon and all other Chinook salmon, annual spawning escapements and associated escapement goals for 13 stocks that represent drainages and tributaries–as well as differential run timing for some tributaries (Munro 2023), and spawner-recruitment data for Kenai River, Deshka River, Eastside Susitna River, Talkeetna River, and Yentna River stocks.

Spawner-recruitment (Ricker) models were used to inform the bounds of the State spawning escapement goals for the stocks with available spawner, recruitment, and age data. The Percentile Approach was used for escapement goal development for nine stocks and a Risk analysis was used for escapement goal development for a single stock. Additional details of these analyses are provided in Mckinley et al. (2024), Reimer and DeCovich (2020), and Fleischman and Reimer (2017).

ADF&G produces preseason forecasts of total run size for Kenai River Early and Late Runs, and Deshka River Chinook salmon stocks. Sibling model relationships for the dominant age classes inform ADF&G's pre-season estimates of total run size, with forecasted returns of minor age classes based on recent average returns.

For UCI, there are five Chinook salmon "Stocks of Management Concern" listed by the State, four of which are in the far northern portion of CI, Chuitna River, Theodore River, Alexander Creek, and

Eastside Susitna River (Munro 2023), as well as the Kenai River Late Large Chinook salmon stock (Miller 2024).

4.5.2.5 Federal data and assessments

After review by NMFS and unless otherwise stated, this SAFE incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 harvest), escapement, age, sex, and other data. However, as stated for the Kenai River Late Run Large Chinook salmon stock, because of the timeline necessary to produce this SAFE and implement the Federal salmon management in the CI EEZ in 2024 and ADF&G estimates were not yet available, this SAFE estimates the proportion of the overall drift gillnet harvests that consisted of Kenai River Late Run Large Chinook salmon in 2023 and 2024, with the estimates in the SAFE using the proportion (~40%) that was estimated for 2022. This and other quantities have been flagged for additional evaluation. The NMFS SAFE Team welcomes feedback on assumptions made and methods used.

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 3 stocks.

4.5.3 Stock size and recruitment trends

Stock overview: During the 2024 CI EEZ fishery, EEZ Chinook salmon harvest accounted for ~18% of the total UCI commercial Chinook salmon harvest (31 fish from a total commercial harvest of 169 fish), and during the most recent five-year period (2020–2024) an average of 26% of the ACHIN (all UCI Chinook salmon) drift gillnet harvest is estimated to have occurred in the EEZ, with a range of 31–87 Chinook salmon from this stock harvested in the EEZ (Table 19). Despite historically low overall harvests across all fisheries during recent years (including the EEZ), all UCI Chinook salmon stocks have been at some of the lowest levels of abundance in the available timeseries. Genetic sampling of Chinook salmon caught in UCI saltwater sport fisheries from June – September during 2014 – 2018 suggests that 77 – 92% of sampled Chinook salmon originated from outside the CI area (Schuster et al. 2021). During the same period, the contribution to the overall saltwater sport harvest of UCI Chinook salmon of Kenai Chinook salmon was found to be 0.3 – 12.7%.

For Kenai Late Run Large Chinook salmon (indicator stock for Tier 3 ACHIN), during the most recent five-year period (2020–2024) an average of 43% of the drift gillnet harvest from this stock is estimated to have occurred in the EEZ, with a range of 12 – 32 Chinook salmon harvested in the EEZ from this stock; however, such estimates are not well supported (e.g., no available genetic data). Additionally, though there is also no available length data for CI EEZ harvests with which the harvested Chinook salmon harvests could be attributed to the Kenai Late Run Large Chinook salmon stock, available weight data (average delivered weight of 7.9 lbs) suggests that few if any of the Chinook salmon harvested in the CI EEZ were of sufficient size (greater than 75 cm mid-eye to tail fork length) to attribute them to the Kenai Late Run Large indicator stock. Of the 31 Chinook salmon harvested, 21 were weighed, and only 2 fish were estimated to be larger than 75 cm using a length-weight relationship (Jasper and Evenson 2006), though whether they are from the Kenai River Chinook salmon stock is unknown.

Despite historically low overall harvest rates across all fisheries during recent years (including the EEZ), spawning escapement and total run sizes have been at some of the lowest levels in the available timeseries. Total run size during the 2020 – 2024 period ranged from 7 – 14.7K Kenai River Late Run Large Chinook salmon.

Escapement goals: Escapement goals pertinent to the ACHIN stock complex could include all UCI Chinook salmon spawning escapement goals. However, as Susitna River stocks of Chinook salmon are not thought to be harvested in significant quantities in the EEZ drift gillnet fishery (Reimer and DeCovich 2020), the only remaining substantial spawning escapement goal that might be pertinent to this ACHIN stock complex is the Kenai River Late Run Large Chinook salmon stock.

The State's Kenai River Late Run Chinook salmon large fish (>75 cm mid-eye to tail fork length) spawning escapement goals (2017–2019: 13,500–27,000; 2020–present: 15,000–30,000) was not achieved in 2019, 2020, 2021 and 2024 (Munro 2023). From 2020–2024, an average of approximately 11.8K Chinook salmon from this stock were estimated to have spawned in the Kenai River system, with a range of 6.6–14.5K.

As first implemented during 2017, the large fish goal was primarily justified in order to match the component of Chinook enumerated via sonar and, secondarily, to ensure that sufficient numbers of female Chinook salmon spawn (which tend to be larger) to maintain baseline levels of egg deposition and potential recruitment (Fleischman and Reimer 2017).

For the ACHIN stock complex, despite large uncertainty in historical EEZ harvest estimates, consistent with the 2024 SSC recommendation, the NMFS SAFE Team recommends including the Kenai River Late Run Large Chinook salmon escapement goal (and associated escapements, as described in the previous section) to assess against MSST (overfished determination) using the Tier 3 approach; with reevaluation for future SAFE reports based on updated information.

Spawner-Recruitment and yield trends: It is the recommendation of the NMFS SAFE Team that, since there is not currently a good basis for knowing which stocks of Chinook salmon are harvested in the CI EEZ, there are no applicable stocks to consider for spawner-recruitment and yield trends for the ACHIN stock complex. The spawner-recruitment and yield estimates for Kenai Late Run Large Chinook salmon stock might be applicable to the CI EEZ fishery, but this is unknown without genetic stock contribution information for the EEZ fishery.

All UCI Chinook salmon stocks for which recruitment data are available are in a period of low productivity, recruitment, and abundance that began in the 2000s, with some of the lowest adult abundances observed since the 1970s. The extent of historical harvests of UCI Chinook salmon stocks in the EEZ is unknown.

As an aggregate stock complex, several of the 14 State Chinook salmon spawning escapement goals in UCI are monitored and enumerated with a single aerial, foot survey, and other methods each year that may represent indices of escapements rather than actual numbers of spawners. As such, it is the recommendation of the NMFS SAFE Team that there is not a reliable estimate of spawners for the Federal ACHIN stock complexes as a whole and, as a result, that the overall run size (harvest + escapement) of the stock complexes is not known. However, spawning escapement estimates and indices, and available aggregate harvest data, all indicate that the stock complexes have declined substantially in size concomitant with the stocks defined by the State for which spawner-recruitment estimates are available.

Kenai River Late Large Chinook salmon spawner-recruitment and yield trends: When examining data from 1985-2015 years, results from the state-space spawner-recruitment (Ricker) analyses (Fleischman and Reimer 2017) conducted by ADF&G suggest that approximately 18,477 spawners would result in maximum sustainable yield for the Kenai River Late Run Large Chinook salmon stock, with a range of 11,731–31,832 equating to the 0.05–0.95 percentiles of the posterior distribution. After controlling for density dependent effects, the ADF&G analyses showed evidence for time-varying productivity, with declining stock productivity after 1999, perhaps due to declining marine survival.

4.5.4 Tier determination and resulting OFL and ABC determination for 2025

Consistent with the 2024 SSC recommendation, the NMFS SAFE Team recommends to the SSC that ACHIN be given a Tier 3 determination (Table 21). As a stock complex with many different drainages and tributaries for which escapement estimates are likely indices of spawners rather than an actual number of fish, these estimates are unlikely to represent "reliable" estimate of spawners or a total run size that can be used to calculate MFMT and F_{EEZ} for the overall stock complex.

The precision of the Chinook salmon harvest rate estimates on component stocks in the CI EEZ is unknown as the drift gillnet fishery is not thought to have been sampled to obtain genetic stock composition estimates. In addition to the issues raised in the previous section regarding EEZ harvest estimates of Kenai River late run large Chinook salmon, as discussed by Reimer and DeCovich (2020) in their assessment of Chinook salmon stocks of the Susitna River drainage, there is also an absence of data to support EEZ harvest estimates of other major UCI Chinook salmon stocks: "A drift gillnet fishery targeting sockeye salmon (O. nerka) in CI also harvests some Chinook salmon (1966–2016) annual average was 954 Chinook salmon; (Shields and Frothingham 2018); however, no stock composition information is available for Chinook salmon harvested in this fishery. We assume it is not significant for the purpose of this study because the fishery largely takes place after Susitna River Chinook salmon have migrated through the area."

Status and catch specifications for ACHIN based on a Tier 3 determination are provided in Table 21 with a range of buffers from 0.1 to 0.9 to reduce the OFL_{PRE} to ABC. The 2025 OFL_{PRE} is calculated as the largest average harvest over a generation time (six years; 2004 - 2009) in the timeseries (Table 19).

For Tier 3 ACHIN, the NMFS SAFE Team recommends that the preseason OFL (373 fish) be reduced by a 30% buffer to result in the ABC of 261 fish. A range of buffers from 10 – 50% were considered given the following information:

1. The ACHIN indicator stock, Kenai Late Run Large Chinook salmon, is not in or approaching an overfished state (Table 19).
2. The 2025 Tier 3 method for calculating the OFL_{PRE} is more representative of a reasonable single season harvest amount compared to the 2024 OFL_{PRE} (2024 buffer = 90%), thus resulting in a smaller, but still relatively conservative buffer.
3. While susceptible to the drift gillnet fishery because of their size, historically, Chinook salmon have primarily been harvested in State waters, particularly in the East Side Set Net/Dip Net fishery. From 1999 – 2024 Chinook salmon harvested in the CI EEZ accounted for an average of 7.8% of the total commercial catch (minimum of 0.7% in 2000, and a maximum of 47% in 2022; 18% in 2024). ADF&G closed the East Side Set Net fishery in 2024 as part of the Kenai River Late Large Chinook salmon recovery plan, recognizing that the vast majority of Chinook salmon appear to migrate closer to the shore in UCI (Stumpf 2024).
4. Chinook salmon are not thought to be targeted in the CI EEZ fishery, and are caught incidentally.
5. Genetic sampling of Chinook salmon harvested in saltwater sport fisheries of the State's Central District of UCI in years 2014 – 2018 indicates that 77 – 92% of sampled Chinook salmon originated from outside the CI area (Schuster et al. 2021), and that Kenai River Chinook salmon made up 0.3 – 12.7% of the total sampled sportfish harvest.
6. The average Chinook salmon weight caught in the Central District Driftnet fishery from 2018 – 2022 (8.2, 9, 10.8, 7.8, 7.7 lbs. respectively) was much lower than the weight of Chinook salmon caught in the Central District Setnet fishery (15.2, 17, 14.1, 13.6, 13.7 lbs.) where Chinook salmon have historically been harvested in larger numbers and have been attributed to returning migrations of Chinook salmon to CI watersheds (Lipka and Stumpf 2024; Marston and Frothingham 2019, 2021, 2022a, 2022b). The smaller average Chinook salmon size in the Central Driftnet fishery indicates that few fish caught in the CI EEZ would be attributed to the Kenai Late Run Large Chinook salmon stock.
7. ADF&G has five UCI Chinook salmon stocks listed as "Stocks of Management Concern".
8. Considering the timeseries of estimated Chinook salmon catch in the CI EEZ, an ABC of 261 Chinook salmon would not have been exceeded since 2009, and has only been exceeded in six (2003 -2007, 2009) of the 26 years in the timeseries under consideration (1999 – 2024; Figure 17).

Considering the above points, the NMFS SAFE Team recommends that a 30% buffer properly balances the need for precautionary measures to conserve UCI Chinook salmon stocks (e.g., Kenai River late run large Chinook salmon and others listed as Stocks of Management Concern by the State) with indications that such stocks might not be present in the CI EEZ fishery in appreciable numbers.

While this stock can be declared overfished if cumulative spawning escapements are determined to be below MSST (similar to Tier 1 and 2) for the Kenai River Late Run Large Chinook salmon indicator stock, as total run size is not estimable in this tier, MFMT and F_{EEZ} are not calculable; overfishing would be assessed based on the OFL.

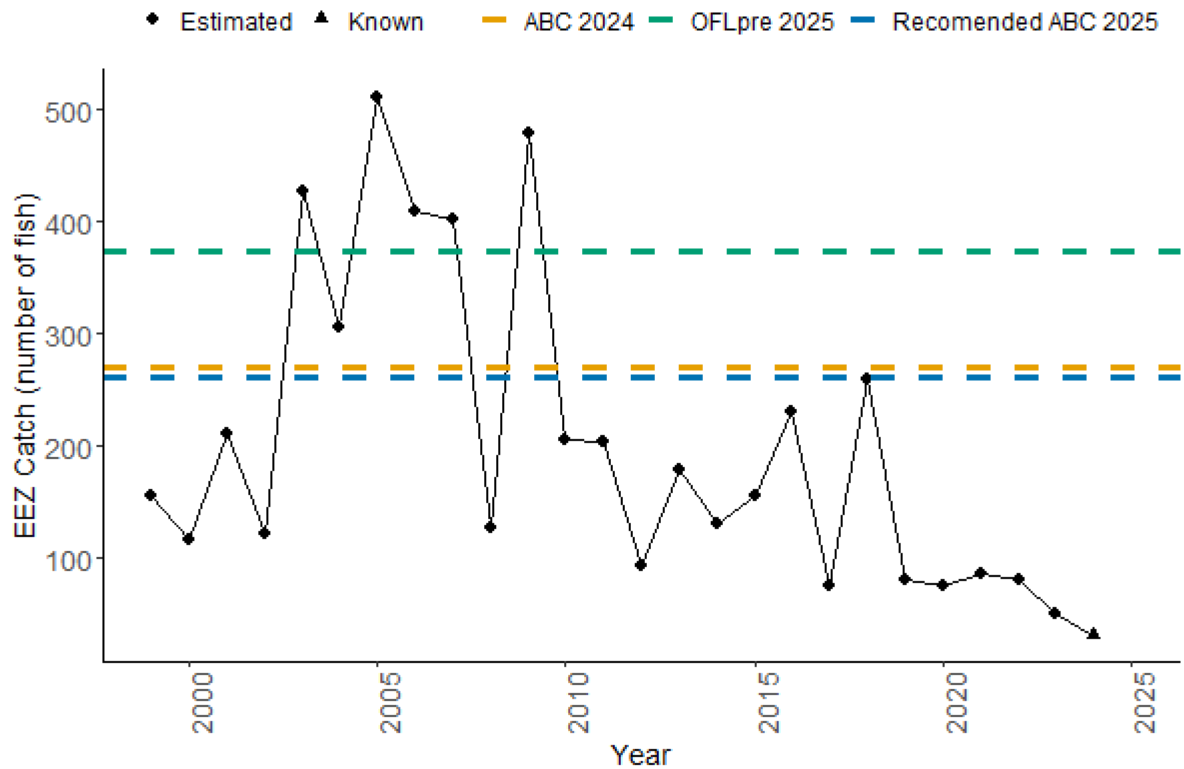

Figure 17. Timeseries of estimated Aggregate Chinook salmon harvest in the EEZ for years 1999 - 2024. For 2025, the OFL_{PRE} is 373 and the NMFS SAFE Team recommends a buffer of 30%, resulting in an ABC of 261 fish. CI EEZ harvest estimates prior to 2024 are based on methods and assumptions are described in section 4.1 of this SAFE report.

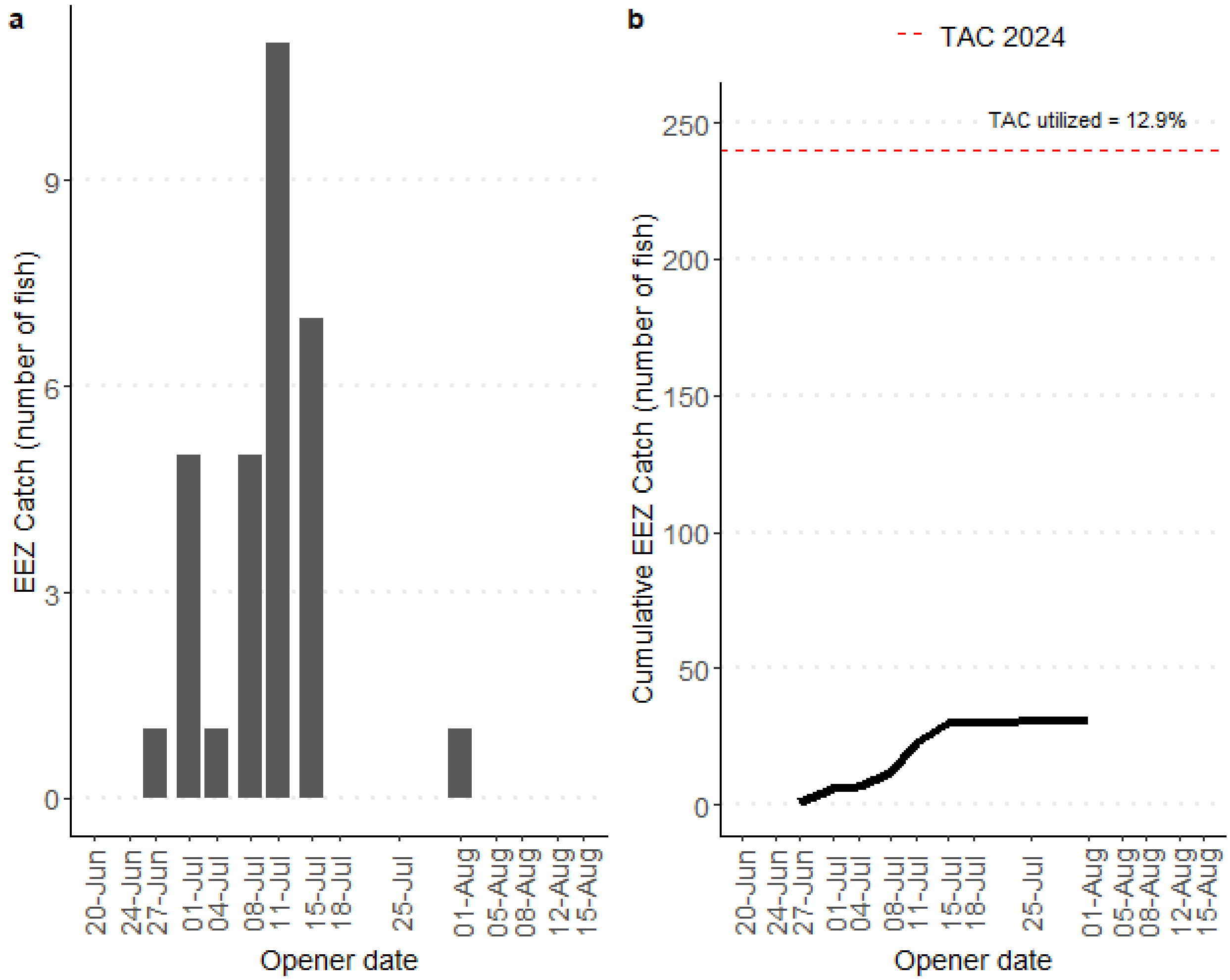

Figure 18. Aggregate Chinook salmon stock complex (a) CI EEZ catch by day and (b)cumulative catch compared to the 2024 TAC.

Table 19. Status and catch specifications for Tier 3 Aggregate Chinook salmon stock complex (ACHIN). An overfished determination is assessed postseason by comparing the minimum stock size threshold (MSST; one half of the sum of the indicator stock's spawning escapement goal summed across a generation, with actual cumulative escapement of the indicator stocks summed across a generation (Cum. Escap.). Overfishing is assessed postseason by comparing the actual harvest summed across a generation (EEZ Cum. Harvest) with the postseason overfishing limit (OFL). Unless otherwise noted, values are in the thousands of fish. Shaded values are new estimates or projections based on the current assessment, the projected EEZ Cum. Harvest for the coming fishing season only including the first five years (T-1) of the current generation. Bolded EEZ Harvest values are used to calculate OFL and OFL_{PRE}. Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Year	MSST[a] (000's)	Cum. Esc.[a] (000's)	Total Run[a] (000's)	Total Harvest	State Drift Gillnet Harvest	EEZ Harvest	EEZ Cum. Harvest	OFL	OFL_{PRE}
1999	NA	NA	45.7	16,557	799	155	NA	NA	NA
2000	NA	NA	41.7	16,217	1447	116	NA	NA	NA
2001	NA	NA	45.8	16,223	2372	211	NA	NA	NA
2002	NA	NA	55.9	15,396	511	122	NA	NA	NA
2003	NA	NA	68.0	19,523	526	428	NA	NA	NA
2004	40.5	238.2	91.3	26,200	379	**306**	1338	NA	NA
2005	40.5	264.8	84.2	28,501	333	**512**	1695	NA	NA
2006	40.5	278.6	57.1	17,817	389	**410**	1989	NA	NA
2007	40.5	278.7	44.4	14,757	124	**402**	2180	NA	NA
2008	40.5	266.3	42.7	14,586	314	**127**	2185	NA	NA
2009	40.5	236.1	28.0	9,793	251	**480**	2237	NA	NA
2010	40.5	184.0	22.2	9,143	400	205	2136	NA	NA
2011	40.5	144.1	26.4	10,650	375	204	1828	NA	NA
2012	40.5	127.2	23.2	753	190	94	1512	NA	NA
2013	40.5	109.9	14.4	2,077	243	179	1289	NA	NA
2014	40.5	93.8	13.4	1,423	98	131	1293	NA	NA
2015	40.5	92.3	22.8	5,971	106	156	969	NA	NA
2016	40.5	94.0	25.1	10,453	130	231	995	NA	NA
2017	40.5	98.9	31.3	10,647	89	75	866	NA	NA
2018	40.5	93.7	18.5	1,222	57	260	1032	NA	NA
2019	40.5	93.0	13.3	1,633	49	81	934	NA	NA
2020	40.5	92.9	12.2	310	799	76	879	NA	NA
2021	40.5	88.2	12.7	518	1447	87	810	NA	NA
2022	40.5	87.5	14.1	139	2371	80	659	NA	NA
2023	40.5	81.5	14.7	240	511	51	635	NA	NA
2024	40.5	70.8	6.7	129[c]	526	31	406	3,072[b]	2,697[b]
2025	40.5	59.2	---	---	---	---	325	2,237	373

[a] Calculated based on escapements and escapement targets for indicator stocks (Kenai River Late-Run Large Chinook Salmon).

[b]For the 2024 SAFE, a different method was used to calculate the Tier 3 OFL and OFL_{PRE}. See the Final 2024 CI EEZ SAFE for additional details.

[c]State plus EEZ drift gillnet harvest. Does not include sport, personal use, or any other harvest

Table 20. Kenai River late-run large Chinook salmon observed escapements and escapement goals for years 2014 - 2024. Bolded values are escapements that did not meet the lower bound of the escapement goal.

Year	Lower Bound of Escapement Goal	Escapement
2014	13,500	**11,980**
2015	13,500	16,825
2016	13,500	14,676
2017	13,500	20,615
2018	13,500	17,289
2019	13,500	**11,638**
2020	13,500	**11,909**
2021	13,500	**12,147**
2022	13,500	13,974
2023	13,500	14,502
2024	13,500	**6,630***

*Preliminary estimated escapement.

Table 21. 2025 recommended Tier 3 SDC for the aggregate Chinook salmon stock complex and a range of buffers to reduce the preseason OFL to ABC.

Buffer	OFL_{PRE}	ABC	OFL
10%	373	336	2,237
20%	373	298	2,237
30%	373	261	2,237
40%	373	224	2,237
50%	373	186	2,237
60%	373	149	2,237
70%	373	112	2,237
80%	373	75	2,237
90%	373	37	2,237

4.6 Aggregate Coho Salmon, stock complex

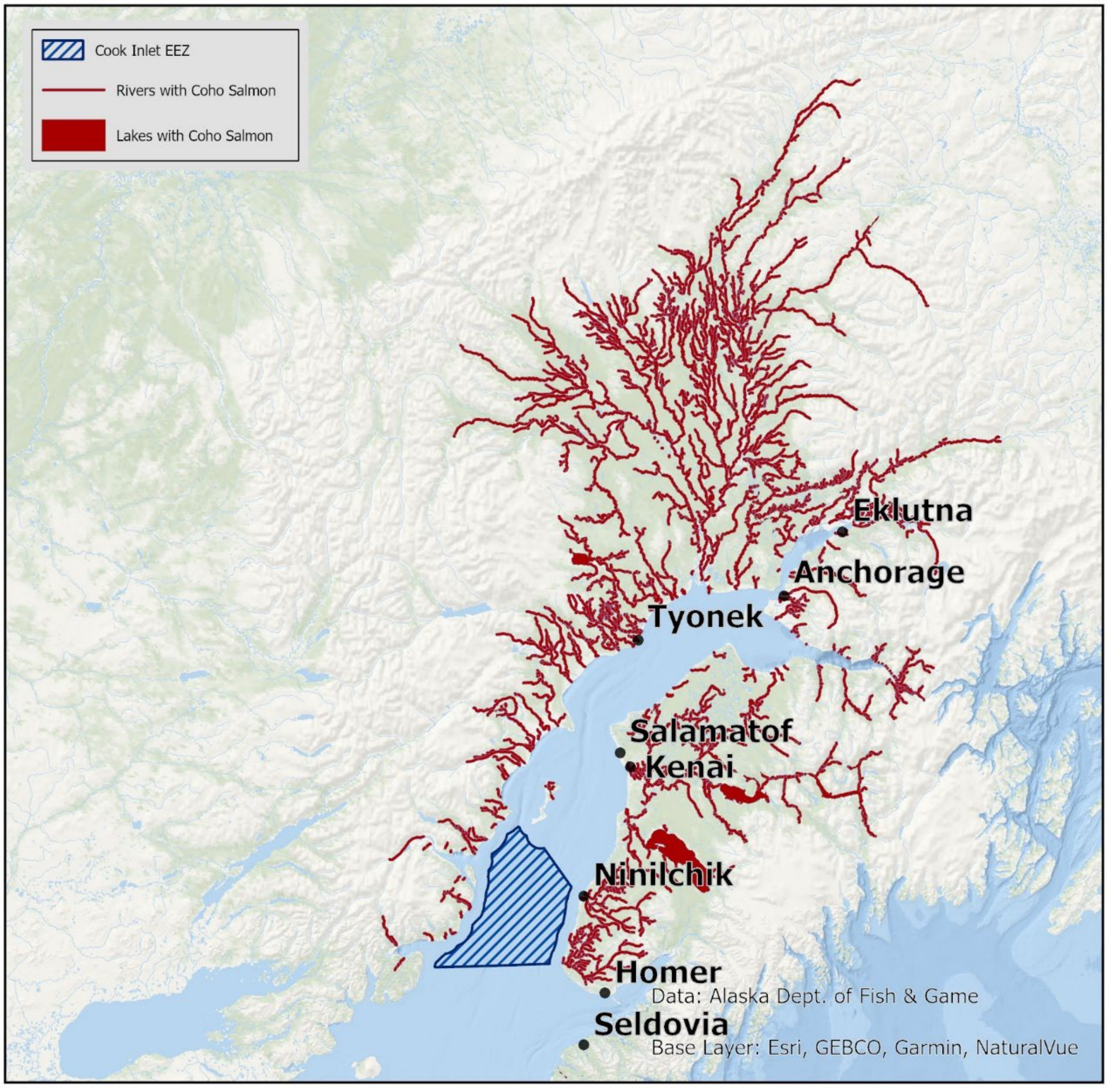

Figure 19. Map showing the CI EEZ and the watersheds with coho salmon located in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Aggregate coho salmon stock complex (COHO) is defined as all coho salmon harvested in the CI EEZ with Deshka and Little Susitna rivers as indicator stocks that may be used to assess applicable SDC. The Federal definition for this stock also includes spawning escapements of coho salmon throughout UCI necessary to produce sustainable yield in future years.

4.6.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

During the 2024 fishery, 4,434 coho salmon were harvested in the CI EEZ; which was less than the 2024 Preseason OFL (358K), ABC/ACL (36K) and TAC (25K; Table 2). Because the estimated postseason cumulative harvest across a generation time (86K) was less than the 2024 OFL (439K) for this stock, it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 (Table 22).

Incomplete estimates of spawning escapements to the Deshka and Little Susitna River indicator stocks during recent years make it challenging to assess the overfished status of COHO, but it is the recommendation of the NMFS SAFE Team that this stock is not in an overfished condition. For 2024, based on ADF&G estimates, a combined sum of 1,606 coho salmon are estimated to have spawned in the Deshka (642) and Little Susitna (964) indicator streams, such that the 2024 cumulative escapement estimate is substantially less than the sum of the lower bound of escapement targets for the indicator stocks (19,400) The cumulative COHO indicator stocks' escapement for the most recent generation (24K fish) is less than MSST (38.8K fish); however, the weir counts for the Deshka River are incomplete for 2022 (pulled early for budget reasons), and for 2023, and 2024 due to flooding. Similarly, the weir counts for the Little Susitna River are considered incomplete for years 2022, 2023, and 2024 due to flood damage, and ADF&G estimates that the lower bound of the escapement goal was most likely met in 2022. As such, given the large uncertainty associated with the indicator stocks and the strong possibility that the reported escapement is biased low (as the weir data describes minimum escapement), it is the recommendation of the NMFS SAFE Team to the SSC that 2024 postseason spawning escapements for the most recent generation do not represent a complete and reliable index of abundance for COHO. The NMFS SAFE Team considered several options (below) for how to assess the overfished status for this and other stocks when spawning escapement estimates are incomplete and has provided its preferred recommendation.

1. (Preferred recommendation) Basing MSST (overfished) and the associated estimates of spawning escapements only on indicator stocks for which there is considered to be a complete and reliable history of monitoring;
2. use modeling approaches to estimate missing escapements for the indicator stocks;
3. assume that unmonitored years had escapements that were achieved;
4. similar to aggregate chum and pink salmon stock complexes, recognize a lack of reliable information to determine an overfished status;
5. an SSC recommendation not considered by the NMFS SAFE Team.

In considering whether COHO is approaching an overfished condition, it is the opinion of the NMFS SAFE Team that such a recommendation could be considered in the future if the cumulative spawning escapements for the indicator stocks was less than half of the sum of the lower bound of the recommended spawning escapement targets for at least two consecutive years (two years is half the generation time of coho salmon). However, to reiterate, it is the opinion of the NMFS SAFE Team that before considering such a recommendation, that the NMFS SAFE Team and the SSC should also consider the extent to which the spawning escapement data represents a complete and reliable index of abundance for the indicator stocks.

4.6.2 Data and assessment methodology

4.6.2.1 Data input changes for 2025

The 2025 SAFE includes Federal catch data from the 2024 federally managed CI EEZ salmon fishery. These data represent the first year of known catch occurring in the CI EEZ, as opposed to the catch estimates presented for years prior to 2024.

4.6.2.2 Changes in assessment methodology for 2025

Following the 2024 SSC recommendations to the NMFS SAFE Team, the 2025 assessment uses the largest total EEZ harvest over a generation (four years for coho salmon) to calculate the OFL, and the average harvest over that same period to calculate the preseason OFL (OFL_{PRE}). For the 2024 assessment, harvests during the years 2004 – 2007 had the highest cumulative harvest in the timeseries and were therefore used to calculate the OFL (sum of harvests across those years) and OFL_{PRE}. (average harvest across those years).

4.6.2.3 Changes in assessment results for 2025

Given the new 2025 methodology outlined above and in previous sections, relative to the 2024 SAFE report, preseason OFL values in this 2025 SAFE are smaller and considered to be more representative of amounts that could reasonably be harvested in the EEZ during a single season (changed from the multi-year methodology used in the 2024 SAFE). As such, based on this change, the NMFS SAFE Team may recommend a smaller 2025 buffer (relative to the 2024 buffer) to reduce the OFL_{PRE} to the resulting ABC.

Additionally, using the largest sum of EEZ harvest across a generation, as opposed to the largest observed EEZ harvest multiplied by the generation time used in the 2024 SAFE, results in a smaller OFL value used postseason to assess overfishing for Tier 3 stocks.

4.6.2.4 Existing data and assessment

The ADF&G data and stock assessment sources used for the Federal assessment of COHO are described in Section (4.6) with the most recent ADF&G stock assessment escapement goal review in Mckinley et al. (2024). Recent escapement goals, estimates, and many additional references pertaining to assessments of this stock can be found in Munro (2023).

Historical CI EEZ harvest estimates for COHO are considered to be complete, with the Federal definition of this stock in the EEZ generally meaning all coho salmon estimated to be harvested in the CI EEZ. Harvest in the CI EEZ occurring in 2024 (the first federally managed fishery in UCI EEZ) is considered to be known (rather than estimated as for pre-2024) and complete.

Spawning escapement data for stocks in the stock complex exists for several tributaries and drainages (described below).

Genetics data and associated stock composition estimates exist for commercial harvests during the years 2013 – 2016 (Barclay et al. 2019)

ADF&G's preseason commercial harvest estimates for UCI-wide coho salmon based on recent average harvests.

4.6.3 Federal data and assessments

After review by NMFS and unless otherwise stated, this SAFE incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 EEZ and State harvest), escapement, age, sex, and other data. However, because of the timeline necessary to produce this SAFE and implement the Federal salmon management in the CI EEZ in 2025, this SAFE estimated personal use harvests in 2024. Estimates for these values were made using five-year averages and will be updated in future years as data become available.

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 3 stocks.

4.6.4 Stock size and recruitment trends

Stock overview: During the most recent five-year period (2020 – 2024), an average of 35% of the drift gillnet coho salmon harvest in UCI is estimated to have occurred in the CI EEZ, with a range of harvests from 1.6 –33K coho salmon (Table 22 and Figure 20). During 2024, it is estimated that 40% of the drift gillnet coho salmon harvest and 18% of the overall UCI commercial harvest occurred in the CI EEZ. Since spawning escapement indices for this stock represent an unknown proportion of overall spawning escapement and such estimates are incomplete/missing during recent years, the NMFS SAFE Team did not estimate a total run size for this stock in this 2025 SAFE.

Escapement goals: The Federal definition of this stock complex includes 2 indicator stocks for which the State has spawning escapement goals (goal ranges in parentheses):

Deshka River (10,200–24,100), and Little Susitna River (9,200–17,700).

The current sum of the lower bounds of these escapement goals for the stock complex is 19,400; which, overall, has not been consistently achieved during recent years (Table 23)(Munro 2023) due to incomplete weir data. From 2020–2024, an average of approximately 7K coho salmon were estimated to have spawned in the tributaries that have been monitored (range of 1.6–10.9K).

Individual escapement goals for the two indicator stocks in the stock complex have not been achieved during recent years (Table 23; (Munro 2023); however, none of these stocks are classified as "Stocks of Concern" by the State (Munro 2023) and, as all escapement goals in the stock complex were developed based on the "Percentile Approach" (Clark et al. 2014); not achieving the lower bound of an escapement goal during some years is an expected product of this approach.

In addition to the two indicator stocks, there are many other drainages and tributaries in UCI where coho salmon are known to spawn, but which lack escapement goals and escapement monitoring.

Spawner-Recruitment and yield trends: The NMFS SAFE Team did not further investigate historical records of spawner-recruitment relationships for the index systems and a full accounting of such relationships is likely to be hampered by the large number of systems that are unmonitored and other data gaps. For example, while genetic analyses have been used by ADF&G to estimate the stock contributions of commercial harvests during some past years, the NMFS SAFE Team determined that the lack of annual estimates, combined by incomplete escapement data, makes it difficult to attribute these harvests to a given number of spawners in order to estimate the productivity (recruits per spawner) of the overall stock complex.

4.6.5 Tier determination and resulting OFL and ABC determination for 2025

Consistent with the 2024 SAFE and 2024 recommendations from the SSC, the NMFS SAFE Team recommends to the SSC a Tier 3 determination for COHO during 2025 due to the inability to verify estimates of total run size that are necessary for obtaining valid SDC estimates under Tier 2 (Table 23).

In further consideration of the level of precaution that is warranted for COHO in this 2025 SAFE report, at the time of this publication, neither of the indicator stocks for the stock complex are listed as "Stocks of Concern" by the State of Alaska (Payton and Rabung 2023). The State of Alaska's definition of a "Stock of Concern" as "escapements [that] chronically (4–5 years) fail to meet expectations for harvestable yield or spawning escapements" (Munro 2023). Under both State and Federal systems, a status designation of "overfished" (Federal) or a "Stock of Concern" (State) could result in accountability measures and a rebuilding plan. In the Federal system under the MSA, accountability measures and a rebuilding plan would be at the recommendation of the SSC and approved by the Council; under the State of Alaska, such measures would be reviewed and approved by the State of Alaska Board of Fisheries.

The retrospective analysis in the amendment 16 EA/RIR did indicate coho salmon were subject to overfishing in 2013. One or both indicator stocks did not achieve at least the lower bound of the escapement goal in 2016, 2018, 2019, 2023, and 2024. As noted by ADF&G, reductions in drift gillnet fishing effort in the last several years may have contributed to improved coho salmon escapement and catches in Northern District fisheries (Marston and Frothingham 2019, 2021)

Status and catch specifications for COHO based on a Tier 3 determination are provided with a range of buffers from 0.1 to 0.9 to reduce the preseason OFL to ABC (Table 24). The Tier 3 OFL for this stock (268,053) is equal to the largest historical cumulative EEZ harvest in the timeseries (1999 – 2024) across the generation time of the species (four years for coho salmon; 2004 – 2007; Table 22). The 2025 preseason OFL (67,013) was calculated as the average harvest across the same years used to calculate the OFL.

The NMFS SAFE Team recommends a buffer to reduce the preseason OFL for setting harvest specifications while exercising the necessary precaution to prevent overfishing.

Using the previous (multiyear) approach described above, 2024 Tier 3 COHO buffer was 90% and reduced the preseason OFL (358k) to an ABC of 35,759 fish. For 2025, the NMFS SAFE Team again recommends a precautionary buffer to reduce the OFL_{PRE} to the resulting ABC given the following considerations:

1. Indicator stocks have not consistently achieved spawning escapement goals during recent years (Munro 2023) (Table 23), including 2024.
2. The estimated 2024 Little Susitna escapement was the lowest in the timeseries (1999 - 2024; Table 23).
3. Based on their size, coho salmon are likely vulnerable to harvest in drift gillnets used target sockeye salmon during much of the fishing season and directly target coho salmon during some portion of the fishing season.
4. Genetic evidence showing that significant proportions of the drift gillnet coho salmon harvested are likely bound for Northern CI drainages where the indicator stocks are located (note that the State's commercial fishery management plan for UCI specifically calls for prioritization of coho salmon passing through Central and Northern Districts).
5. Concerns about the prey available to endangered CI beluga whales that occupy Northern CI, including the far reaches of the Inlet when coho salmon are present (McHuron et al. 2023). Coho salmon are listed as one of the preferred prey item of CI belugas (Hobbs and Shelden 2008; Huntington 2000; Quakenbush et al. 2015).

Given the considerations above, the NMFS SAFE Team considered a range of precautionary buffers from 75 – 90% and recommends that a buffer of 90% be applied to the preseason OFL, resulting in a recommended 2025 preseason ABC of 6,701 fish. Estimated harvests of coho salmon in the CI EEZ have only been less than this amount twice since 1999 (2020 and 2024; Table 22; Figure 20).The NMFS SAFE Team may recommend smaller buffers in future years if spawning escapement objectives are achieved for the indicator stocks.

The NMFS SAFE Team recommends prioritizing future research to better characterize the abundance, timing, spatial distribution, and genetic stock composition of the coho salmon harvested in the CI EEZ fishery (Willette et al. 2003).

While this stock can be declared overfished if cumulative spawning escapements are determined to be below MSST (similar to Tier 1 and 2), as a Tier 3 stock, overfishing would be assessed based on the OFL.

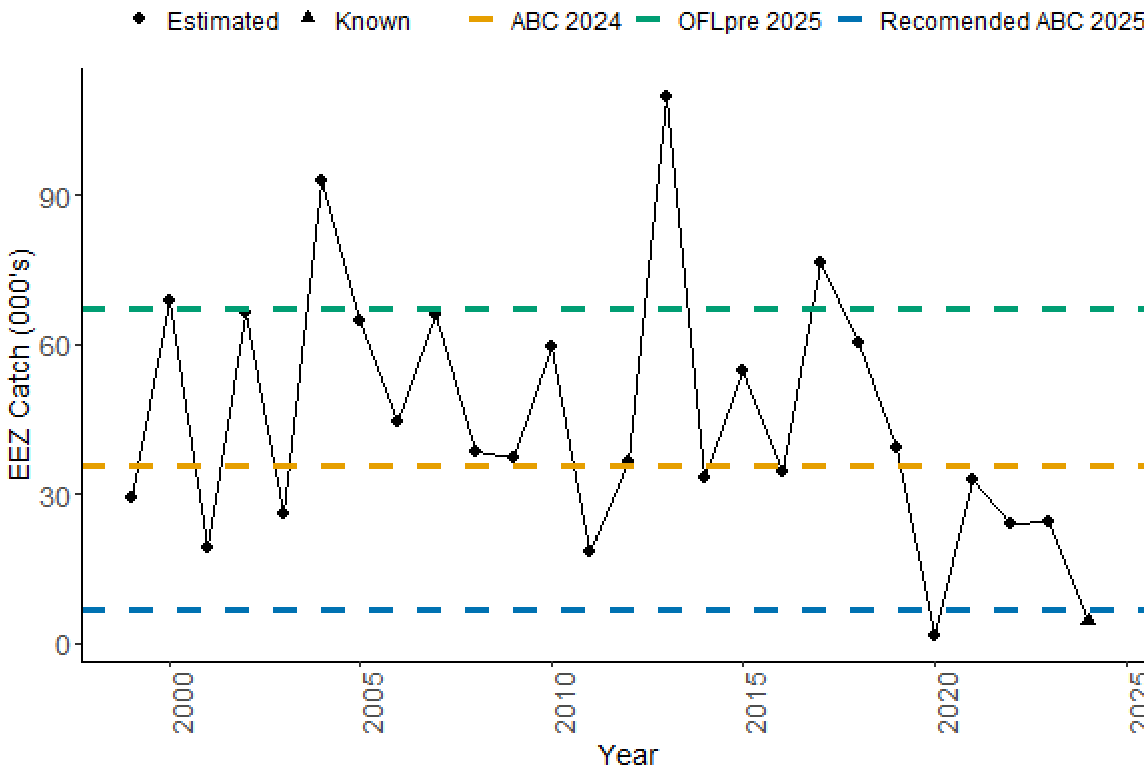

Figure 20. Timeseries of Aggregate coho salmon stock complex (COHO) harvest in the CI EEZ for years 2019 - 2024. For 2025, the OFL_{PRE} = 67,013 and the NMFS SAFE Team recommends a buffer of 90%, resulting in an ABC of 6,701. CI EEZ harvest estimates prior to 2024 are based on methods and assumptions described in section 4.1 of this SAFE report.

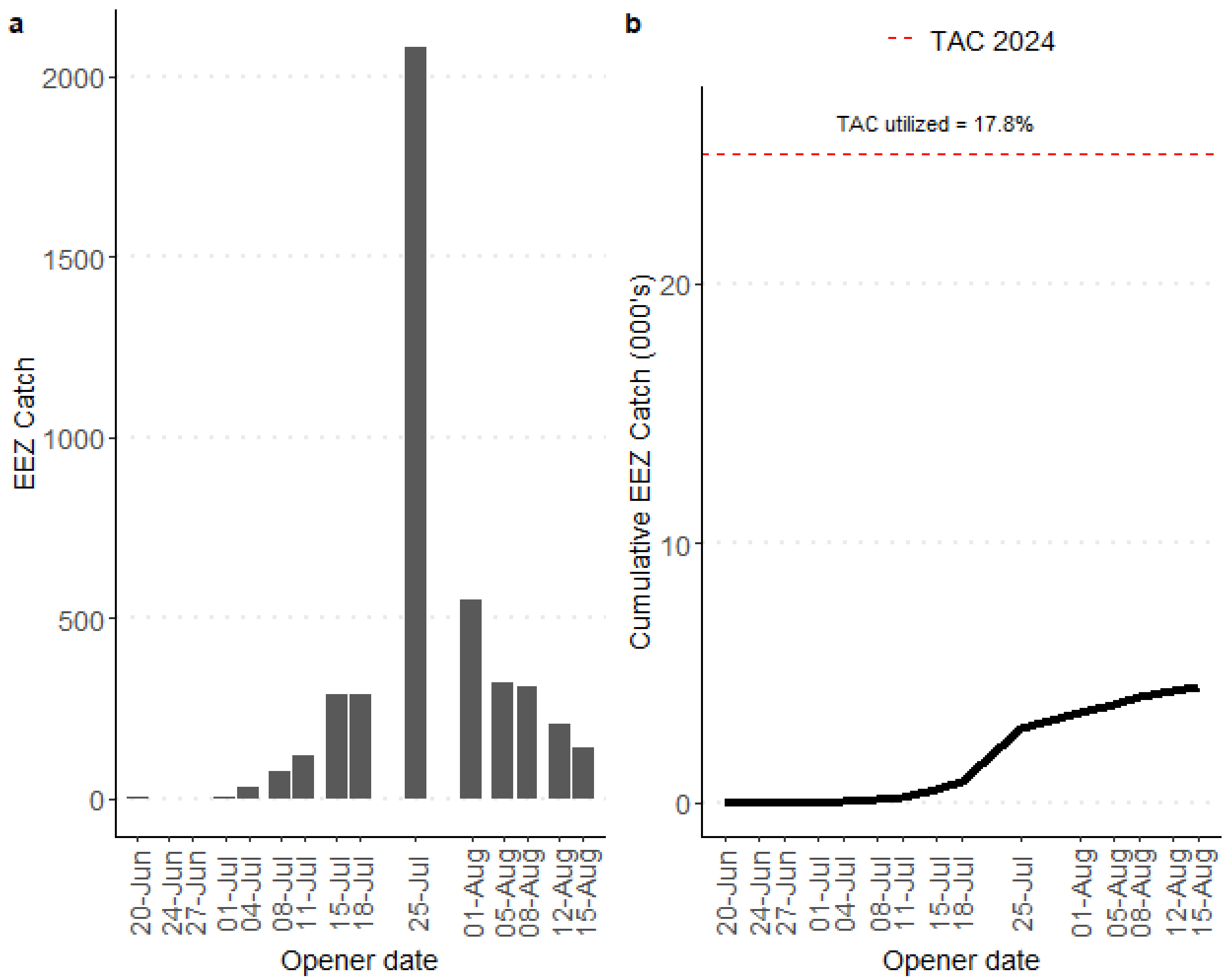

Figure 21. Aggregate coho salmon (a) CI EEZ catch by day and (b) cumulative catch compared to the 2024 TAC

Table 22. Status and catch specifications for Tier 3 Aggregate coho salmon stock complex. An overfished determination is assessed postseason by comparing the minimum stock size threshold (MSST; one half of the sum of the indicator stock's spawning escapement goal summed across a generation, with actual cumulative escapement of the indicator stocks summed across a generation (Cum. Escap.). Overfishing is assessed postseason by comparing the actual harvest summed across a generation (EEZ Cum. Harvest) with the postseason overfishing limit (OFL). Unless otherwise noted, values are in the thousands of fish. Shaded values are new estimates or projections based on the current assessment, the projected EEZ Cum. Harvest for the coming fishing season only including the first three years (T-1) of the current generation. Bolded EEZ Harvest values are used to calculate OFL and OFL_{PRE}. Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Year	MSST[a,c]	Cum. Escap.[a]	Total Comm. Harvest	State Drift Gillnet Harvest	EEZ Harvest	EEZ Cum. Harvest	OFL	OFL_{PRE}
1999	46.0	NA	126	36	29	NA	NA	NA
2000	46.0	NA	237	63	69	NA	NA	NA
2001	46.0	NA	113	20	19	NA	NA	NA
2002	46.0	182	246	60	66	184	NA	NA
2003	46.0	203	102	26	26	180	NA	NA
2004	46.0	264	311	107	**93**	205	NA	NA
2005	46.0	269	225	80	**65**	250	NA	NA
2006	46.0	264	178	54	**45**	228	NA	NA
2007	46.0	264	177	43	**66**	268	NA	NA
2008	46.0	192	172	51	38	214	NA	NA
2009	46.0	164	153	45	37	186	NA	NA
2010	46.0	116	207	51	59	201	NA	NA
2011	46.0	100	95	22	19	154	NA	NA
2012	46.0	82	107	38	36	152	NA	NA
2013	46.0	81	261	75	110	224	NA	NA
2014	46.0	97	137	44	33	198	NA	NA
2015	46.0	109	216	76	54	234	NA	NA
2016	46.0	112	147	56	35	232	NA	NA
2017	46.0	131	304	115	76	199	NA	NA
2018	46.0	116	232	48	60	226	NA	NA
2019	46.0	107	164	49	39	211	NA	NA
2020	38.8	101	139	47	2	178	NA	NA
2021	38.8	57	147	48	33	135	NA	NA
2022	38.8	43	102	27	24	98	NA	NA
2023	38.8	34	84	25	25	83	NA	NA
2024	38.8	24	25	7	4.4	86	439[b]	358[b]
2025	38.8	13	---	---	---	53	268	67

[a] Calculated based on escapements and escapement targets for indicator stocks (Deshka and Little Susitna rivers).

[b] For the 2024 SAFE, a different method was used to calculate the Tier 3 OFL and OFL_{PRE}. See the Final 2024 CI EEZ SAFE for additional details.

[c] No escapement goal for the Deshka River prior to 2017.

Table 23. Coho salmon escapement goals and escapements in the Deshka and Little Susitna rivers. These rivers are indicator stocks for the UCI Aggregate coho salmon stock complex. The lower bound of the escapement goal (L.B.) and escapement (Esc.) are presented for both indicator stocks. The total escapement is the sum of escapements for both rivers in each year. The minimum stock size threshold (MSST) is the sum of escapement targets for both rivers over the previous generation time (4 years) and the cumulative escapement (Cum. Esc) is the sum of total escapement over the previous four years. When cumulative escapement is less than MSST, the stock may be considered overfished. Total catch is the sum of all coho harvest in UCI and total run is the sum of total catch and total escapement (Total Esc.).

	Deshka River		Little Susitna River						
Year	L.B.	Esc.	L.B.	Esc.	Total Esc.	MSST	Cum. Esc.	Total Catch	Total Run
2019	10,200	10,445	10,100	4,229	14,674	40,600	106,848	273,194	287,868
2020	10,200	**NA**	9,200	10,765	10,765	38,800	100,744	226,730	237,495
2021	10,200	**NA**	9,200	10,923	10,923	38,800	57,017	277,020	287,943
2022	10,200	3,168[a]	9,200	3,162[a,b]	6,330[a]	38,800	42,692[a]	214,514	220,844
2023	10,200	1,817[a,c]	9,200	3,726[a,c]	5,543[a]	38,800	33,561[a]	196,778	202,321
2024	10,200	642[a,c]	9,200	964[a,c]	1,606	38,800	24,402[a]	135,469	137,075

[a]Incomplete weir count
[b]ADF&G considers the escapement goal met
[c]ADF&G estimates the escapement goal was not met

Table 24. 2025 Tier 3 SDC for aggregate Coho salmon stock complex with a range of buffers to reduce the preseason OFL to ABC.

Buffer	OFL_{PRE}	ABC	OFL
10%	67,013	60,312	268,053
20%	67,013	53,611	268,053
30%	67,013	46,909	268,053
40%	67,013	40,208	268,053
50%	67,013	33,507	268,053
60%	67,013	26,805	268,053
70%	67,013	20,104	268,053
80%	67,013	13,403	268,053
90%	67,013	6,701	268,053

4.7 Aggregate Chum Salmon, stock complex

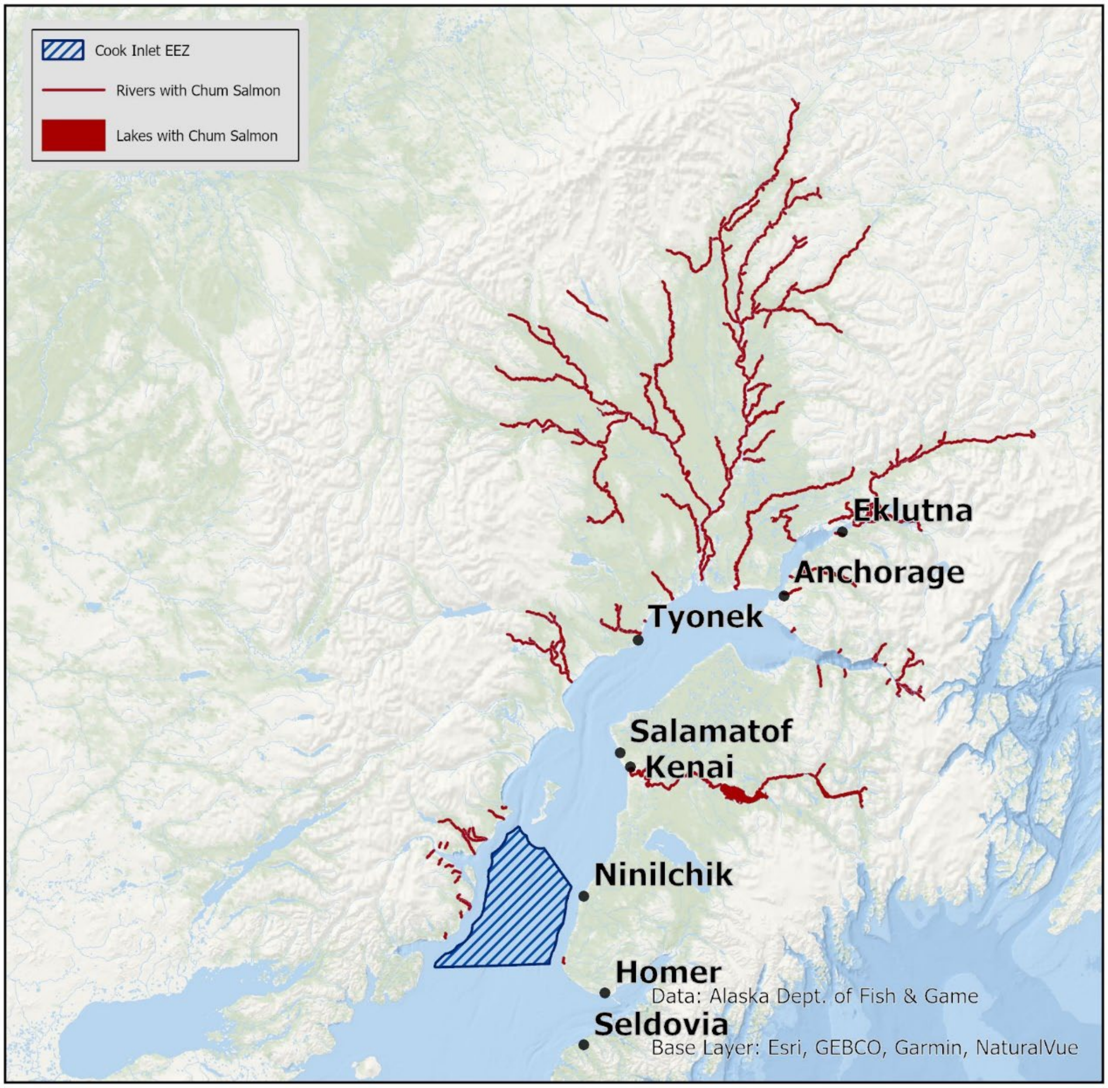

Figure 22. Map showing the CI EEZ and the watersheds with chum salmon located in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Aggregate chum salmon stock complex (CHUM) is defined as all chum salmon harvested in the CI EEZ. The Federal definition for this stock also includes spawning escapements of chum salmon throughout UCI necessary to produce sustainable yield in future years.

4.7.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

During the 2024 fishery, 28,823 chum salmon were harvested from the CHUM in the CI EEZ; which was less than the 2024 preseason OFL (442K), ABC/ACL (110K), and TAC (99.4K; Table 2). Because the estimated postseason cumulative harvest across the most recent generation (148K) was less than the 2024 OFL (561K) for this stock, it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 (Table 25).

4.7.2 Data and assessment methodology

4.7.2.1 Data input changes for 2025

The 2025 SAFE includes Federal catch data from the 2024 federally managed CI EEZ salmon fishery. These data represent the first year of known catch occurring in the EEZ, as opposed to the catch estimates presented for years prior to 2024.

4.7.2.2 Changes in assessment methodology for 2025

Following the 2024 SSC recommendations, the 2025 assessment uses the largest total EEZ harvest over a generation (four years for chum salmon) to calculate the OFL, and the average harvest over that same period to calculate the preseason OFL (OFL_{PRE}). Harvests during the years 2013 – 2016 had the highest cumulative harvest in the timeseries and were therefore used to calculate the OFL (sum of harvests across those years) and OFL_{PRE}. (average harvest across those years).

4.7.2.3 Changes in assessment results for 2025

Given the new 2025 methodology outlined above and in previous sections, relative to the 2024 SAFE report, preseason OFL values in this 2025 SAFE are smaller and considered to be more representative of amounts that could reasonably be harvested in the EEZ during a single season (changed from the multi-year methodology used in the 2024 SAFE). Based on this change, the NMFS SAFE Team may recommend a smaller 2025 buffer (relative to the 2024 buffer) to reduce the OFL_{PRE} to the resulting ABC.

Additionally, using the largest sum of EEZ harvest across a generation, as opposed to the largest observed EEZ harvest multiplied by the generation time used in the 2024 SAFE, results in a smaller OFL value used postseason to assess overfishing for Tier 3 stocks.

4.7.2.4 Existing data and assessment

The ADF&G data and stock assessment sources used for the Federal assessment of the CHUM are described in Section 4.7.

Clearwater Creek is the only State escapement goal for chum salmon in UCI. Recent escapement indices for this stock are provided in Munro (2023) and in the 2023 UCI commercial salmon fishery season summary (Lipka 2023).

Harvest estimates from this stock includes commercial, personal use, and recreational fisheries, most of which are available from ADF&G reports and through the ADF&G website. Harvest in the CI EEZ occurring in 2024 (the first federally managed fishery in UCI EEZ) is considered to be known (rather than estimated as for pre-2024) and complete.

The extent to which escapement indices represent actual numbers of spawners for all freshwater systems is unknown given that a single drainage is monitored. Therefore, estimates of total run size are unavailable.

For UCI, there are no chum salmon "Stocks of Concern" listed by the State.

4.7.2.5 Federal data and assessments

After review by NMFS and unless otherwise stated, this SAFE incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 harvest), escapement, and other data. However, because of the timeline necessary to produce this SAFE in time to implement the Federal drift gillnet fishery in the CI EEZ, NMFS estimated the following quantities during recent years: 2024 personal use harvests (based on a 5-year 2018–2022 average); 2022–2024 sportfish harvests, with these estimates considered to be minor portions of overall harvests.

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 3 stocks.

4.7.3 Stock size and recruitment trends

Stock overview: During the most recent five-year period (2020–2024), an average of 35% of the overall drift gillnet chum salmon harvest in UCI is estimated to have been harvested in the CI EEZ, with a range of 7,681–51,081 chum salmon harvested in the EEZ during this period (Table 25 and Figure 23). For 2024, CI EEZ harvests were approximately 45% of the overall UCI drift gillnet harvest and approximately 37% of all UCI commercial harvests of chum salmon. No estimates of total run size are available for CHUM.

Escapement Goal: Clearwater Creek is the only State escapement goal for chum salmon in UCI. For that system, escapement is monitored by aerial survey with the annual escapements set by the peak aerial survey count for the year, with an escapement goal range of 3,500-8,000 chum salmon that was informed by the Percentile Approach (Clark et al. 2014). For the ten years from 2014–2023, escapements at Clearwater Creek have met or exceeded the lower bound of the spawning escapement goal range during all but two years (2014 and 2018).

Spawner-Recruitment and yield trends: There are no available spawner-recruitment or yield trends for this stock due to the lack of reliable estimates of spawning escapements across all areas in UCI and lack of age data for harvests or escapements.

While escapement indices are available for 1 system managed by the State, it is the recommendation of the NMFS SAFE Team that the single spawning escapement goal and associated index of annual escapements do not provide a representative estimate of spawning abundance for all tributaries in UCI.

4.7.4 Tier determination and resulting OFL and ABC determination for 2025

Consistent with the 2024 SAFE and SSC recommendation, the NMFS SAFE Team again recommends to the SSC that CHUM be designated as Tier 3. The lack of reliable estimates of spawning abundance or total run size for the stock preclude a Tier 2 determination.

Status and catch specifications for CHUM based on a Tier 3 determination are provided in Table 25. Based on the Tier 3 methods described in the Salmon FMP and this SAFE, the NMFS SAFE Team recommends an OFL of 390,030 chum salmon that reflects the maximum cumulative CI EEZ harvest across a generation time of four years (2013 - 2016) in the timeseries under consideration (1999 – 2024; Table 25). The 2025 preseason OFL is calculated as the largest average harvest over the same generation used to calculate the OFL, resulting in a preseason OFL of 97,508 chum salmon.

In recommending values of OFL and ABC, the NMFS SAFE Team notes that there are no known conservation concerns for UCI chum salmon and they are not listed by the State as a “Stock of Concern” in UCI. It assumed that chum salmon are incidentally harvested (not targeted) in the CI EEZ, with the majority of harvest estimated to occur outside the EEZ. The NMFS SAFE Team also assumes that CHUM in UCI is healthy and harvested at a low exploitation rate in the EEZ fishery. Generally, it is understood that conservation and management considerations related to occurring sockeye and coho salmon stocks constrain the total harvest of chum salmon in UCI, including for the CI EEZ fishery. The NMFS SAFE Team welcomes input and additional information on this and other assumptions.

Given the considerations above, the NMFS SAFE Team recommends that a 20% buffer be applied to the preseason OFL (97,508), resulting in an ABC of 78,006 chum salmon.

Recommending a 20% buffer for this stock compared to recommended buffers for ACHIN (30%) and PINK (10%; see discussion in Section 4.8.4 below) reflects the NMFS SAFE Team’s judgment that CHUM is less of a conservation concern than ACHIN but, based on their size, are more likely to be caught in the gillnet fishery than PINK and that available evidence suggests that there are fewer, perhaps even substantially fewer, chum salmon spawning streams and overall spawning area relative to the other four species of salmon in UCI (see maps at the start of each salmon stock assessment in this SAFE for a qualitative overview of salmon spawning locations throughout UCI based on State data (Giefer 2024)(NMFS has not conducted a formal, quantitative review or assessment of available spawning habitat for chum salmon throughout UCI). Additionally, this recommendation of a 20% buffer compared to the 2024 buffer of 24% reflects the new Tier 3 method, whereby preseaon OFLs represent an amount of harvest that could be reasonably achieved in a single season. If a harvest of 78,006 chum salmon occurred in a single season, it would be ~47K more than the most recent five-year (2020 – 2024) average of estimated of chum salmon harvests in the CI EEZ and 3 – 62K less than the harvest in years 1999, 2002, 2010, 2012, 2015, and 2017 (Figure 23). As with other stocks for which there is a paucity of available information, the NMFS SAFE Team recommends research to estimate overall escapement and total run size for this stock.

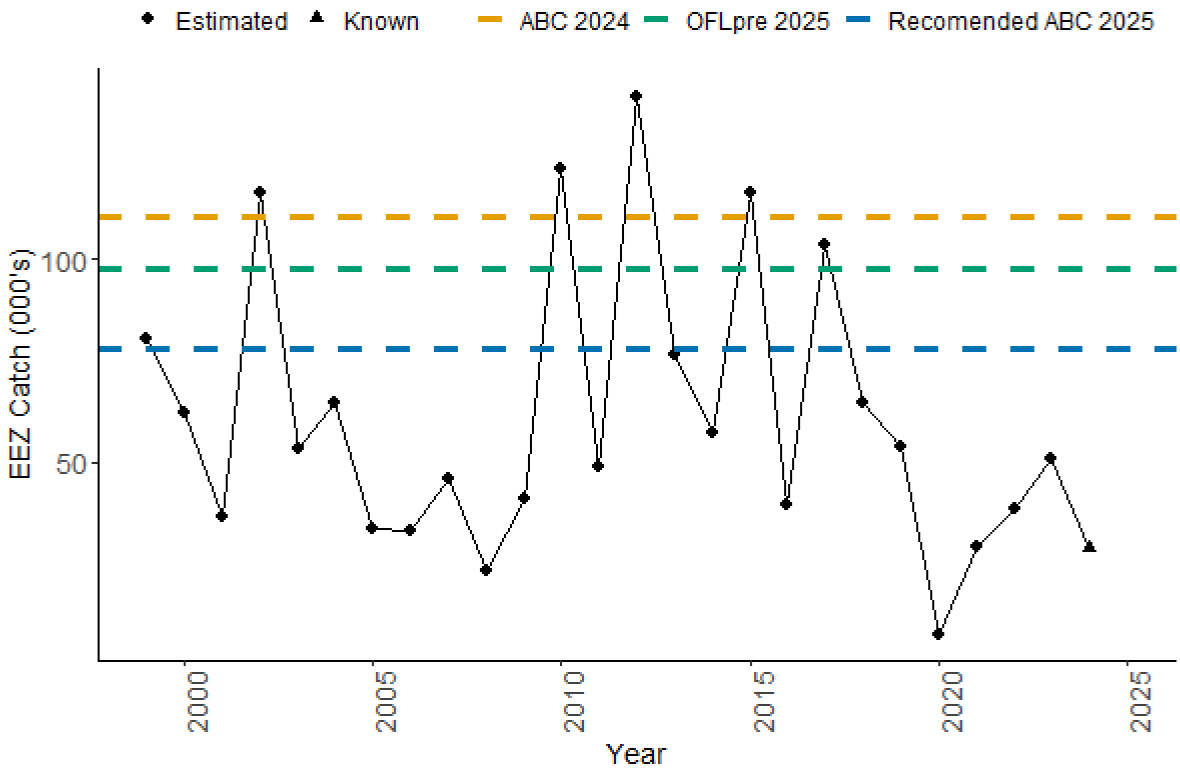

Figure 23. Timeseries of Aggregate chum salmon harvest in the CI EEZ for years 1999 - 2024. For 2025, the OFL_{PRE} is 97,508 and the NMFS SAFE Team recommends a buffer of 20%, resulting in an ABC of 78,006. CI EEZ harvest estimates prior to 2024 are based on methods and assumptions described in section 4.1 of this SAFE report.

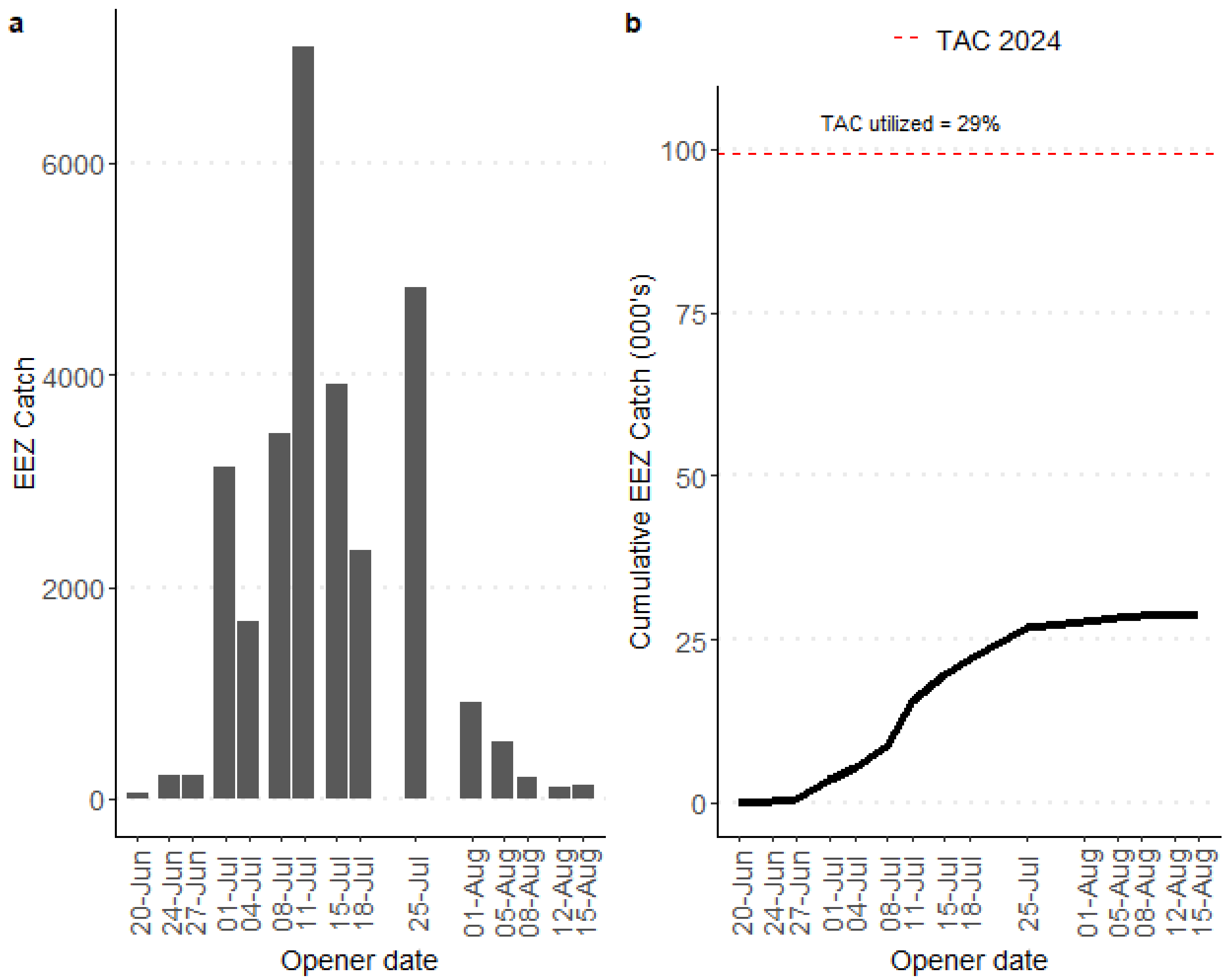

Figure 24. Aggregate Chum salmon (a) CI EEZ catch by day and (b) cumulative catch compared to the 2024 TAC.

Table 25. Status and catch specifications for Tier 3 Aggregate chum salmon stock complex. Overfishing is assessed postseason by comparing the actual harvest summed across a generation (EEZ Cum. Harvest) with the postseason overfishing limit (OFL). Unless otherwise noted, values are in the thousands of fish. Shaded values are new estimates or projections based on the current assessment. The projected EEZ Cum. Harvest for the coming fishing season only including the first three years (T-1) of the current generation. Bolded EEZ Harvest values are used to calculate OFL and OFL_{PRE}. Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Year	Total Comm. Harvest	State Drift Gillnet Harvest	EEZ Harvest	EEZ Cum. Harvest	OFL	OFL_{PRE}
1999	1745	86	81	NA	NA	NA
2000	127	56	62	NA	NA	NA
2001	84	39	37	NA	NA	NA
2002	238	108	116	296	NA	NA
2003	121	53	53	268	NA	NA
2004	146	73	65	271	NA	NA
2005	70	32	34	268	NA	NA
2006	64	27	33	185	NA	NA
2007	77	29	46	178	NA	NA
2009	50	23	23	136	NA	NA
2010	83	36	41	144	NA	NA
2011	229	94	123	233	NA	NA
2012	129	62	49	236	NA	NA
2013	270	124	**140**	353	NA	NA
2014	139	56	**76**	388	NA	NA
2015	116	51	**57**	323	NA	NA
2016	276	136	**116**	390	NA	NA
2017	124	74	40	289	NA	NA
2018	244	129	104	317	NA	NA
2019	115	44	65	324	NA	NA
2020	129	59	8	230	NA	NA
2021	29	18	29	155	NA	NA
2022	70	36	39	130	NA	NA
2023	99	53	51	127	NA	NA
2024	126	62	29	148	561*	442*
2025				118	390	97.5

* For the 2024 SAFE, a different method was used to calculate the Tier 3 OFL and OFL_{PRE}. See the Final 2024 CI EEZ SAFE for additional details.

Table 26. 2025 recommended Tier 3 SDC for the Aggregate chum salmon stock complex and a range of buffers to reduce the preseason OFL to ABC.

Buffer	OFL_{PRE}	ABC	OFL
10%	97,508	87,757	390,030
20%	97,508	78,006	390,030
30%	97,508	68,255	390,030
40%	97,508	58,504	390,030
50%	97,508	48,754	390,030
60%	97,508	39,003	390,030
70%	97,508	29,252	390,030
80%	97,508	19,501	390,030
90%	97,508	9,751	390,030

4.8 Aggregate Pink Salmon, stock complex

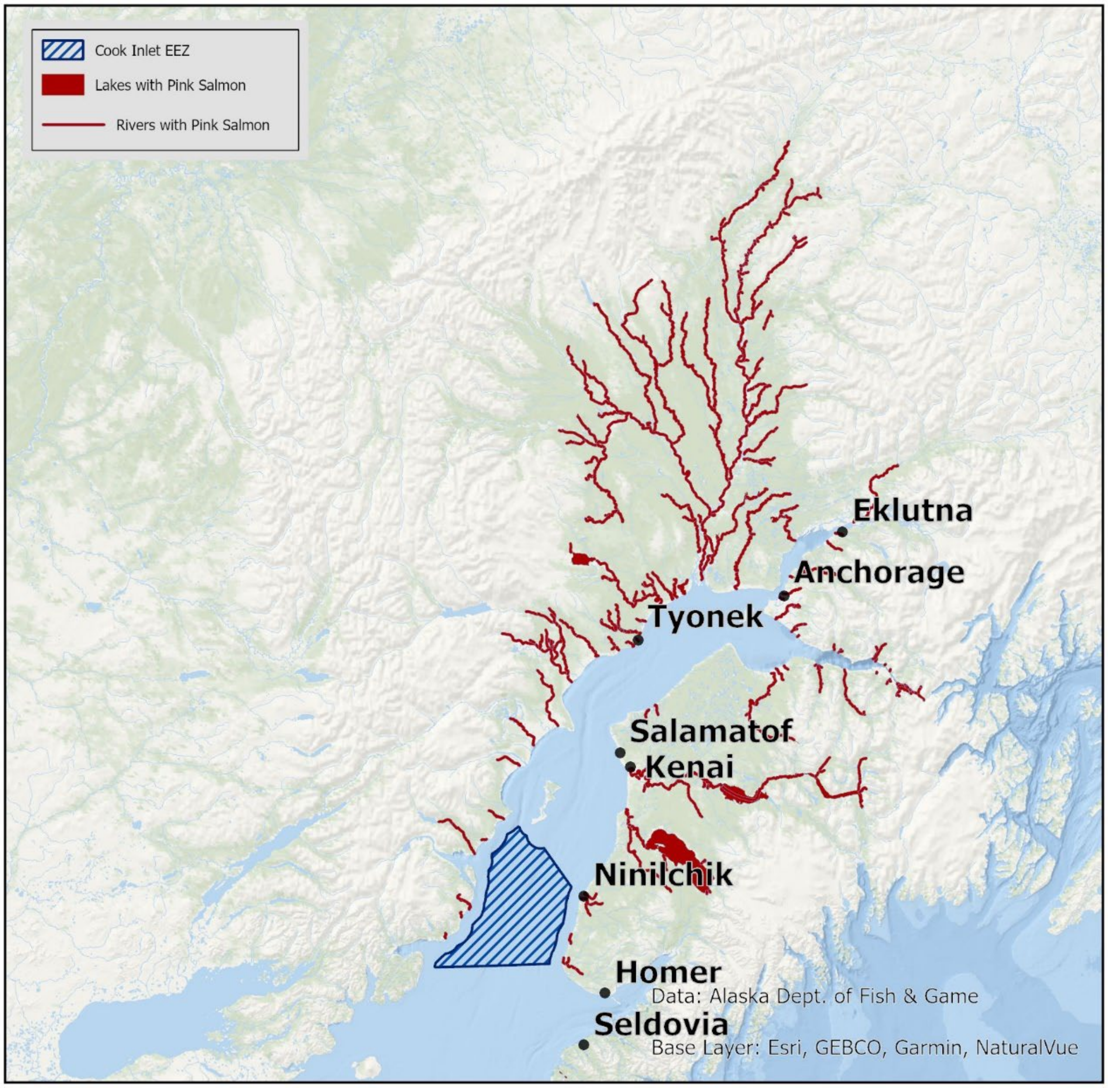

Figure 25. Map showing the CI EEZ and the watersheds with pink salmon located in Upper Cook Inlet.

Definition: As described in the Salmon FMP, the Aggregate pink salmon stock complex (PINK) is defined as all pink salmon harvested in the CI EEZ. The Federal definition for this stock also includes spawning escapements of pink salmon throughout UCI necessary to produce sustainable yield in future years.

This stock definition is applicable to both even- and odd-year broodlines of UCI pink salmon, which are assessed separately.

4.8.1 Retrospective assessment of fishery information relative to status determination criteria, including overfishing and overfished designations

4.8.1.1 Even-Year broodline

During the 2024 fishery, 6,250 pink salmon were harvested in the CI EEZ; which was less than the 2024 OFL (300K), preseason OFL (270K), ABC/ACL (135K), and TAC (122K; Table 2). Because the estimated postseason cumulative harvest across a generation time (36K) was less than the 2024 OFL (300K) for this stock, it is the recommendation of the NMFS SAFE Team that overfishing did not occur during 2024 (Table 27).

4.8.1.2 Odd-Year Broodline

Since a Federal fishery in the CI EEZ was not in place in 2023, this assessment of overfishing is retrospective in nature and assumes that overfishing for 2023 is assessed in a manner similar to that recommended in this SAFE and the Salmon FMP.

During the 2023 fishery (most recent odd-year run), it is estimated that ~24K pink salmon were harvested in the CI EEZ. Because the total catch mortality for this stock across the most recent generation (~55K) was well below the 2022 OFL of 300K, it is the NMFS SAFE Team's assessment that overfishing did not occur.

4.8.2 Data and assessment methodology

4.8.2.1 Data input changes for 2025

The 2025 SAFE includes Federal catch data from the 2024 federally managed CI EEZ salmon fishery. These data represent the first year of known catch occurring in the EEZ, as opposed to the catch estimates presented for years prior to 2024.

4.8.2.2 Changes in assessment methodology for 2025

Following the 2024 SSC recommendations to the NMFS SAFE Team, the 2025 assessment uses the largest total EEZ harvest over a generation (two years for pink salmon) to calculate the OFL, and the average harvest over that same period to calculate the preseason OFL (OFL_{PRE}). For the 2024 assessment, odd-year PINK harvests during the years 2007 and 2009 had the highest cumulative harvest in the timeseries and were therefore used to calculate the OFL (sum of harvests across those years) and OFL_{PRE}. (average harvest across those years).

4.8.2.3 Changes in assessment results for 2025

Given the new 2025 methodology outlined above and in previous sections, relative to the 2024 SAFE report, preseason OFL values in this 2025 SAFE are smaller and considered to be more representative of amounts that could reasonably be harvested in the EEZ during a single season (changed from the multi-year methodology used in the 2024 SAFE). Based on this change, the NMFS SAFE Team may recommend a smaller 2025 buffer (relative to the 2024 buffer) to reduce the OFL_{PRE} to the resulting ABC.

Additionally, using the largest sum of EEZ harvest across a generation, as opposed to the largest observed EEZ harvest multiplied by the generation time used in the 2024 SAFE, results in a smaller OFL value used postseason to assess overfishing for Tier 3 stocks.

4.8.2.4 Existing data and assessment

The ADF&G data and stock assessment sources used for the Federal assessment of the PINK are described in Section 4.8.

There are no escapement goals or known and reliable estimates of pink salmon escapement in UCI.

Harvest estimates from this stock includes commercial, personal use, and recreational fisheries, most of which are available from ADF&G reports and through the ADF&G website. Harvest in the CI EEZ occurring in 2024 (the first federally managed fishery in UCI EEZ) is considered to be known (rather than estimated as for pre-2024) and complete.

4.8.2.5 Federal data and assessments

After review by NMFS and unless otherwise stated, in addition to the 2024 Federal harvest data for pink salmon from the CI EEZ, this SAFE also incorporates ADF&G data and associated estimates of harvest (2024 harvest in State waters and 1999 – 2023 harvest).

To inform SDC and harvest specifications, the Federal stock assessment relied on the method described previously for Tier 3 stocks.

Pink salmon have discreet even- and odd-year broodlines that do not interact and SDC are calculated separately for each brood-year. As per the recommended Tier 3 methodology, the 2025 odd-year broodline OFL is the maximum cumulative historical harvest (116K) over a generation (2 years) in the time series under consideration (1999 – 2024; with 2007 and 2009 representing the two largest consecutive years). The preseason OFL is the largest average catch (58K) over the same generation that was used to calculate the OFL and represents an amount that could reasonably be harvested in a generation.

4.8.3 Stock size and recruitment trends

Stock overview:

Even-year: During the most recent five year even-year return (2014, 2016, 2018, 2020, 2022), an average of 19% of the overall drift gillnet pink salmon harvest is estimated to have been from PINK in the CI EEZ, with a range of 12–150K pink salmon harvested in the CI EEZ during this period (Figure 26). For 2024, CI EEZ harvests were approximately 23% of the overall drift gillnet harvest and approximately 36% of all commercial harvests in UCI. No estimates of total run size are available.

Odd-year: During the most recent five year odd-year return period (2015, 2017, 2019, 2021, 2023), an average of 18% of the overall drift gillnet pink salmon harvest is estimated to have been from PINK in the CI EEZ, with a range of 10–26K pink salmon harvested in the CI EEZ during this period (Figure 26).

Escapement Goal: There are no State spawning escapement goals for pink salmon in UCI.

Spawner-Recruitment and yield trends: There are no available spawner-recruitment or yield trends for this stock due to the lack of reliable estimates of spawning escapements across all areas in UCI.

4.8.4 Tier determination and resulting OFL and ABC determination for 2025

Consistent with the 2024 SSC recommendations, the NMFS SAFE Team recommends to the SSC that PINK be designated as Tier 3 stock.

Similar to chum salmon, it is the assumption of the NMFS SAFE Team that the CI EEZ pink salmon stock complex is healthy, is not subject to overfishing and that past estimates of EEZ harvests represent incidental (not targeted) harvests that are not impactful to the overall spawning population. Given the small size of pink salmon relative to other salmon, it is also assumed that many pink salmon would get through the gillnets used in the CI EEZ, which primarily target sockeye salmon. As such, while spawning estimates are not available, it is the judgment of the NMFS SAFE Team that even- and odd-year pink salmon represent a particularly low conservation concern with respect to harm to the stock that could come as a result of fishing activity in the CI EEZ. The NMFS SAFE Team welcomes feedback, data, and additional information pertaining to the assumptions and analyses presented in this SAFE.

Given the considerations above, the NMFS Safe Team recommends a preseason OFL of 58,174 pink salmon and that a 10% buffer be applied to this, resulting in an ABC of 52,357 pink salmon. For the 2024 harvest specifications, using a different (multi-year) method to calculate the preseason OFL, a 50% buffer was applied to the preseason OFL. However, as recommended by the SSC for this updated 2025 assessment, the Tier 3 method for calculating the preseason OFL results in amounts that could reasonably be harvested in the CI EEZ during a single season. A harvest of 52,357 odd-year pink salmon has only been exceeded once (2009) in the 13 years of odd-year harvests that are included in this assessment (1999-2024; Figure 26).

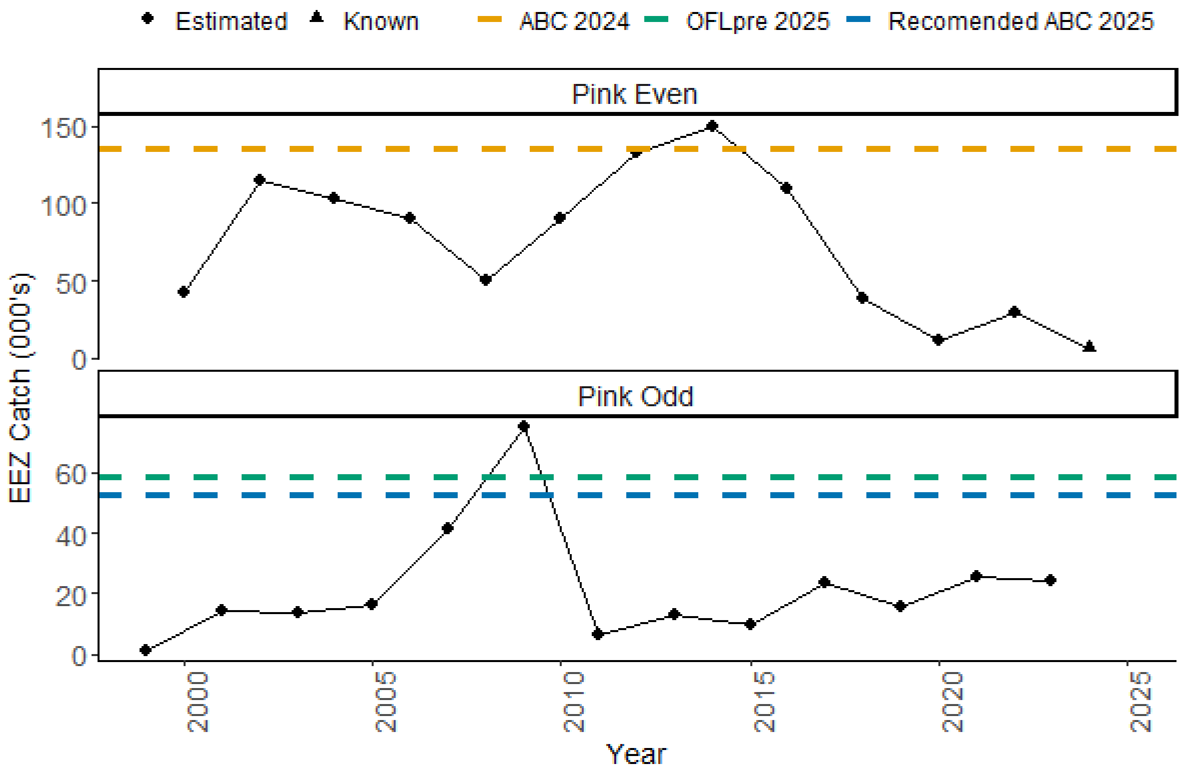

Figure 26. Timeseries of pink salmon (even and odd year broodlines) harvest in the CI EEZ for years 2019 - 2024. For 2025, the pink salmon odd-year broodline OFL_{PRE} is 58,174 and the NMFS SAFE Team recommends a buffer of 10%, resulting in an ABC of 52,357. The CI EEZ harvest estimates prior to 2024 are based on methods and assumptions described in Section 4.1 of this SAFE report.

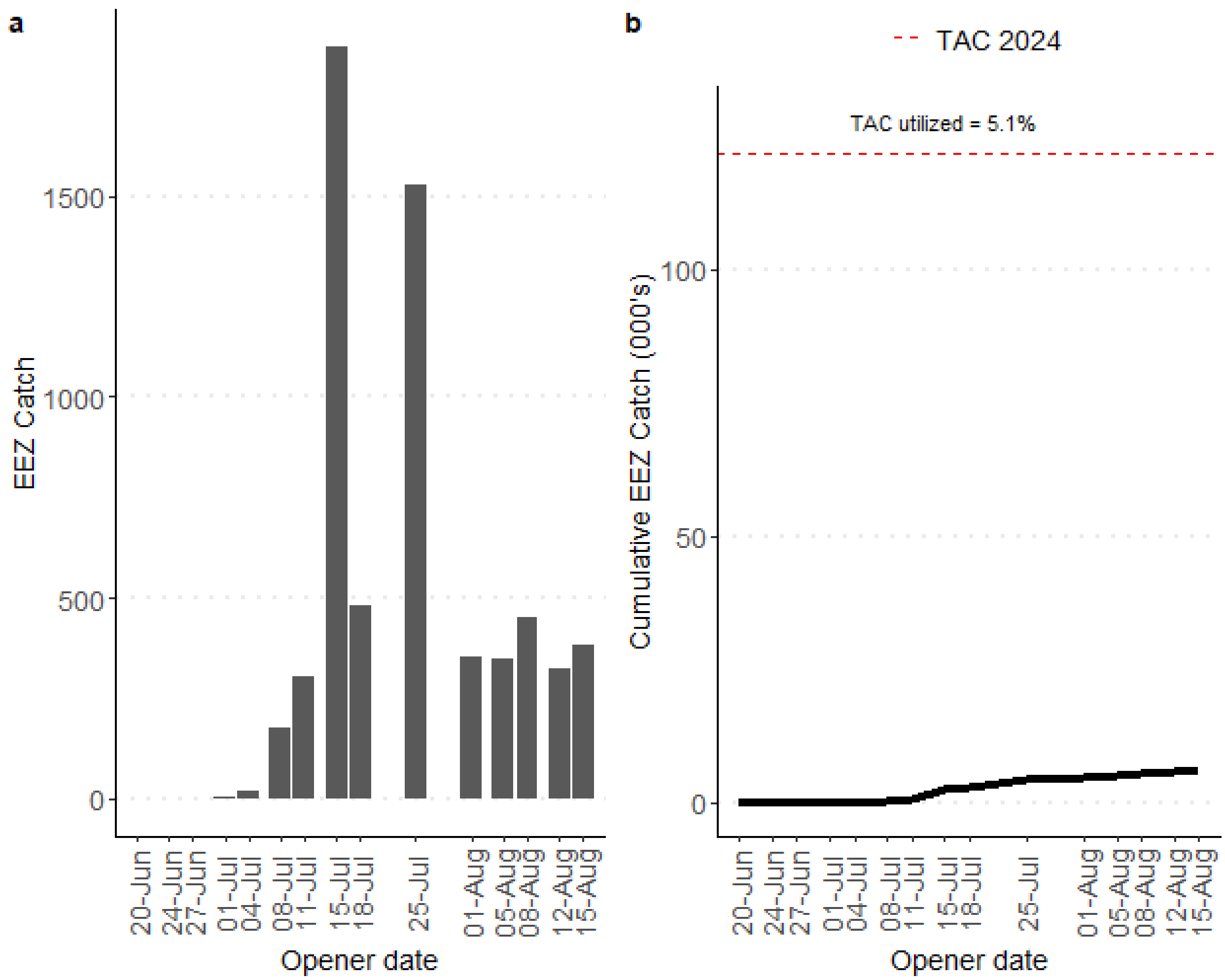

Figure 27. Aggregate even-year pink salmon (a) EEZ catch by day and (b) cumulative catch compared to the 2024 TAC.

Table 27. Tier 3 status and catch specifications for the Aggregate pink salmon stock complex. Overfishing is assessed postseason by comparing the actual harvest summed across a generation (EEZ Cum. Harvest) with the postseason overfishing limit (OFL). Unless otherwise noted, values are in the thousands of fish. Shaded values are new estimates or projections based on the current assessment, the projected EEZ Cum. Bolded EEZ Harvest values are used to calculate OFL and OFL_{PRE}. Cumulative EEZ Harvest for the coming fishing season only including one year (T-1) of the current generation. Note that EEZ harvest prior to 2024 is estimated as described in section 4.1.

Brood Year	Year	Total Comm. Harvest	State Drift Gillnet Harvest	EEZ Harvest	EEZ Cum. Harvest	OFL	OFL_{PRE}
Even	2000	146	48	43	NA	NA	NA
	2002	447	109	115	157	NA	NA
	2004	358	132	103	218	NA	NA
	2006	404	122	91	194	NA	NA
	2008	169	54	50	140	NA	NA
	2010	293	74	90	139	NA	NA
	2012	470	170	133	223	NA	NA
	2014	643	267	150	283	NA	NA
	2016	382	159	109	260	NA	NA
	2018	127	45	39	148	NA	NA
	2020	345	282	12	51	NA	NA
	2022	101	60	30	41	NA	NA
	2024	42	31	6	36	300*	270*
Odd	1999	16	2	1	NA	NA	NA
	2001	73	17	15	16	NA	NA
	2003	49	17	13	28	NA	NA
	2005	48	15	16	29	NA	NA
	2007	147	26	**42**	58	NA	NA
	2009	214	65	**75**	116	NA	NA
	2011	34	9	6	81	NA	NA
	2013	48	18	13	19	NA	NA
	2015	48	12	10	22	NA	NA
	2017	168	67	23	33	NA	NA
	2019	71	12	16	39	NA	NA
	2021	79	40	26	42	NA	NA
	2023	66	34	24	50	NA	NA
	2025				24	116	58

*For the 2024 SAFE, a different method was used to calculate the Tier 3 OFL and OFL_{PRE}. See the Final 2024 CI EEZ SAFE for additional details.

Table 28. 2025 recommended Tier 3 SDC for the Aggregate odd-year pink salmon stock complex and a range of buffers to reduce the preseason OFL to ABC.

Buffer	OFL_{PRE}	ABC	OFL
10%	58,174	52,357	116,348
20%	58,174	46,539	116,348
30%	58,174	40,722	116,348
40%	58,174	34,904	116,348
50%	58,174	29,087	116,348
60%	58,174	23,270	116,348
70%	58,174	17,452	116,348
80%	58,174	11,635	116,348
90%	58,174	5,817	116,348

5 Summary of NMFS SAFE Team Recommendations to the SSC for the 2025 CI EEZ Stock Assessment cycle.

Recommended 2025 Tiers, SDC, and buffer to reduce the preseason OFL to the ABC.

Tables 1-2 contain 2025 NMFS SAFE Team recommendations for stock tiers, SDC, and buffers to reduce the preseason OFL to the ABC.

Recommended 2024 Preliminary Postseason Stock Status in Relation to SDC

Table 3 contains preliminary 2024 postseason stock status in relation to SDC. Values in Table 3 are likely to be updated in future years as estimates of harvests and escapement become finalized. For example, this 2025 SAFE report estimated 2025 sportfish and personal use harvests because they were not available in time for this report.

Recommended 2024 Preliminary Postseason Harvests in Relation to Final 2024 Harvest Specifications

Table 4 contains preliminary 2024 postseason harvests for each stock in comparison to the 2024 final harvest specifications.

Additional Recommendations

- The NMFS SAFE Team recommends that, for Tier 1 stocks, the lower bound of the State's spawning escapement goals represents S_{MSY} and is the appropriate value to calculate SDC. Significant discussion of this topic can be found in the NMFS SAFE Team responses to 2024 SSC recommendations (Section 2.1.1). The NMFS SAFE Team recommends that the State's goal ranges represent the highest probability of achieving MSY over the longer term in compliance with National Standard 1 Guidelines.
- The NMFS SAFE Team recommends research projects to measure spawning escapements of salmon harvested in the CI EEZ salmon fishery. Given that the number of escapement monitoring projects has declined in recent years, which restricts the ability to assess SDC, increasing the number of monitored systems would greatly assist the assessment of salmon stocks harvested in the CI EEZ.
- The NMFS SAFE Team recommends a genetic mixed stock analysis study of salmon caught in the CI EEZ fishery. At present, the origin of Chinook salmon harvested in the EEZ and the proportion of sockeye attributed to KNSOCK, KASOCK, and AOSOCK are unknown. These data would allow for more accurate Tier 1 SDC and recommended AOSOCK and ACHIN buffers.
- The NMFS SAFE Team recommends an assessment of alternative fishery methods for the CI EEZ (e.g., purse seines) that could be used to harvest available yield for stocks with a high abundance while enabling species that are in a low state of abundant to be released.
- The NMFS SAFE Team recommends using the AR approach to predict run size and State harvest levels for Tier 1 stocks, and the resulting buffers to account for scientific uncertainty in reducing the preseason OFL to the recommended ABC
- The NMFS SAFE Team recommends to the SSC that 2024 postseason spawning escapements for the most recent generation do not represent a complete and reliable index of abundance for COHO and that this stock is not in an overfished condition. The NMFS SAFE Team considered several options listed below for how to assess the overfished status for this and other stocks when spawning escapement estimates are incomplete, as well as the preferred recommendation to the SSC in the following list:

1. (Preferred recommendations) Basing MSST (overfished) and the associated estimates of spawning escapements only on indicator stocks for which there is considered to be a complete and reliable history of monitoring;
2. Use modeling approaches to estimate missing escapements for the indicator stocks;
3. assume that unmonitored years had escapements that were achieved;
4. similar to aggregate chum and pink salmon stock complexes, recognize a lack of reliable information to determine an overfished status;
5. an SSC recommendation not considered by the NMFS SAFE Team.

In considering whether COHO is approaching an overfished condition, it is the opinion of the NMFS SAFE Team that such a recommendation could be considered in the future if the cumulative spawning escapements for the indicator stocks was less than half of the sum of the lower bound of the recommended spawning escapement targets for at least two consecutive years (two years is half the generation time of coho salmon). However, to reiterate, it is the opinion of the NMFS SAFE Team that before considering such a recommendation, that the NMFS SAFE Team and the SSC should also consider the extent to which the spawning escapement data represents a complete and reliable index of abundance for the indicator stocks.

- The NMFS SAFE Team recommends prioritizing future research to better characterize the abundance, timing, spatial distribution, and genetic stock composition of the coho salmon harvested in the CI EEZ fishery (Willette et al. 2003).
- As with other stocks for which there is a paucity of available information, the NMFS SAFE Team recommends research to estimate overall escapement and total run size for CHUM

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Appendix A. Preliminary Draft COHO Risk Table

Following the 2024 SSC recommendation that the NMFS SAFE Team develop risk tables for future SAFE reports as a means to organize and track uncertainty not captured in the assessment, a preliminary draft risk table for the Aggregate coho salmon stock complex is presented below. The NMFS SAFE team used the 2024 SAFE report for the groundfish resources of the Gulf of Alaska risk table considerations as a template and request guidance and recommendations on future iterations of CI Salmon SAFE risk tables for the 2026 Salmon SAFE. Future risk tables will be constructed for all seven CI salmon stocks and used to inform NMFS SAFE Team ABC recommendations to the SSC.

Table 29. Aggregate coho salmon stock complex risk table assessment.

Assessment-related	*Population dynamics*	*Ecosystem*	*Fishery-informed stock*
Level 2 -Increased Concern	Level 3 – Extreme Concern	Level 2 – Increased Concern	Level 3 - Extreme Concern

Assessment Considerations

Recommended **Level 2 concern:** The Aggregate coho salmon stock complex is managed as a Tier 3 stock, using estimated historic EEZ catch to generate SDC. The Tier 3 method allows for a range of buffers from 0.1 – 0.9, allowing assessment authors to recommend buffers that adequately account for uncertainty associated with SDC determination methods. Given the uncertainty associated with the accuracy and precision of historic harvest estimates, an elevated concern is warranted when setting SDC and harvest specifications until EEZ harvest is more accurately known.

Population Dynamics

Recommended **Level 3 concern.** Further details on coho salmon population dynamics in UCI are sparse. The life history of coho salmon is well known, however, total run size for the Aggregate coho salmon stock complex in UCI is not known. Escapement monitoring in UCI is sparse, with the Deshka and Little Susitna River ADF&G monitoring projects (via weirs) and annual harvest representing the only index of the Aggregate coho salmon stock complex population dynamics. The 2024 coho catch in UCI was 86% below the 20-year average. However, given that coho salmon generally spend 1 year in the marine environment before returning to spawn, 2024 catch may not be indicative of overall population dynamics and run size magnitude in future years.

Ecosystem

Recommended Level 2 concern. The most recent data available suggest an ecosystem risk Level 2 – Major Concern: “Multiple indicators showing consistent adverse signals a) across the same trophic level, and/or b) up or down trophic levels (i.e., predators and prey of stock)”. This elevated risk score is informed by warmer ocean temperatures in 2024, potential for increased adult competition with pink salmon in 2025, and the ongoing reduced marine freshwater and marine survival of coho as monitored in SE Alaska. Preliminary coho ocean age-0 marine survival (percentage of ocean age-0 coho per smolt (escapement only) by smolt year) in Auke Bay, SE Alaska, was below average for a 2nd year (Vulstek et al. 2024). Preliminary marine survival indices of 2024 coho salmon (ocean age-0 and age-1 harvest plus escapement) in Auke Bay continued a 10 year below-average trend (Vulstek et al. 2024). The mechanisms driving continued low coho survival may include juvenile growth rate and size, smolt age, and smolt ocean entry timing. Coho salmon returning in 2025 were in freshwater in the fall of 2022 through spring 2024, the nearshore marine environment in spring 2024, and the central Gulf of Alaska 2024-2025. The freshwater conditions for early stage coho are not represented in this risk table. This risk table section is informed by cited contributions to the 2023 and 2024 Gulf of Alaska Ecosystem Status Report (Ferriss 2024).

Environmental Processes: The central GOA sea surface temperature was warmer than average in the winter through early spring. The 2023/2024 El Niño event brought warmer surface temperatures to the GOA in the winter, but it was moderate and short-lived, resulting in approximately average surface temperatures by spring. Despite warmer than average surface temperatures averaged across the western GOA shelf in January (5.1°C, satellite-derived, (Lemagie and Callahan 2024)), NOAA's January acoustic survey in Shelikof Str. observed cooler temperatures in the top 10m (3.2°C) and showed no evidence of warmth at depth (4°C at 100m, (Jones et al. 2024)). Previous warm years in the Gulf of Alaska (2014-2016 and 2019) have resulted in poor coho salmon returns. Temperature thresholds for dynamics leading to these poor returns are now well known, and cannot be used to interpret the impacts of the warmer 2024 temperatures. However, from an ecosystem perspective, 2024 conditions in the GOA were not warm enough to show strong responses in the foodweb. Upcoming 2025 winter and spring surface temperatures are predicted to be cooler than average, in alignment with weak La Niña conditions (Lemagie and Bell 2024). The Pacific Decadal Oscillation and the North Pacific Gyre Oscillation continue a multi-year negative trend, which historically was associated with reduced survival of Alaska salmon, however these relationships should be questioned as they have weakened since 1988, and then became inverse from 2014-2019 (Litzow et al. 2020).

Prey: Prey for juvenile coho salmon in the marine environment was approximately average in 2024. There is some evidence of increased age-0 pollock in 2024 and low abundance of age-1 pollock in the western GOA (Monnahan et al. 2024). Forage fish were available in aggregate, in 2024. Capelin continues to rebound in the GOA (Arimitsu et al. 2024; McGowan et al. 2024), and herring continue to have relatively elevated populations supported by the strong 2016- and 2020-year classes (Hebert and Dressel 2024). Forage species that are relatively lower in abundance include sandlance. The reproductive success of piscivorous, diving seabirds (with an overlapping prey base with coho salmon), was generally above average across the GOA (Drummond and Renner 2024). An important exception was reproductive failures of black-legged kittiwakes on Amatuli Island, the colony monitored closest to Cook Inlet. The broad positive trends in forage fish availability were potentially less applicable near the mouth of Cook Inlet. The status of deepwater squids (e.g., armhook squid, *Berryteuthis anonychus*) as prey for adult coho in the winter is unknown.

Predators and Competitors: Predation pressure from key predators in the marine environment on juveniles (seals) and adults (killer whales and salmon sharks) is expected to not have changed in recent years, although these populations are not well monitored. Competitors for marine juvenile and adult coho salmon include hatchery-released pink and chum salmon. In Cook Inlet, though the even-year broodline is dominant, adult coho salmon had lower competition with pink salmon for deepwater squid in 2024, due to the unusually low pink salmon returns. Competition for returning coho salmon in 2025 is expected to be similar or greater due to the more dominant, or larger, odd year returns of pink salmon in Prince William Sound and other areas around the GOA , but the less- dominant CI pinks salmon broodline (Shaul and Geiger 2016).

Fishery Performance

Recommended **Level 3 concern.** Though coho salmon are not directly targeted in the CI EEZ gillnet fishery, they are easily caught in sockeye salmon gillnets due to their similar size to sockeye salmon and the timing of their return migration through the CI EEZ, with the largest portion of the 2024 EEZ catch occurring on July 25 (Figure 21). Additionally, the total UCI and CI EEZ harvest were 86% and 91%, respectively, below the 20-year average catch in those areas. However, the 2024 CI EEZ catch is the first year that catch is known, as opposed to estimated in the rest of the timeseries, and future years of known EEZ catch will provide a better understanding of coho catch in the CI EEZ fishery.

Risk table considerations/levels of concern				
	Assessment-related	*Population dynamics*	*Ecosystem*	*Fishery-informed stock*
Level 1: Normal	Typical to moderately increased uncertainty/minor unresolved issues in assessment.	Stock population dynamics (e.g., recruitment, growth, natural mortality) are typical for the stock and recent trends are within normal range.	No apparent ecosystem concerns related to biological status (e.g., environment, prey, competition, predation), or minor concerns with uncertain impacts on the stock.	No apparent concerns related to biological status (e.g., stock abundance, distribution, fish condition), or few minor concerns with uncertain impacts on the stock.
Level 2: Increased concern	Substantially increased assessment uncertainty/ unresolved issues, such as residual patterns and substantial retrospective patterns, especially positive ones.	Stock population dynamics (e.g., recruitment, growth, natural mortality) are unusual; trends increasing or decreasing faster than has been seen recently, or patterns are atypical.	Indicator(s) with adverse signals related to biological status (e.g., environment, prey, competition, predation).	Several indicators with adverse signals related to biological status (e.g., stock abundance, distribution, fish condition).
Level 3: Extreme Concern	Severe assessment problems; very poor fits to important data; high level of uncertainty; very strong retrospective patterns, especially positive ones.	Stock population dynamics (e.g., recruitment, growth, natural mortality) are extremely unusual; very rapid changes in trends, or highly atypical patterns compared to previous patterns.	Indicator(s) showing a combined frequency (low/high) and magnitude(low/high) to cause severe adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels (i.e., predators and prey of the stock) that are likely to impact the stock.	Multiple indicators with strong adverse signals related to biological status (e.g., stock abundance, distribution, fish condition), a) across different sectors, and/or b) different gear types.

Appendix B. Bayesian Approach (Tier 1, Option 3)

This appendix provides the SSC with a Bayesian modeling approach as an alternative Tier 1 method for calculating a preseason OFL and the corresponding ABC. The development of this approach stems from a request by the SSC to incorporate the probability of over-forecasting when calculating and selecting Tier 1 buffers to reduce the preseason OFL to the ABC. This proposed Bayesian approach is similar to the 2024 Tier 1 method of calculating a preseason OFL, except that AR forecasts are fit using RStan (Stan Development Team 2024), a Bayesian probabilistic programming language. The key difference is that, with the Bayesian approach, the preseason run size forecast is fit using an AR1 model, and the preseason forecasted State harvest ($\hat{F}_{state}$) is fit using a moving average (KASOCK) or white noise model (KNSOCK), which are the auto.arima function selected models (selected using AIC)(Hyndman et al. 2024) for the current year. A range of buffers to reduce the OFL_{PRE} to ABC from 0.1 – 0.9 can be applied to predictions for each year in retrospective one-step-ahead testing for 2015 – 2024. Retrospective testing results of different ABC amounts will be used to calculate the probability of over-forecasting the preseason OFL (based on forecasts for total run size and the harvest rate in non-EEZ fisheries). The benefit of this proposed Bayesian approach is that uncertainty associated with the preseason run size and State harvest forecasts are directly incorporated when calculating the OFL_{PRE} by using the posterior distributions of probable run sizes ($\hat{R}_y$) and State harvest rates ($\hat{F}_{state,y}$) in year y, as:

$$p(\widehat{OFL}_y) = p(\hat{R}_y) - G_y - [p(\hat{F}_{state,y}) * p(\hat{R}_y)]$$

resulting in a distribution of OFL_{PRE} values and their associated relative probabilities of occurring given the uncertainty associated with the aforementioned forecasts.

Run Size Preseason Forecast

An AR1 model was fit to the natural log of historic total run sizes as,

$$\ln(\hat{R}_t) = \alpha + \beta \ln(R_{t-1})$$

$$\ln(R_t) \sim normal(\hat{R}_y, \sigma)$$

Where R_t is the total run size in year t, $\hat{R}_t$ is the predicted run size, α is the intercept, β is the slope, and σ is the log-normal standard error. Vague priors were specified as:

$$\alpha \sim normal(0,10^{10})$$

$$\beta \sim (0, 10^{10})$$

$$\sigma \sim normal(0,5)[0, \infty).$$

State Harvest (F_{state}) Preseason Forecast

1. Moving Average Model (KASOCK):

A moving average model (AR(0,1,1)) was fit to historic State harvest rates as,

$$logit(\hat{F}_{state,t}) = \mu + logit(F_{state,t-1}) + \theta * \epsilon_{t-1}$$

$$\epsilon_t = logit(F_{state,t}) - logit(\hat{F}_{state,t})$$

$$\epsilon_t \sim normal(0, \sigma^f)$$

$$\epsilon_{t=1} = logit(F_{hist}) - \mu$$

Where F_t is the State harvest in year t, $\hat{F}_t$ is the predicted State harvest rate, μ is a constant describing the overall State harvest rate estimated mean, θ describes the weight assigned to the lagged error term ϵ, and ϵ is the lagged prediction difference. Vague priors were specified as:

$$\mu \sim normal(0,10)$$

$$\theta \sim normal(0,2)$$

$$\sigma^f \sim normal(0,5).$$

2. White Noise with zero mean Model (KNSOCK):

For the KNSOCK stock, a white noise model was fit as,

$$\ln(\hat{R}_t) = \alpha$$

$$\ln(F_t) \sim normal(\hat{F}_t, \sigma)$$

where α is the parameter describing the mean State harvest rate (F_{State}), $\hat{F}_t$ is the predicted State harvest rate at time t and σ^f is the lognormal standard deviation. Vague priors were specified as:

$$\alpha \sim normal(0,100)$$

$$\sigma \sim normal(0,5).$$

Preseason predicted OFL

The OFL_{PRE} was calculated using the posterior predictive distribution of the preseason forecasted total run size and State harvest proportion as:

$$\widehat{OFL}_{PRE,t} = \hat{R}_t - G - (\hat{R}_t * \hat{F}_{State,t})$$

resulting in a distribution of probable OFL values that explicitly incorporate the uncertainty associated with each forecast. The point estimate for the OFL_{PRE} was calculated as the median of the posterior predictive distribution of OFL values.

Buffer to reduce OFL to ABC

A range of buffers are proposed and applied to the OFL. The resulting ABCs are presented with the associated probability of exceeding the ABC as calculated in the preceding 10 years.

To calculate the probability of over-forecasting, models were fit to a time series (1999 – 2024) of State harvest rates and observed run sizes using a one-step-ahead method for years (2015 – 2024). The posterior run size and State harvest rate were used to generate a posterior distribution of OFL_{PRE} values as described above, and the median for each year was multiplied by the range of buffers (0.1 – 0.9) to generate candidate ABC values. Next, the resulting ABC values were compared to the observed OFLs (OFL_{OBS}) in each year, and the probability of overforecasting was calculated as

$$P(Overforecasting\ ABC) = \frac{\sum Y_{ABC>OFL_{OBS}}}{N_{years}},$$

where $Y_{ABC>OFL_{OBS}}$ are the years where the ABC is greater than the realized OFL and N is the total number of years (N = 10) that were retrospectively predicted.

The resulting probabilities associated with a range of candidate buffers for the 2025 KNSOCK and KASOCK ABC are presented in Table 30Table 31.

2025 Results

To generate forecasted run size and the State harvest rate, models were fit using Rstan. An AR1 model was fit to historic run size (1999 - 2024) for both Kenai River late run sockeye salmon and Kasilof sockeye salmon stocks. A moving average and white noise model were fit to the observed State harvest rates and the model with the lowest Mean Absolute Percent Error (MAPE) was selected to generate the stock-specific preseason 2025 State harvest rate.

Kenai River Late Run Sockeye Salmon

The 2025 forecasted run size point estimate (median of the posterior predictive distribution) for KNSOCK is 3,475,121(95% Credible Interval = [1.7M – 7.1M]) fish, and the forecasted State harvest rate is 50.8% (95% Credible Interval = [32.8% - 68.6%]). The resulting OFL_{PRE} (calculated using $S_{MSY\text{-}POINT}$) point estimate (median of the posterior predictive distribution) is 471,564 fish.

Kasilof River Sockeye Salmon

The 2025 forecasted run size point estimate (median of the posterior predictive distribution) for KASOCK is 1,348,423 (95% Credible Interval = [647K – 2.9M]) fish, and the forecasted State harvest rate is 36.3% (95% Credible Interval = [26.2% - 48.4%]). The resulting OFL_{PRE} (calculated using $S_{MSY\text{-}POINT}$) point estimate (median of the posterior predictive distribution) is 628,188 fish.

Table 30. A comparison on frequentist and Bayesian approaches for forecasting run size, the State harvest rate, and potential yield (OFL_{PRE}) for Tier 1 stocks of sockeye salmon harvested in the CI EEZ.

Stock	Method	Runsize (000's)	State Harvest (000's)	OFL_{PRE} (000's)
Kenai	Frequentist	3,454	50%	515
	Bayesian	3,475	50.8%	472
Kasilof	Frequentist	1,313	32.5%	664
	Bayesian	1,348	36.3%	628

Table 31. A range of proposed buffers to reduce the OFL to ABC and their associated probabilities of over-forecasting for Kenai and Kasilof River sockeye salmon stocks.

Stock	ABC Buffer (%)	$P(ABC > OFL_{OBS})$(%)
Kenai	10	40
	20	40
	30	40
	40	20
	50	20
	60	20
	70	20
	80	20
	90	10
Kasilof	10	40
	20	40
	30	40
	40	20
	50	20
	60	20
	70	20
	80	20
	90	10

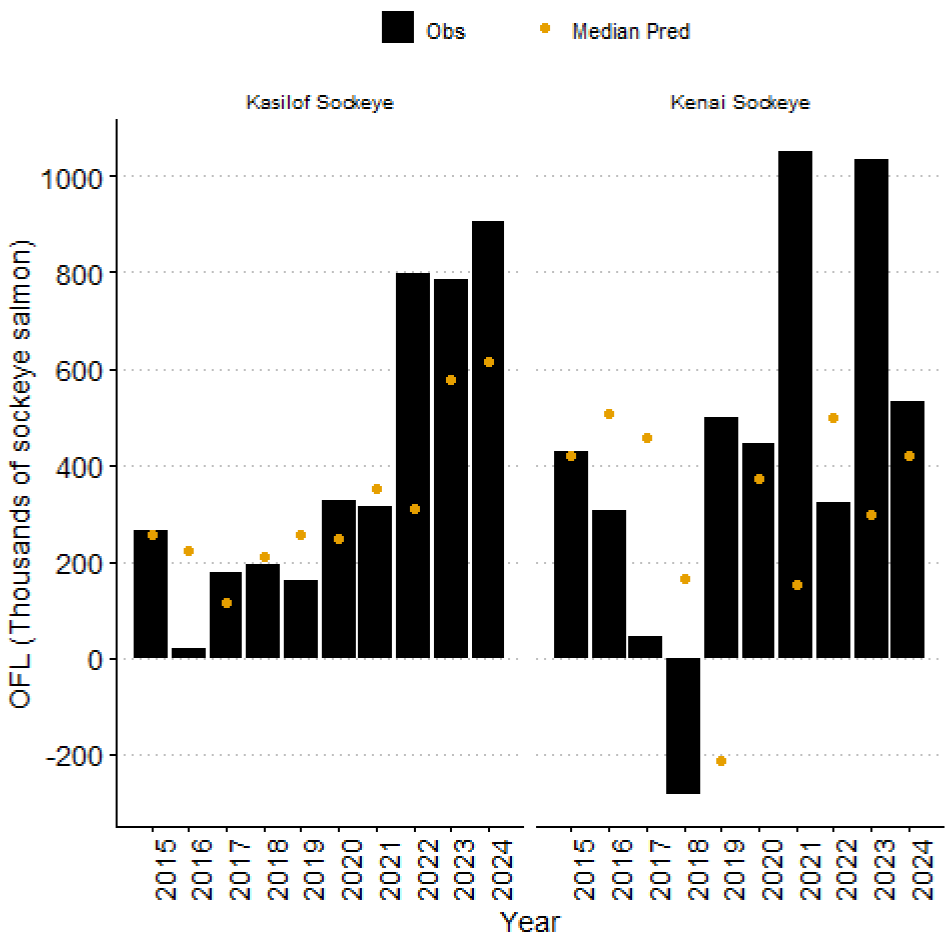

Figure 28. Retrospective out of sample OFL predictions for Kenai and Kasilof River sockeye salmon stocks. One-step ahead forecasting for years 2015 – 2024. Forecast models (F_{STATE} and $\hat{R}$) were fit to years 1999 to the year prior to the year the prediction was made.

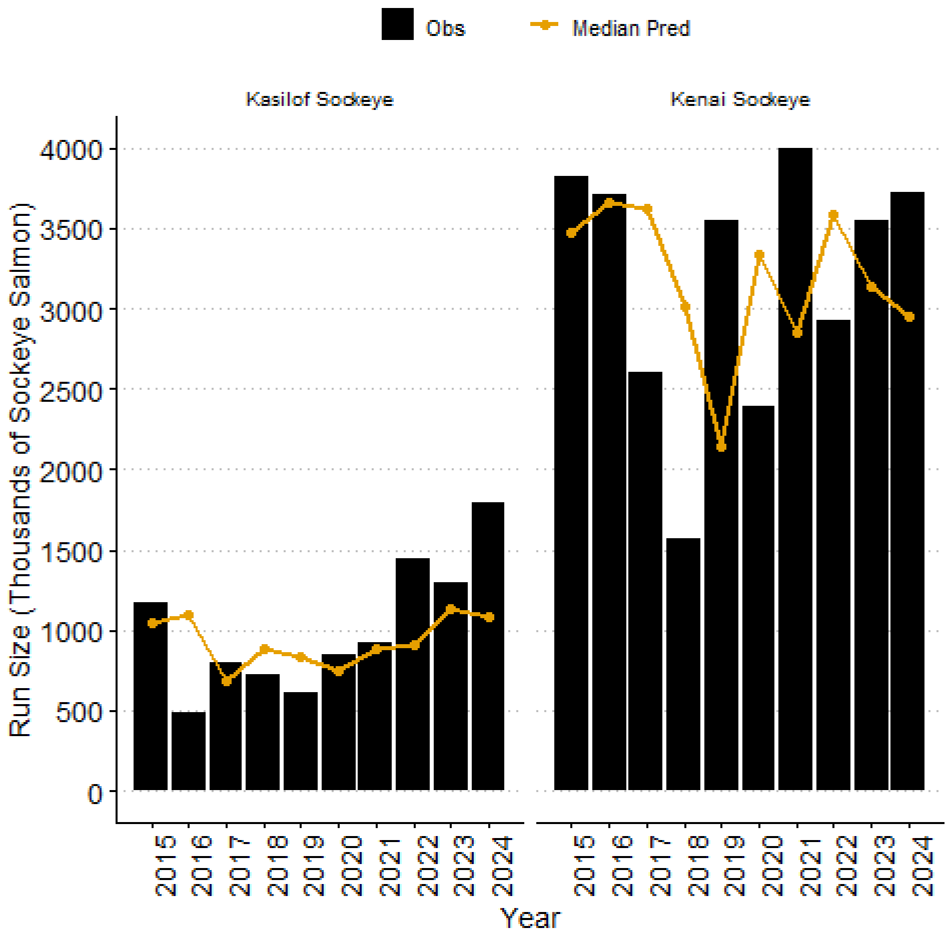

Figure 29. Retrospective out of sample run size predictions for Kenai and Kasilof River sockeye salmon stocks. One-step ahead forecasting for years 2015 – 2024. Run size model was fit to years 1999 to the year prior to the year the prediction was made.

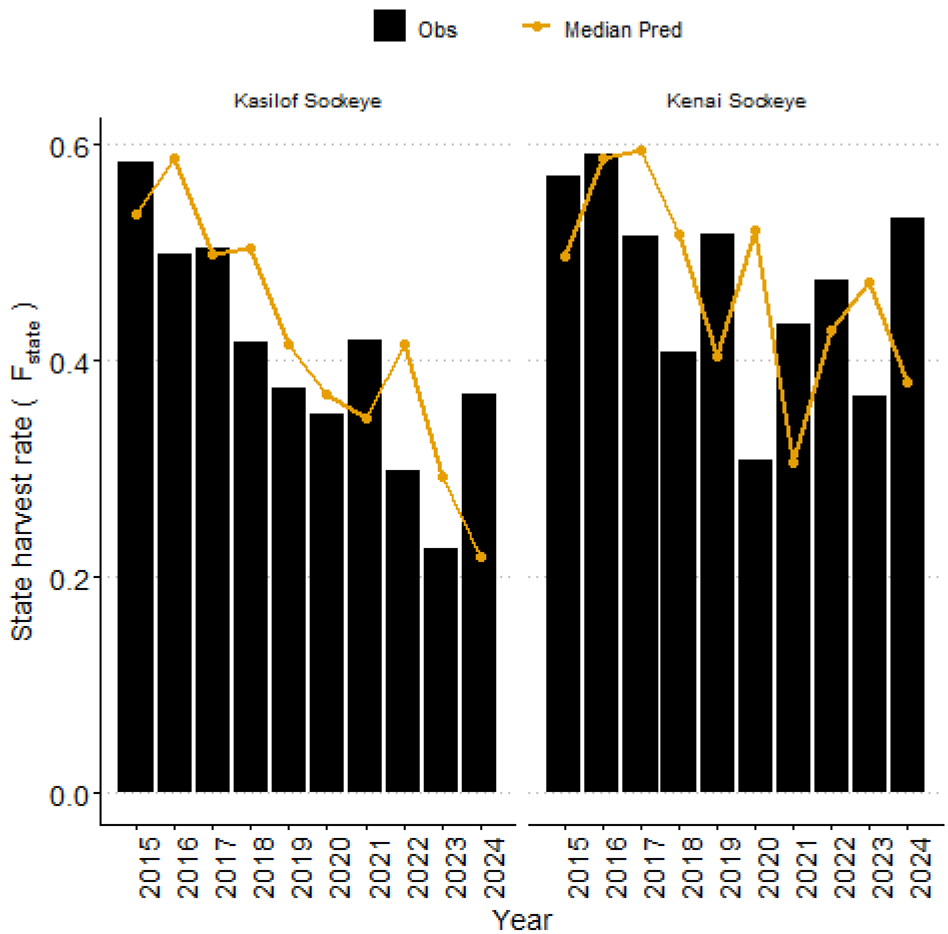

Figure 30. Retrospective out of sample State harvest rate predictions for Kenai and Kasilof River sockeye salmon stocks. One-step ahead forecasting for years 2015 – 2024. State harvest rate model was fit to years 1999 to the year prior to the year the prediction was made.

Appendix C. Equations from amendment 16 to the Salmon FMP

Tier 1: Salmon stocks with escapement goals and stock-specific harvest estimates

Each year, salmon stocks that have escapement goals and stock-specific harvest and escapement estimates would be considered for placement in Tier 1.

The assessment authors and SSC would identify the Tier 1 stocks each year during the annual harvest specification process.

For the Tier 1 stocks, the following calculations would be conducted each year to determine the status of the managed salmon stocks and set the appropriate biological reference points:

Overfishing

Overfishing occurs whenever a stock or stock complex is subjected to a level of fishing mortality or total catch that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. The realized fishing mortality rate in the EEZ for a stock (F_{EEZ}) is expressed as an exploitation rate (harvest/total run size), which is calculated for the stock over one generation (the average length of time between when a salmon egg is fertilized and when it spawns as an adult) in years (*T*), weighted as informed by available data, where *t* = run year, *R* = annual run size of a stock, and C_{EEZ} = annual EEZ catch of a stock in year *t*:

(1) $F_{EEZ,t} = \frac{\sum_{i=t-T+1}^{t} C_{EEZ,i}}{\sum_{i=t-T+1}^{t} R_i}$

The level of fishing mortality in the EEZ above which overfishing occurs (MFMT) for a stock is based on an exploitation rate assessed over one generation and is defined as:

(2) $MFMT_t = \frac{\sum_{i=t-T+1}^{t} Y_{EEZ,i}}{\sum_{i=t-T+1}^{t} R_i}$; where

(3) $Y_{EEZ,i} = max\left(0, R_t - G_t - C_{state,t}\right)$

and $C_{state,t}$ is the harvest that occurred in state waters in year *t* and Y_{EEZ} is the potential yield in the EEZ and *G* = escapement goal or target for a stock. The lower bound of the established escapement goal range is the default used in this tier system; however, NMFS, or the SSC may recommend a different value during the annual stock status determination process based on the best scientific information available (e.g., the point estimate of the spawners necessary to result in maximum sustainable yield in future years, $S_{MSY\text{-}POINT}$). NMFS or the SSC may also recommend additional buffers to account for uncertainty in harvests and escapement estimates. Due to uncertainty inherent to management, the realized yields are unlikely to be equal to the potential yields.

Should F_{EEZ} exceed the MFMT in any year, it will be determined that a stock is subject to overfishing; this definition corresponds to the **F_{OFL} control rule**.

MFMT for a stock would be assessed postseason each year with the most current *T* years of data.

Overfished

Should a stock's realized spawning escapements summed across a generation fall below the MSST in any year, the stock would be declared overfished. The MSST is defined as one half of the sum of the stock's spawning escapement goal summed across a generation:

(4) $MSST_t = \frac{\sum_{i=t-T+1}^{t} G_i}{2}$, evaluated by comparing $\sum_{i=t-T+1}^{t} S_i$ with MSST, where S is spawning escapement in year *i*.

MSST for a stock would be assessed postseason each year with the most current *T* years of data used to estimate MSST and S. NMFS or the SSC may recommend buffers to account for uncertainty in escapement estimates or spawning escapement goals.

Overfishing Limit (OFL), Acceptable Biological Catch (ABC), and Annual Catch Limit (ACL)

Specification for OFL, ABC, and ACL will occur as follows:

The preseason estimates of MFMT would be calculated from the sum of potential yield in the EEZ from the previous T-1 years and the preseason estimate of potential yield in the EEZ based on the preseason forecast of run size, projected harvest in other fisheries, and the escapement goal or target in a given year, G_t using the following equation:

$$(5) \quad MFMT_{pre,t} = \frac{\sum_{i=t-T+1}^{t-1} Y_{EEZ,i} + \hat{Y}_{EEZ,t}}{\sum_{i=t-T+1}^{t-1} R_i + \hat{R}_{,t}}$$

where $\hat{Y}_{EEZ,t}$ is the preseason estimate of potential yield in the EEZ for year t used to establish annual harvest specifications and is calculated based on:

(6) $\hat{Y}_{EEZ,t} = max(0, \hat{R}_t - G_t - (\hat{F}_{state,t} * \hat{R}_t))$, where $\hat{R}_t$ is the predicted run size in year t based on a vetted preseason forecast method and $\hat{F}_{state,t}$ is the estimated harvest rate in State waters over the average generation time (T) for the species and stock, or, as recommended by the SSC, an estimated or modeled harvest rate.

The preseason estimates of F_{EEZ} ($\hat{F}_{EEZ}$) is the is calculated from the sum of actual harvests in the EEZ from the previous T-1 years and the preseason estimate of potential yield in the EEZ based on the preseason forecast of run size:

$$(7) \quad \hat{F}_{EEZ,pre,t} = \frac{\sum_{i=t-T+1}^{t-1} C_{EEZ,i} + \hat{Y}_{EEZ,t}}{\sum_{i=t-T+1}^{t-1} R_i + \hat{R}_{,t}}$$

The preseason OFL (OFL_{PRE}) would be equivalent to the estimate of potential yield for a stock as described in Equation 6.

The **ABC control rule**: ABC must be less than or equal to OFL. The SSC may recommend reducing ABC from OFL to account for scientific uncertainty, including uncertainty associated with the assessment of spawning escapement goals, forecasts, harvests, and other sources of uncertainty.

The ACL will be established equal to or less than the ABC.

Tier 2: Salmon stocks managed as a complex

Tier 2 stocks are salmon stocks managed as a complex, with specific salmon stocks designated as indicator stocks. An indicator stock is a stock for which sufficient data exists to allow for the development of measurable and objective SDC and can be used as a proxy to manage and evaluate data poor stocks within the stock complex. Further, an indicator stock is thought to be representative of the typical vulnerabilities of stocks within the stock complex. The assessment authors and SSC would identify the Tier 2 stocks each year during the annual harvest specification process. In general, management of Tier 2 stocks is based on aggregate abundance as previously described. Information on the individual indicator stock is used to inform management actions for the stock complex.

For the Tier 2 stocks, the following calculations would be conducted each year to determine the status of the salmon stocks and set the appropriate biological reference points.

Overfishing

The Tier 1 formulas for F and MFMT would be used for Tier 2 indicator stocks. Whenever estimates of F or MFMT, as defined under Tier 1, are unavailable for each stock in a stock complex managed under this FMP, a list of indicator salmon stocks for a given stock complex will be established.

Using the same definitions and criteria described under Tier 1, a determination that one or more indicator salmon stocks is subject to overfishing will constitute a determination that the respective stock complex is subject to overfishing, except as provided in the paragraph below.

Overfishing of one or more stocks in a stock complex may be permitted, and may not result in a determination that the entire stock complex is subject to overfishing, under the following conditions established under the National Standard 1 guidelines (50 CFR §600.310(l)):

a) it is demonstrated by analysis that such action will result in long-term net benefits to the Nation;
b) it is demonstrated by analysis that mitigating measures have been considered and that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristics in a manner such that no overfishing would occur; and
c) the resulting rate or level of fishing mortality will not cause any stock or stock complex to fall below its MSST more than 50% of the time in the long term.

Overfished

The MSST for a stock complex is equal to one-half the sum of the escapement goals (*G*) for the indicator salmon stocks from the most recent *T* years.

Should a stock complex's cumulative escapements for a generation fall below the MSST in any year, it will be determined that the stock complex is overfished.

Specification for OFL, ABC, and ACL will occur as follows:

The OFL, ACL, and ABC will be set for the indicator stock using the Tier 1 methodology.

Tier 3: Salmon stocks with no reliable estimates of escapement

Tier 3 salmon stocks or stock complexes have no reliable estimates of escapement or total run size, therefore OFL and ABC are based on catch history. Tier 3 stocks may have escapement goals, but, relative to Tier 2 stocks, the goals and associated inseason assessment of escapement represent a coarse and/or unknown index of abundance rather than a true number of fish. The assessment author and SSC would identify the Tier 3 stocks each year during the annual harvest specification process.

For Tier 3 stocks, the following calculations would be conducted each year to determine the status of the salmon stocks and set the appropriate biological reference points.

Overfishing

For Tier 3 stocks or stock complexes, should the sum of harvest for the most recent generation (T years) be greater than the OFL, then it will be determined that the stock is subject to overfishing. Overfishing for Tier 3 stocks is assessed postseason after stock-specific harvest data become available; NMFS or the SSC may recommend additional buffers to account for uncertainty of estimates.

Overfished

For Tier 3 stocks or stock complexes with escapement goals for suitable indicator stock(s), MSST is calculated the same as for Tier 1 stocks. Should a stock or stock complex's cumulative escapements for a generation fall below the MSST in any year, it will be determined that the stock complex is overfished. When calculating MSST and comparing spawning escapements summed across the most recent generation, NMFS or the SSC may recommend buffers to account for uncertainty in estimates.

For Tier 3 stocks or stock complexes without escapement goals, it is not possible to calculate MSST.

Specification for OFL, ABC, and ACL will occur as follows:

OFL = the largest cumulative annual EEZ catch summed across a generation time (*T* years) in the timeseries under consideration (rolling sum). Postseason, this value of OFL will be the basis for assessing if overfishing of the stock has occurred.

The preseason OFL (OFL_{PRE}) is the basis for defining harvest specifications and is the single season manifestation of the OFL. Unless another value is recommended by the SSC, OFL_{PRE} is equal to the largest average annual catch across a generation in the timeseries under consideration.

ABC = the OFL_{PRE} reduced by a buffer to account for uncertainty. As recommended by the SSC, the ABC could be set higher or lower by applying a more liberal or conservative buffer to the OFL to account for less or greater uncertainty. Potential sources of uncertainty could include but are not limited to: uncertainty associated with the achievement of escapement targets; uncertainty associated with whether the OFL, ABC, or ACL will be achieved or exceeded; uncertainty associated with the level of harvest in fisheries outside the EEZ; uncertainty associated with interannual run size; uncertainty associated with run timing; uncertainty associated with inseason metrics of run size or timing; other sources of uncertainty identified during the annual stock assessment process. ABC would be set each year during the annual stock status determination process based on the best available information.

The ACL is equal to or less than ABC.

Appendix D. SSC Suggested Corrections from Dr. Andrew Munro

Overview

This appendix documents SSC member Dr. Andrew Munro's (ADF&G) suggested corrections to the 2025 Preliminary SAFE report, which was reviewed by the SSC during the 2025 February NPFMC meeting. Dr. Munro sent these suggested corrections to the NMFS SAFE Team on February 1, 2025 via email. The NMFS SAFE Team incorporated Dr. Munro's suggested edits in this Final 2025 Salmon SAFE report.

- the lower bounds of the escapement goals for Deshka and Little Su are wrong/mixed up in Table 24.

- Pg 94 / Table 24: Deshka has the current Little Su lower bound listed. The lower bound of Deshka for the 2019-2024 period is 10,200. The lower bound of Little Su for the 2020-2024 period is 9,200 (2019 is correct: 10,100). Given this, the MSST for 2019 should be 46,000 and for 2020-2024 it should be 38,800.

- Pg 87 Section 7.6.1 the above means the sum of the lower bounds in 2024 was 19,400 fish and MSST listed should be corrected to 38.8K

- Pg 88 Section 7.6.4 the escapement goal ranges are correct, but the summation of the lower bounds should be 19,400

- Table 23: MSST needs correcting to 38.8

- Also, on Table 24, where did the 3,168 escapement for 2022 Deshka come from? Was it the fish count page? Looking at the latest UCI EG report and the statewide EG report, 2022 Deshka coho escapement is listed as NA similar to 2021 and 2020, which also have counts of coho passage on the fish count page. Also, I believe the 2019 escapement estimate for Little Su should also be noted as being incomplete according to McKinley et al. 2024

- Pg 97 (7.7.2.2): It states 2004-2007 had the highest years of cumulative harvest and were used for calculating OFL and OFL_PRE, but I believe that should be 2013-2016 as indicated in Table 26.

- Pg 98 (7.7.4): OFL_PRE is said to be 97,506 in a couple of places, but I calculate the average of 390,030 as 97,508 (which is the value in the caption of Fig. 17). In addition, the ABC with at 20% buffer is said to be 82,882, but that is a 15% buffer. I believe it should be 78,006 (again this is the value in Fig 17 and further down in the text in the same section).

- Table 26: OFL_PRE is listed as 87.8, but I believe it should be 97.5

NMFS SAFE Team responses to SSC member Dr. Andrew Munro's suggested edits

NMFS SAFE Team responses to Dr. Andrew Munro's suggested edits are provided below in *italics*.

COHO:

Pg 94 / Table 24: Deshka has the current Little Su lower bound listed. The lower bound of Deshka for the 2019-2024 period is 10,200. The lower bound of Little Su for the 2020-2024 period is 9,200 (2019 is correct: 10,100). Given this, the MSST for 2019 should be 46,000 and for 2020-2024 it should be 38,800.

***NMFS SAFE Team Response**:* The tables in the presentation have been updated with the correct Little Su (2019 = 10,100, 2020-2024 =9,200) and Deshka (10,200) lower bounds and the corresponding MSST = 38,800. The MSST for 2019, by my calculation would be 40,600 (10,100+10,200)*4/2. The SAFE will be updated for the Final SAFE.

Pg 87 Section 7.6.1 the above means the sum of the lower bounds in 2024 was 19,400 fish and MSST listed should be corrected to 38.8K

Pg 88 Section 7.6.4 the escapement goal ranges are correct, but the summation of the lower bounds should be 19,400

Table 23: MSST needs correcting to 38.8

***NMFS SAFE Team Response**: These edits were made in the Final SAFE.*

Also, on Table 24, where did the 3,168 escapement for 2022 Deshka come from? Was it the fish count page? Looking at the latest UCI EG report and the statewide EG report, 2022 Deshka coho escapement is listed as NA similar to 2021 and 2020, which also have counts of coho passage on the fish count page. Also, I believe the 2019 escapement estimate for Little Su should also be noted as being incomplete according to McKinley et al. 2024

***NMFS SAFE Team Response**: The 3,168 came from the 2022 Season Summary (https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1447206643.pdf). We added a note in the presentation about 2019 escapement as being incomplete and will add to the Final SAFE as well.*

CHUM:

Pg 97 (7.7.2.2): It states 2004-2007 had the highest years of cumulative harvest and were used for calculating OFL and OFL_PRE, but I believe that should be 2013-2016 as indicated in Table 26.

***NMFS SAFE Team Response**: We changed this typo in the Final SAFE.*

Pg 98 (7.7.4): OFL_PRE is said to be 97,506 in a couple of places, but I calculate the average of 390,030 as 97,508 (which is the value in the caption of Fig. 17). In addition, the ABC with at 20% buffer is said to be 82,882, but that is a 15% buffer. I believe it should be 78,006 (again this is the value in Fig 17 and further down in the text in the same section).

NMFS SAFE Team Response*: We changed the OFLPRE typo to 97508 as suggested and the incorrect in-text ABC to 78,006 in the Final SAFE.*

Table 26:

OFL_PRE is listed as 87.8, but I believe it should be 97.5

NMFS SAFE Team Response*: We corrected this in the Final SAFE.*

Appendix E. SSC Comments from February 2025 Council Meeting

SCIENTIFIC AND STATISTICAL COMMITTEE
DRAFT REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
February 3rd – 5th, 2025

The SSC met from February 3rd – 5th, 2025 in Anchorage, AK. Members present in Anchorage were:

Franz Mueter, Co-Chair *University of Alaska Fairbanks*	Jason Gasper – Co-Chair *NOAA Fisheries—AKRO*	Ian Stewart – Co-Chair *Intl. Pacific Halibut Commission*
Alison Whitman, Vice Chair *Oregon Dept. of Fish and Wildlife*	Chris Anderson *University of Washington*	Fabio Caltabellotta *Washington Dept. of Fish and Wildlife*
Curry Cunningham *University of Alaska Fairbanks*	Martin Dorn *University of Washington*	Mike Downs *Wislow Research*
Robert Foy *NOAA Fisheries—AFSC*	Dana Hanselman *NOAA Fisheries—AFSC*	Brad Harris *Alaska Pacific University*
Kailin Kroetz *Arizona State University*	Andrew Munro *Alaska Dept. of Fish and Game*	Chris Siddon *Alaska Dept. of Fish and Game*
Patrick Sullivan *Cornell University*	Robert Suryan *NOAA Fisheries—AFSC*	Sarah Wise *NOAA Fisheries—AFSC*

SSC members who were absent:

Sherri Dressel, Co-Chair *Alaska Dept. of Fish and Game*	Jennifer Burns *Texas Tech University*

SSC Election of Officers

The SSC re-elected Sherri Dressel (ADF&G) and elected Jason Gasper (NOAA-AKRO) and Ian Stewart (IPHC) as co-chairs for 2025. The SSC also re-elected Alison Whitman (ODFW) to serve as vice chair. Dr. Gasper will chair the April meeting, Dr. Dressel the June and December meetings, and Dr. Stewart the October meeting. Former co-chair Dr. Franz Mueter (University of Alaska Fairbanks) is serving as co-chair at this February 2025 meeting due to unforeseen circumstances. The SSC expresses its sincere thanks for Dr. Mueter's leadership as co-chair since 2022.

SSC Administrative Discussion

The SSC extends a warm welcome to new member Sarah Wise (NOAA-AFSC). Jennifer Burns (Texas Tech University) will be starting on the SSC in April. The SSC is appreciative to the Council for their appointments.

Diana Evans (NPFMC) provided a summary of the NPFMC general code of conduct, an overview of the agenda items at this February 2025 meeting, and reviewed guidelines for oral public testimony, emphasizing that the SSC focuses on scientific evaluation. Ms. Evans also noted the April meeting in Anchorage, and that travel arrangements for the June NPFMC meeting will need to be completed soon. Staff will send out an email to SSC members with directions this week.

General Comments

Process for Reviewing Revised Analyses

For items that the SSC has previously reviewed and in instances where there is limited time for presentations, the SSC supports focusing on responses to SSC comments, additions and key revisions. The SSC notes that there could be efficiency gains and potential improvement to public and SSC comments if a brief overview of the various analyses and components of the reports were summarized and included in the executive summaries of applicable agenda items.

Methodology for Socio-economic Evaluation

The SSC notes the diversity of potential benefits associated with fisheries, many of which are best characterized using qualitative approaches. The SSC encourages the use of social indicators and human well-being frameworks that are well established in social science literature to better understand the suite and magnitude of social, ecological, economic, and cultural benefits related to issues like subsistence harvest of salmon. These frameworks would enable the categorization of impacts from certain management actions and explore the scope of those impacts for fisheries and fishing communities (e.g., Leong et al. 2024[1]). Applying such frameworks in relation to specific regions and issues and the impacts of management programs, amendments or regulatory actions is valuable to identifying metrics which can be used to monitor and evaluate outcomes. This could include tables, figures, or dashboards that summarize various types of benefits and costs.

Local Knowledge, Traditional Knowledge, and Subsistence (LKTKS)

The SSC notes that how to most effectively apply LKTKS within the Council process is complex and evolving. **The SSC supports the inclusion of LKTKS in Council documents** and notes that the efforts related to inclusion of LKTKS information under agenda item C2 at this February 2025 meeting represent concrete progress toward the larger goal of providing these types of information for consideration and use in Council decision making processes on a regular basis.

C1 2025 Preliminary Salmon SAFE of the Cook Inlet EEZ

The SSC reviewed and received a presentation on the 2025 SAFE Report for the Salmon Fisheries of the Cook Inlet Exclusive Economic Zone (EEZ) from Diana Stram (NPFMC), Richard Brenner (NFMS-AKRO) and Aaron Lambert (NMFS-AKRO).

The SSC received oral public testimony from Pat Shields (self), Janet Carroll (OBI Seafoods), Nick Jacuk (self), Alfred Tellman (Knik Tribe), Samuel Schimmel (Tikahtnu Inter Tribal Fish Commission), Jim Sykes (Matanuska-Susitna Borough Fish & Wildlife Commission), Roland Maw (United Cook Inlet Drift

[1] Leong, K.M., Ingram, R.J., Kleiber, D., Long, S.H., Mastitski, A., Norman, K., Weng, C. and Wise, S., 2024. Aligning fisheries terminology with diverse social benefits. Marine Policy, 170, p.106377.

Association; UCIDA), and David Martin (Cook Inlet Fishermen's Fund). The SSC received written public testimony from Mike Simpson (Alaska Salmon Alliance), Andy Couch (Matanuska-Susitna Borough Fish & Wildlife Commission), and David Martin (UCIDA). As the C1 agenda item represents influential scientific information, public testimony is required to be characterized and responded to during SSC deliberations.

Public testimony highlighted several common areas of concern, including:

- The unsuitability of EEZ harvest management based on a preseason total allowable catch (TAC), given the high interannual variability in return abundance, and support for the use of abundance/escapement-based harvest policies with active and adaptive in-season management
- Failure to manage to maximum sustainable yield (MSY) and optimum yield (OY) as well as lost harvest opportunity due to surplus escapement
- Use of recent data to inform status determination and harvest specifications due to recent fishery disaster declarations and State of Alaska management decisions, which may not be representative of long-term productivity trends
- Not all harvest is reported and escapement enumerated (e.g. small Chinook in recreational harvest and Kenai River escapement)
- SAFE is specific to the EEZ only and the drift gillnet fishery in particular, but does not consider the harvest of stocks that pass through the EEZ before and after the drift gillnet fishery
- Economic and industry stability under this management system
- The need to consider broader management implications across both state and federal components of the fishery relative to MSY and OY

Public comment included general support for:

- Use of the lower bound of the escapement goal for calculating status determination criteria and harvest specifications
- Efforts to allow northern Cook Inlet stocks to pass through the EEZ and associated SAFE-recommended ABC buffers specifically for coho and Chinook aggregate stocks.
- Research to fill data gaps on salmon populations and migration timing, including a test fishery, collection of real-time data and use of genetic stock identification of the harvest
- Interest in a test fishery, potentially Tribally led
- Expanded enforcement to ensure all harvested salmon are counted
- Inclusion of Indigenous Knowledge
- Engaging in government-to-government consultation as relevant

Public comment also included recommendations for timing and frequency of fishing periods in the EEZ as well as gear specifications to allow for passage of fish to northern Cook Inlet salmon streams. The SSC considered these comments in their recommendations.

General Comments

The SSC highlights its appreciation for the extensive efforts of the NMFS Cook Inlet Salmon SAFE Team (SAFE team) in drafting the 2025 Cook Inlet EEZ Salmon SAFE report and responding to the SSC recommendations from February 2024. **The SSC reiterates the challenge of providing a basis for status determination and harvest specifications for this salmon fishery that requires adapting the escapement-based management policy used by the State of Alaska to comply with the Magnuson Stevens Act (MSA) framework.** As noted last year, this is an iterative process and there are opportunities to benefit from lessons learned in MSA salmon management on the West coast by the Pacific Fishery Management Council (PFMC).

Reviewing the SAFE methodology for the first time at the same meeting where harvest specifications are set - without the benefit of independent review - poses a significant challenge. Last year, the SSC highlighted the value of long-format Plan Team meetings for reviewing groundfish and crab stock assessments. These meetings serve as a critical forum for in-depth discussions, allowing for substantive progress in improving processes and models that support management decisions, as well as reviewing proposed methodological changes prior to harvest specifications. **The SSC reiterates its recommendation from last year that a workshop, or series of workshops, focused on further developing Cook Inlet Salmon harvest specification and status determination methods in the context of continued in-season EEZ management be held in the coming year.** This workshop could include members of the SAFE team, ADF&G, SSC, and experts from the PFMC where issues related to federal management of salmon fisheries have been extensively considered. **The SSC also recommends evaluating the establishment of a Plan Team for federally managed salmon stocks in the Cook Inlet EEZ, recognizing that costs, timing of data availability, and determining membership of a plan team need to be considered carefully**.

With regards to the annual assessment and specifications cycle, the SAFE team suggested providing an early draft of the SAFE by December for review by the SSC. The SSC discussed the benefits of previewing newly proposed analyses and methods in response to requests and recommendations from the previous harvest specifications cycle, whether originating from the SSC, workshops or a plan team. The timing of presenting an early preview would be dependent on how soon the SAFE team could prepare a report and when the SSC could accommodate it in their schedule. This would allow for the SSC to provide feedback and recommendations prior to the meeting at which specifications are set.

The SSC also discussed the need for continued research and data collection, especially genetics and age-sex-length data of the salmon harvested in the EEZ fishery. Priorities include genetic sampling of sockeye to identify the stock structure and timing of the different sockeye runs in the EEZ fishery, and Chinook sampling to assess the importance of Kenai large late run Chinook in EEZ fishery, and to evaluate the prevalence of non-Cook Inlet Chinook in the fishery. Given the number of Chinook salmon reported to be harvested, it would be reasonable to obtain a census sample from the fishery. The SSC acknowledges the value of in-season information that could be provided by a test fishery, as noted during public testimony. A test fishery could help characterize the timing, magnitude, and distribution of returning salmon, as well as support stock composition estimates if in-season genetic stock composition analysis are feasible.

The SSC reiterates its February 2024 report comment that as the Cook Inlet EEZ management process matures and consistent with National Standard (NS) 2, **the SSC looks forward to the SAFE incorporating a summary of scientific information on the most recent social and economic condition of the relevant fishing interests, fishing communities, and the fish processing industries.** The SSC recognizes the capacity challenges facing the analysts in the absence of a plan team. However, it is important in the context of NS8 to capture the differential distribution of impacts associated with the change to federal management in the early years, especially if there are substantial changes in patterns of engagement or dependency for fishing communities, fishery sectors, and/or fishery support sectors. It is difficult in general to capture information on correlation or causation of changes seen in retrospect, especially with respect to those who exit the fishery. Further, it is important to capture changes in participation across commercial, sport, personal use, and subsistence fisheries, as well as the potential for new or returning entrants, including those represented in evolving Tribal fishery initiatives.

The drainage maps provided at the beginning of each SAFE chapter for the aggregate salmon stock complexes do not align with the Federal definition of these Upper Cook Inlet aggregates provided below each map. The SSC requests that the authors correct these maps for the final SAFE.

The SSC appreciates the SAFE team providing the GitHub repository with data used for the assessment and requests that this practice continue for future salmon SAFEs.

2025 Cook Inlet aggregate salmon harvest specifications and SAFE

Stock status determination criteria for aggregate salmon stock complexes in the Upper Cook Inlet EEZ in 2024 and the 2025 SSC harvest recommendations are summarized in Tables 1 and 2, respectively.

The SSC reviewed status determination criteria for 2024. **Aggregate salmon stock complexes were not apparently subject to overfishing, pending final harvest data. Aggregate salmon stock complexes, with the exception of aggregate chum and pink stocks, were not apparently overfished, pending final harvest and escapement data. For aggregate chum and pink stocks, an overfished status determination is not possible.**

Table 1. Aggregate stock status in relation to status determination criteria for 2024 salmon fisheries of the Cook Inlet Exclusive Economic Zone Area for 2025. Values are in numbers of fish. Status determination recommendations made by the SSC are based on the best scientific information available and final status determination will be made by NMFS Headquarters following SAFE review.

Stock	Tier	MSST	Cumulative Escapement	MFMT	F_{EEZ}	OFL	OFL_{PRE}	ABC	Catch	Overfished
Kenai River Late Run Sockeye salmon	1	3,030,000	8,258,000	0.204	0.072	NA	901,932	431,123	189,380*	no
Kasilof River Sockeye salmon	1	555,000	4,008,000	0.495	0.036	NA	541,084	375,512	77,960*	no
Aggregate Other Sockeye salmon	3	163,000	529,700	NA	NA	1,271,000	887,464	177,493	57,496*	no
Aggregate Chinook salmon	3	44,200	70,800	NA	NA	3,072	2,697	270	31	no
Aggregate Coho salmon	3	38,800	24,400**	NA	NA	439,000	357,688	35,769	4,432	no
Aggregate Chum salmon	3	NA	NA	NA	NA	561,000	441,727	110,432	28,832	NA
Aggregate Pink salmon	3	NA	NA	NA	NA	300,000	270,435	135,218	6,249	NA

*Kenai late-run, Kasilif and Aggregate "Other" sockeye salmon catches are estimated to a stock-specific level using ADF&G inseason genetic stock composition information

** 2025 SAFE notes that this escapement estimate is based on incomplete information

Table 2 SSC recommendations for the salmon fisheries of the Cook Inlet Exclusive Economic Zone Area for 2025. Values are in numbers of fish. Tier designations in this table are based on the SAFE report and accepted by the SSC. SSC recommendations that differ from the SAFE are in bold. This table combines Tier 1 and Tier 3 stocks into a single table; therefore, some columns will have information that is not applicable to a given tier or would require calculations that are not recommended based on the information available (NA).

Stock	Tier	MSST	Escapement goal, lower bound	S_{MSY}*	OFL	OFL_{PRE}	ABC	ABC Buffer (%)
Kenai River Late Run Sockeye salmon	1	**3,030,000**	750,000	1,212,000	NA	**514,761**	**360,332**	**30 %**
Kasilof River Sockeye salmon	1	**555,000**	140,000	222,000	NA	**664,294**	**285,646**	**57%**
Aggregate Other Sockeye salmon	3	163,000	65,000	NA	906,757	181,351	154,148	15%
Aggregate Chinook salmon	3	40,500**	13,500**	NA	2,237	373	261	30%
Aggregate Coho salmon	3	38,800**	19,400**	NA	268,053	67,013	**16,753**	**75%**
Aggregate Chum salmon	3	NA	3,500	NA	390,030	97,508	78,006	20%
Aggregate Pink salmon	3	NA	NA	NA	116,348	58,174	52,357	10%

*Hasbrouk et al 2022
** corrected values to be updated in final 2025 SAFE

Tier 1 General Topics

S_{MSY} vs Lower Bound of the State's Scientifically-based Escapement Goals

The Salmon fishery management plan (FMP) specifies the lower bound of the escapement goal range as the default for calculating status determination criteria (SDC) and harvest specifications, unless the SSC recommends otherwise. In its 2024 review of the first Cook Inlet EEZ SAFE, the SSC recommended that the S_{MSY} should be used for Tier 1 stocks to provide sufficient precaution for setting the preseason OFL and SDCs and to be consistent with the interpretation of this reference point. For the 2025 preliminary Cook Inlet EEZ SAFE, the SAFE team recommended using the lower bound of the State's escapement goal range for Tier 1 stocks with the rationale that this represents the best scientific information available for maximizing yield and preventing overfishing over the long term, in fulfillment of NS1 Guidelines. The SAFE team provided a reasonable rationale for considering using the lower bound of the escapement goal. The SSC appreciates the flexibility in determining the value used to estimate the productive capacity of the stock. For example, in the East Area, the MSST for coho uses the lower bound of the escapement goal range, but Chinook uses the mid-point. Both public testimony and the authors noted the PFMC Salmon FMP includes several examples of reference points that are equal to the lower bound of MSY escapement ranges or other lower bound escapement targets. Part of the challenge with determining the correct approach is the unique nature of the harvest specifications for the Cook Inlet EEZ salmon fishery, including the challenge of using escapement-based management with federal reference point requirements under the MSA. **For the 2025 specifications, the SSC recommends that OFL and MFMT used in SDC calculations for Tier 1 stocks be based on the best available estimate for the spawning biomass that produces maximum sustainable yield over the long-term (S_{MSY}). Likewise, the SSC recommends that an escapement target equal to S_{MSY} also be used in defining the preseason OFL and ABC specifications for the 2025 season. The SSC also recommends further consideration of this issue, such as by the proposed workshop(s) discussed under General Comments.** The SSC recommends this issue be considered on a stock-by-stock basis based on data availability.

MSST scaling

In 2024, the SSC recommended using S_{MSY} as the escapement target for calculating MSST for Tier 1 stocks for consistency with how the MSST is defined in the crab and groundfish FMPs. Under this approach, the MSST is $0.5*S_{MSY}$ (summed over a generation) or half of the spawning abundance expected to produce MSY over the long term. The SAFE team requested input from the SSC on the potential for changing the scalar used to adjust the escapement target in the calculation of MSST to values other than 0.5. The authors noted that this approach is used for select West coast salmon stocks. The SAFE team suggested that the SSC might consider scaling factors from 0.5 to 0.75 and provided examples using 0.6 of the lower bound of the escapement goal as footnotes in Tables 7 and 12 of the preliminary SAFE report. **The SSC acknowledges flexibility in the MSST definition but recommends continuing to use $0.5*S_{MSY}$ (summed over a generation) for the 2025 specifications. The SSC also recommends that the SAFE team provide a more detailed rationale for selecting appropriate scalars for different stocks as necessary.**

SDC and Harvest Specifications Methods/Buffer Calculations

The SAFE team presented three options to calculate components of the preseason OFL for the Tier 1 stocks:

- Using the State-produced preseason forecast of run size

- Autoregressive modeling of historical total run size estimates to project next year's run size as well as the harvest rate in state waters (F_{state}). This was the same method used in 2024 and included calculation of buffers for reducing OFL to ABC based on the probability of over forecasting.

- A new Bayesian approach, which is similar to the autoregressive model framework currently used, except that the preseason run size forecast is fit using an AR1 model and the state harvest model fixed to the best models for the current year. As with the current method, buffers for reducing OFL to ABC are based on the magnitude of positive errors in preseason OFL estimates.

T**he SSC supports the SAFE team's recommendation to use autoregressive models for both Tier 1 stocks (Kenai River late run sockeye and Kasilof River sockeye) to forecast run size and the state waters harvest rates component of the preseason OFL.** Details associated with these models are provided for each stock. The SSC notes that the State-produced preseason forecast sibling models had lower forecast error but are currently unavailable due to the timing of when those estimates are produced relative to when they are needed for harvest specifications. The SAFE team also provided a Bayesian approach that retrospectively evaluated the probability that an ABC exceeded the post-season OFL under different buffers on the preseason OFL. The SSC appreciates the SAFE team's work on this analysis, and supports further efforts to develop this model, including consideration of a longer time series where available. The SSC further recommends the SAFE team consider whether the magnitude of the buffer could be scaled relative to the cumulative probability of a preseason OFL<0 under the posterior distribution for this quantity, rather than the proportion of years in which the ABC was over forecasted.

Kenai River Sockeye

The SAFE team recommended designating Kenai River late-run sockeye as a Tier 1 stock. An autoregressive model approach was used to predict the 2025 run size (AR1) and state waters harvest (AR model - zero mean white noise) based on historical data, similar to the 2024 methods. Based on these results, the preseason OFL was determined. Buffers for reducing the preseason OFL to the ABC were based on the retrospective median symmetric accuracy of preseason OFL relative to post-season OFL, for those years where the OFL was over-predicted between 2015 and 2024. Harvest specifications based on using S_{MSY} for the stock and the lower bound of the escapement goal were both presented. **The SSC concurs with the SAFE team's recommendation of a Tier 1 designation for Kenai River late run sockeye in 2025.** The SSC accepts the methods used by the SAFE team to forecast the 2025 run size estimate and the estimated harvest rate in state waters given the numerous constraints and data availability at this time. The SSC discussed the appropriate buffer for setting the ABC below the preseason OFL. The buffer recommended in the preliminary SAFE using S_{MSY} as a basis for calculating the preseason OFL based on the retrospective accuracy of preseason OFLs was considered conservative by the SSC. **The SSC recommends setting an ABC buffer of 30% (rounded from the buffer calculated using the lower bound of the escapement goal). This recommendation recognizes that the S_{MSY} estimate for this stock is near the upper end of the MSY escapement goal range based on the stock-recruit relationships presented in the SAFE. Additionally, there are no conservation concerns for this stock**.

Finally, the SSC noted a number of minor editorial comments that will be communicated directly to the SAFE team for the final 2025 SAFE, including correcting the pre-2020 estimates of S_{MSY} and the lower bound of the escapement goal in Table 10. The SSC recommends that the SAFE team provide additional detail (e.g., a table) in the assessment that lists components of the harvest (commercial, sport, personal use, subsistence) and escapement information such that the reader can more easily identify what are final versus preliminary estimates. In addition, the SAFE team should clearly state whether the status determination recommendations (i.e., overfishing and overfished status) include preliminary information.

Kasilof River Sockeye

The SAFE team recommended designating Kasilof River sockeye a Tier 1 stock. An Autoregressive model approach was used to predict the 2025 run size (AR1) and State waters harvest (autoregressive moving average model) based on historical data, similar to the methods used in 2024. Based on these results, the preseason OFL was determined. Buffers for setting an appropriate ABC below the preseason OFL based on the retrospective accuracy of preseason relative to post-season OFL estimates were proposed similar to Kenai River late-run sockeye salmon. Harvest specifications based on using either S_{MSY} or the lower bound of the escapement goal were both presented. **The SSC concurs with the SAFE team's recommendation of a Tier 1 designation for Kasilof River sockeye in 2025.** The SSC accepts the methods used by the SAFE team to forecast the 2025 run size estimate and the estimated harvest rate in State waters, given the numerous constraints and data availability at this time. The buffer recommended in the preliminary SAFE using S_{MSY} as a basis for calculating the preseason OFL based on the retrospective accuracy of preseason OFL estimates was considered conservative by the SSC. **The SSC recommends setting an ABC buffer of 57%** (the buffer based on the same analysis, but using the lower bound of the escapement goal).

Finally, the SSC noted several minor editorial comments that will be communicated directly to the SAFE team for the final SAFE, including correcting the pre-2020 estimates of S_{MSY} in Table 15. Similar to Kenai River late-run sockeye, the SSC suggests that the authors provide additional detail for the components of the State harvest (commercial, sport, personal use, subsistence) and clearly distinguish final estimates from preliminary estimates.

Tier 3 Stocks

The SAFE team recommended that aggregate "other" sockeye salmon, aggregate Chinook salmon, aggregate coho salmon, aggregate chum salmon, and the aggregate pink salmon stock complexes be specified as Tier 3 stocks, where harvest specifications are based on historical catch statistics. **The SSC supports the designation of these stock complexes as Tier 3.**

In its February 2024 minutes, the SSC made several recommendations regarding the Tier 3 aggregate stocks for the 2025 SAFE. The OFLs should be based on limiting harvest in the current year, rather than the multi-year approach that was used in 2024. The SSC recommended that ABC buffers be expressed as a percent reduction from OFL, consistent with groundfish and crab. Finally, the SSC suggested that a starting point might be the 25% default buffer used for Tier 6 average-catch stocks in the groundfish FMPs, though alternatives should be considered on a stock-by-stock basis.

In response, the SAFE team developed a new Tier 3 approach in which the preseason OFL is based on the maximum average catch over a generation during the period 1999-2024. The maximum average over a generation tends to be 40-60% higher than the overall average but will always be lower than the maximum catch over the equivalent period. Overfishing is determined by comparing the cumulative catch over the previous generation to the maximum cumulative catch. **The SSC supports this more transparent approach and considers it a substantial improvement over last year.** However, it should be acknowledged that this will be less precautionary than the groundfish Tier 6 average-catch approach. Although not articulated in the SAFE, a potential rationale is that for most salmon stocks, a single brood year will return to spawn over several years, so that not all of the stock is exposed to harvest in any single year. This may result in additional resilience to harvest compared to groundfish, where all of the exploitable stock is exposed to harvest.

The SAFE team recommended ABC buffers for each Tier 3 stock, starting with a 15% default ABC buffer. Recommended buffers were 15% for other sockeye, 30% for Chinook, 90% for coho, 20% for chum, and 10% for pinks. In general, proposed departures from the default 15% buffer were well justified. **The SSC**

raised concerns about the recommended buffer for aggregate coho as noted below, but otherwise concurs with the recommended SAFE team buffers for this year.

Overall, the SSC is concerned that a 15% default buffer does not adequately recognize the severe limitations of basing harvest specifications on historical catch statistics. These specifications do not respond to changes in the stock abundance due to varying environment conditions, and their relationship to sustainable yield is highly uncertain. In some cases, there is no adequate basis for determining overfished status. These limitations are the same as for Tier 6 groundfish, implying that the default 25% buffer to obtain the ABC for these stocks would be applicable to Tier 3 salmon stocks to maintain a consistent approach to uncertainty across FMPs. **The SSC therefore requests the SAFE team adopt a default 25% buffer for developing harvest recommendations next year.** Departures from the 25% buffer (both higher and lower) should be justified based on specific issues for each aggregate stock complex such as data availability and quality.

The SSC agrees with the SAFE team's concern with low coho abundance. Harvest in the EEZ and escapement counts from coho index stocks are at all-time lows. Complete weir counts are not available for either coho indicator stock in the last three years. The SAFE team-recommended buffer of 90% is very large and the resulting ABC would have led to an early fishery closure in 24 of the last 26 years. Instead, the SSC recommends a large, but less extreme buffer of 75% for aggregate coho. This magnitude is comparable to the largest buffer used for BSAI crab stocks of 75% for West Aleutian Islands red king crab, which is at very low abundance and has been closed to directed fishing since 2003.

The SAFE team evaluated aggregate "other" sockeye salmon, aggregate Chinook salmon, aggregate coho salmon, aggregate chum salmon and aggregate pink salmon stock complexes with respect to overfishing by comparing cumulative catch over the previous generation to the maximum cumulative catch. Due to limited availability of indicator stock information, only aggregate "other" sockeye, aggregate Chinook, and aggregate coho could be evaluated for overfished status. While none of these stocks were below the MSST, escapement data to compare to the respective MSST are very limited for aggregate coho. In addition, Kenai large late run Chinook may not be a suitable indicator stock since it is likely not well represented in the EEZ salmon fishery.

The SAFE team requested input from the SSC on how to treat overfished determinations with missing or incomplete weir data. The SSC recommends that the calculation of the cumulative escapement goal omit the indicator goal in years when the index is missing or incomplete. For example, when a weir count is missing, the escapement goal for that site in that year is not counted towards the cumulative escapement target over a generation.

The 2025 SAFE document highlighted some sources of uncertainty that were not considered in the assessment, including the unconfirmed historical estimates of salmon harvests in the Cook Inlet EEZ prior to 2024. However, for Tier 3 stocks, these estimates are the basis for the 2024 and 2025 SDC and harvest specifications recommendations. The SSC recommends that, to the extent possible, the SAFE team explore the uncertainty in the historical estimates of salmon harvests in the Cook Inlet EEZ prior to 2024 for all the Tier 3 stock complexes in future assessments.

The SSC appreciates the draft risk table for the aggregate coho salmon complex. While the risk table served to highlight the serious concerns regarding the status of Cook Inlet coho, the scoring was elevated compared to how the risk table has been used for groundfish. Attributes that are typical of Tier 3 stocks should not result in an elevated risk score as they are reflected in the default buffer. The SSC looks forward to further refinement of risk tables for the aggregate salmon stocks in the Cook Inlet EEZ.

The SSC identified the following data needs that would provide an immediate benefit to Tier 3 salmon assessments:

- There should be ongoing genetic sampling of EEZ salmon landings. Priorities include genetic sampling of sockeye to identify the stock structure and timing of the different sockeye runs in the EEZ fishery, and Chinook sampling to assess the importance of Kenai large late run Chinook in EEZ fishery and to evaluate the prevalence of non-Cook Inlet Chinook in the fishery.

- It is a concern that monitoring of salmon escapement in Cook Inlet has decreased over time. Ideally, each Tier 3 aggregate stock complex should have several monitored indicator stocks. Increased support for the existing coho indicator stocks is the highest priority.

There were a number of minor errors in the SAFE document that were communicated to the SAFE team.

C2 Initial Review of Preliminary Draft Environmental Impact Statement for Bering Sea Chum Salmon Bycatch Management

The SSC received a presentation on the C2 preliminary Draft Environmental Impact Statement (DEIS) for chum salmon bycatch management from Kate Hapaala (NPFMC), Sarah Marrinan (NPFMC), and Patrick Barry (NOAA-AFSC). Dr. Barry focused on the simplified adult equivalent (AEQ) analysis, while Dr. Hapaala and Ms. Marrinan focused on the content of the DEIS.

The SSC received written public testimony from Brooke Woods (Permafrost Pathways), Tom Enlow (UniSea), Chair Jonathan Samuelson (Kuskokwim River Inter-Tribal Fish Commission), Roark Brown (HOC Services) and Nathan Elswick (Anvik Village). The SSC received oral public testimony from Frank Kelty (City of Unalaska), Cory Lescher (Alaska Bering Sea Crabbers), Jimmy Hurley (Self), Heather Munro Mann (Midwater Trawlers Cooperative), Andrea Keikkala & Susie Zagorski (United Catcher Boats), Caitlin Yeager and Austin Estabrooks (At-Sea Processors Association), Glenn Merrill (Glacier Fish Company), Trent Hartill (American Seafoods), Craig Chythlook (Self), Brenden Raymond-Yakoubian (Kawerak), Francis Thompson (St. Mary's Village Council), Terese Vicente and Justin Leon (Kuskokwim River Inter-Tribal Fish Commission), Nick Jacuk (Ocean Conservancy) and Steve Martell (Sea State). As the C2 item represents influential scientific information, public testimony is required to be characterized and responded to during SSC deliberations.

Public testimony suggested several specific improvements to the analyses in the DEIS, including:

- Investigating the effects of the pollock fishery on crab and crab habitat, including evaluation of Alternative 5 in relation to crab distribution and seasonal movement patterns.

- Including the effects of alternatives on individual vessels, including smaller vessels that are unable to travel longer distances and larger vessels with differing production needs. It was noted that under the co-op structure, bycatch caps would likely translate into vessel-specific bycatch allotments and could result in a race for fish.

- The impact of alternatives on the performance of the Incentive Plan Agreements (IPAs). Specifically, the potential for reduced rolling hot spot (RHS) information that might lead to reduced ability to identify areas of lower chum bycatch.

- Evaluation of the non-monetary value and costs of the alternatives to Alaska Native communities.

- Replacing the Bethel Test Fishery Index (Alternative 3) with an index based on the Kuskokwim sonar count.

Pollock industry participants highlighted potential costs from PSC limits/caps that could create economic hardship for the pollock fishery participants, Community Development Quota (CDQ) programs, and dependent communities. Public testimony highlighted the economic importance and dependence of harvesters, processors and communities on the pollock fishery with the recent reductions in the crab fisheries. Particular concern was raised of effects on the CV fleet if closures affect areas that are easily accessible to smaller vessels. Interactions between chum, Chinook and herring bycatch caps and management were identified as likely to change incentives and resulting behavior. Changes in global hatchery fish production were flagged as an uncontrollable factor that would affect performance alternatives. There was support for ‘narrower’ or more targeted corridors associated with the clusters in Alternative 5 and support for Alternative 4 to provide flexibility in responding to chum encounters through existing IPA and RHS approaches.

Public testimony also identified the need to protect chum salmon in migratory pathways and supported Alternative 5 - Option 1 (a Cluster 1 cap). Some supported Alternative 3 (with a low abundance threshold) to reduce risk and support recovery of the stock. Many comments highlighted the uncertainty in AEQ calculations, impact rates, and the conservation benefits that might accrue. Some highlighted that the AEQ approach was insufficient, not capturing the impacts to discrete spawning populations and impacts due to the waste of sentient species.

Testimony emphasized taking a precautionary approach - that every fish returning to spawn increases the likelihood of bringing back chum salmon stocks. It was reiterated that low impact rates may not translate into low effects on stocks and/or communities relying on the subsistence way of life. Cumulative impacts of fishing on the marine ecosystem and interaction with climate change were also raised as significant concerns. Public testimony identified a need for additional research to address uncertainty particularly in relation to market and non-market costs for Western Alaska (WAK) communities dependent on chum salmon. Testimony also questioned the treatment of potential impacts to WAK Alaska Native communities, suggesting that those impacts were not given equal consideration compared to those of the pollock fishery due to the lack of quantifiable data. Finally, many comments reflected the critical reliance of Alaska Native Peoples on chum salmon for social, spiritual, psychological, educational and cultural needs.

Following extensive discussions and considering the recommended revisions summarized below, the **SSC recommends that the February 2025 DEIS is sufficient to inform the Council’s decision-making and the document be advanced for public release, after incorporating the recommendations in the following sections to the extent practicable.**

General Comments/Responses to Previous SSC Comments

The SSC appreciates the responsiveness of the analysts to previous SSC comments. This section focuses on general SSC comments on the current DEIS, previous SSC recommendations from the April 2024 meeting, and the subsequent responses by the authors in their current report. Additionally, the SSC provides general recommendations and suggestions to improve the clarity of the report.

The SSC highlights two previous comments from its April 2024 report for the Council to consider as this management action moves forward:

- “The SSC recognizes, however, that establishing new management lines based on historical data can be problematic for many reasons, particularly when climate change is leading to changes in migration and distribution for many marine species.”

- **“The SSC recommends clearly defining which outcomes would be considered a success at the time of the action and how those outcomes would be measured. Therefore, the SSC recommends scheduling a performance review of any new management measures to reduce**

chum bycatch relatively soon after implementation. This will allow managers to quantitatively evaluate the effectiveness of management actions and make the needed corrections."

The SSC appreciates the authors' diligence in addressing SSC recommendations from April 2024 to the extent practicable. The SSC offers some additional general recommendations to improve the clarity and accessibility of the final DEIS:

- **The SSC recommends that all relevant text and future presentations explicitly state that comparisons to Alternative 1 (status quo) are based on data from 2011 – 2023. This period includes the Council's 2022 request to industry to take immediate voluntary steps to avoid chum salmon in the 2022 B season following a high bycatch year in 2021. As a result, fleet changes during this time may not be fully reflected in the status quo comparison.** Although only two complete years of data have become available since this change, evidence suggests marked reductions in both chum and Chinook salmon bycatch. These reductions should be considered when comparing alternatives to the status quo. **The SSC also advises caution when interpreting results that rely on later years of the retrospective analyses.** Specifically, the quantitative analyses for Alternatives 2, 3, and 5 are based on past fishery data, including recent years when many of the Alternative 4 provisions were in effect. Although the SSC does not recommend additional evaluation on this issue, it urges analysts to acknowledge this limitation in the independent evaluation of Alternatives 2, 3, and 5. Analysts should also highlight where recent years may be outliers due to incentivized chum avoidance.
- **The SSC recommends that the authors further refine, consolidate and present chum fishery removals in one place.** Currently, bycatch, commercial catch, subsistence harvest, and Area M removals are in different sections of the DEIS. While the removals may not be directly comparable as they are not fully standardized and have their own limitations, presenting them together will improve their contextualization. To the extent possible, the SSC requests that analysts provide these data on similar scales. For example, the Area M South Peninsula commercial fishery harvested approximately 1.12 million chum in 2023 (DEIS, pg. 299). While the genetic stock structure of this catch is not known, limited information from earlier years suggests that 13-30% may be Coastal Western Alaska (CWAK) chum, with lower proportions in a more recent study[2,3], potentially equating to removals of 140,000 – 330,000 CWAK chum salmon in 2023, if proportions were as high as in some recent years. Additionally, the DEIS should include a statement that available data suggest CWAK chum removals likely occur in high seas/international trawl fisheries.
- A similar approach should be taken for the Upper/Middle Yukon stock as part of the AEQ analysis (see Simplified AEQ section below for details).
- The SSC suggests that the authors consider separating each of the five regional areas (in Section 3.2.4.1.2) to explicitly highlight where major concerns exist within the CWAK reporting group.

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[2] Dann, T. H., H. A. Hoyt, E. M. Lee, E. K. C. Fox, and M. B. Foster. 2023. Genetic stock composition of chum salmon harvested in commercial salmon fisheries of the South Alaska Peninsula, 2022. Alaska Department of Fish and Game, Special Publication No. 23-07, Anchorage.

[3] Munro, A. R., C. Habicht, T. H. Dann, D. M. Eggers, W. D. Templin, M. J. Witteveen, T. T. Baker, K. G. Howard, J. R. Jasper, S. D. Rogers Olive, H. L. Liller, E. L. Chenoweth, and E. C. Volk. 2012. Harvest and harvest rates of chum salmon stocks in fisheries of the Western Alaska Salmon Stock Identification Program (WASSIP), 2007–2009. Alaska Department of Fish and Game, Special Publication No. 12-25, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/SP12-25.pdf

- The SSC recommends that authors re-evaluate the use of averages when a median might be more appropriate. For example, the averages presented in Table 3-12 or Table 4-36 when there was marked step change in 2021 for many population and bycatch metrics. It is important to consider the distribution of the data being presented when choosing one over the other.

- The SSC notes that much of the information is presented in bar and line graphs with text describing relationships between the time series. In some cases, a simple correlation could more effectively illustrate the relationship between two metrics, making it easier for readers to identify patterns and outlying years. As an example, this approach may be useful in Figure 3-17 when comparing the annual total number of chum salmon to WAK chum salmon. Similarly, applying autocorrelation metrics with a one-year lag could help assess the reliability of using prior-year data to assess subsequent-year outcomes (e.g. salmon run size). **The SSC recommends that the analysts consider this type of evaluation in the analysis to the extent practicable.**

Finally, the SSC recommends that authors review content for clarity and condense and refocus pertinent information where possible, especially streamlining the lengthy executive summary.

Integration of LKTKS within the DEIS

The SSC supports the revisions to more fully incorporate LKTKS and acknowledges the breadth and depth of LKTKS information now in the main body of the DEIS and the LKTKS information that has been provided in a new series of appendices. The inclusion of information supplied by Cooperating Agencies, the Kuskokwim River Inter-Tribal Fish Commission (KRITFC) and the Tanana Chiefs Conference (TCC), in the analysis lent clarity and depth when evaluating the Alternatives. LKTKS information is critical to understanding the nature and magnitude of potential risks and benefits of the proposed action alternatives to WAK subsistence chum salmon reliant communities. Public testimony also provided valuable context given the complexity of the subject and possible alternatives.

AEQ and WAK Community Outcomes

The SSC encourages further exploration and expansion to contextualize the AEQ numbers relative to potential benefits of increased chum returns to WAK communities. The analysis notes that it is difficult to determine which communities may receive indirect benefits from potential bycatch reductions; however, it clearly outlines the substantial benefits to inland WAK communities with any increase in chum returns. Specifically, the AEQ numbers could be better contextualized with additional text that directly communicates the likely survival rates of fish caught at sea, and by explicitly addressing the potential for longer-term benefits if WAK bycatch were reduced and those fish escaped to add to stock productivity during periods where escapement goals are not met. When the escapement goals are not met, the AEQ is only a starting point from which the potential for population growth, time to reopening and potential future benefits should be explored.

Individual Vessel Impacts

The SSC appreciates the quantitative evaluation of vessel-specific impacts in Appendix 6, Section 6.4 and the qualitative discussion of potential vessel-specific responses and heterogeneity in responses across vessels within sectors and alternatives. The SSC notes that outcomes will be heavily dependent on how cooperatives choose to respond to the alternatives. **The SSC encourages the analysts to revise the main document to clearly identify relevant material on this subject located in appendices or other sections of the report and direct readers to those sections where appropriate.** The need for considering vessel-specific impacts was also highlighted in public testimony. This is especially needed for material relating to the potential differential distribution of social, economic, and community impacts across communities based on the different catcher vessel (CV) length categories noted in Table 4-26. These may occur within local fleets due to proximity to time and area closures and discussion should include potential safety at sea considerations. While the SSC notes there is a great deal of uncertainty, it would be beneficial to provide insights into the potential magnitude of costs.

Characterization of the Potential for Unintended Consequences

The SSC recommends the analysts summarize the potential for unintended consequences of all alternatives in a separate section for easier comparisons across alternatives. Specifically, this section should consider how fleet efforts to manage pollock harvest and total chum and WAK chum bycatch in response to an action intended to reduce WAK bycatch mortality could inadvertently lead to higher WAK bycatch mortality. This risk arises because the alternatives are structured around total chum bycatch, which can be monitored in real time whereas WAK chum bycatch cannot be determined until after genetic analyses have been completed. Since total chum bycatch is an imperfect proxy for WAK chum bycatch, directing the fleet to reduce total chum bycatch could unintentionally shift fishing effort to times or areas where the proportion or absolute number of WAK chum encountered is higher. Public testimony before the SSC in April 2024 presented data that suggest total chum to WAC chum ratios vary spatially, both between and within Clusters 1 and 2. The present analysis focuses on aggregate year-to-year changes in WAK chum proportion of total chum encountered, without considering the time or area composition of effort.

The SSC appreciates the quantitative and qualitative work summarizing how fleet responses under Alternative 5 could lead to increases in WAK chum bycatch relative to the status quo and requests the analysts consider a similar approach for Alternatives 2 and 3. This would focus on the potential for fleet behavior that is changing across space and time in response to incentives to reduce chum bycatch, and could lead to more fishing in areas that have lower overall chum bycatch but higher WAK chum bycatch. The new section should also include a general discussion of the potential for Alternatives 2, 3, and 5 to increase Chinook and/or herring bycatch relative to the status quo.

Research outlook

The SSC is encouraged by several potential new sources of data or decision support information and requests the analysts provide updates on the status of the Bristol Bay Science and Research Institute initiative to produce in-season chum genetics information, and ongoing work underway at AFSC in collaboration with ADF&G (PI: Dr. Wes Larson) to develop a new genetic marker panel with low coverage whole genome sequencing for WAK chum salmon that will improve the resolution of stock structure. The SSC notes that in-season genetics for the inshore sector could importantly change the tools available to identify and potentially avoid areas with a high proportion of WAK chum.

Simplified AEQ and Impacts

The goal of an AEQ analysis is to estimate the number and potential impact (e.g., proportion of a total run size, harvest, etc.) of bycaught salmon that may have otherwise survived the marine environment and returned to natal streams. In April 2024, the SSC requested the analysts prepare a simplified AEQ analysis, acknowledging that information would be limited. The SSC commends the analysts for the substantial work completed since the April SSC review and their responsiveness to SSC requests related to the simplified AEQ.

For the simplified AEQ analysis, the analysts used the CWAK Summer and the Yukon River Fall genetic baseline reporting groups. This aggregation approach, used by the United States Fish & Wildlife Service and ADF&G, differs from reporting groups in previous Council analyses by placing five Upper/Middle Yukon river stocks in the CWAK Summer group. The SSC supports this approach and notes that these groups are nearly identical to the CWAK and Upper/Middle Yukon reporting groups the Council is familiar with. To avoid confusion, the analysts have adopted “CWAK” and “Upper/Middle Yukon” terminology for these groups, respectively.

Chum bycatch in the Bering Sea pollock fisheries is dominated by age 3-5 fish, which are estimated to have survival rates ranging from 80 – 90%. As a result, the simplified AEQ estimates are similar in scale to the total WAK chum bycatch amounts. The SSC notes that AEQ estimates account for natural mortality and fish maturation schedules but do not account for exposure of returning fish to other sources of fishing mortality (e.g., Area M fisheries).

Estimates of AEQ CWAK chum salmon removed due to pollock fishery B-season bycatch constituted 1.4% of total removals during 2011–2019, and 5.7% from 2020–2022 on average. These proportions are informative but subject to changes in run size as well as processes that influence fishery removals and are difficult to interpret without estimates of uncertainty. AEQ impact rates were not provided given the lack of run size estimates for this reporting group. Run reconstructions are available for the Upper/Middle Yukon group and the AEQ impact rate ranged from 0.22% of the run size in 2013 to 4.93% in 2021, averaging 1.0% over the time period (2011–2022). The notable increase in 2021 is attributed to low reconstructed run size and a doubling of the estimated AEQ from the previous year.

The SSC appreciates the clear and concise characterization of the numerous sources of uncertainty and the associated assumptions required to complete the AEQ analysis, including the conditions of oceanic maturity and survival, in-river age composition, estimates of stock of origin and run size.

The SSC agrees that AEQ estimates and impact rates are helpful in developing realistic expectations of salmon savings associated with status quo and policy alternatives but are not a complete assessment of the potential impact bycatch removals of chum salmon may have on WAK chum salmon populations. Further, Bering Sea pollock fishery bycatch is one of a number of processes that may affect WAK chum salmon abundance including catch from ocean and in-river salmon fisheries, competition from hatchery fish, and environmental factors associated with climate change.

The SSC appreciated the insights provided by KRITFC and TCC in the DEIS Section 4.3.3.2 - Importance of Chum Salmon for Indigenous Peoples in the Yukon and Kuskokwim Regions. The SSC requests that going forward the analysts provide a discussion of AEQ or AEQ impacts in the context of the ecological and cultural information provided by the Indigenous Peoples of the Yukon and Kuskokwim Regions.

The SSC considers the simplified AEQ analyses sufficient to inform the Council's decision-making for this action with the following additional recommendations:

- **Given that run size uncertainty is important for interpretation of AEQ impacts, the SSC requests that the analysts incorporate the available run size uncertainty information (e.g., Addendum Table Ad1 CV estimates) into the Upper/Middle Yukon AEQ impacts analyses and graphics.** The SSC requests the analysts provide 95% confidence intervals in lieu of CVs and that a description of uncertainty estimation methods be included (the SSC cautions against use of the implausibly low Yukon summer chum estimates of uncertainty without further supporting information). The aim is to provide the Council with an understanding of how likely a given reduction in chum bycatch is 1) to be detectable in chum assessments or run reconstructions, 2) to achieve the desired policy outcome, and 3) to support a fuller exploration of tradeoffs in the context of practicability.

- **Provide figures or tables with AEQ, commercial and subsistence catch as a proportion of total removals and - for the Upper/Middle Yukon group - as proportion of run size to provide context for AEQ interpretation,** in addition to the information provided in Figure 3-16. The SSC notes that text related to Figure 3-16 compares commercial harvests to the AEQ numbers and characterizes the AEQ numbers as "low." The SSC recommends not using subjective terms like "low" in the description and to simply report percentages.

- Provide additional information on the assumptions made regarding which year B-season bycatch savings would have returned to river systems, considering the geographic and temporal location of the bycatch in relation to the likely dates of spawning and in-river migration.

- Provide a set of definitions and examine the use of terms used to convey run size (e.g., returns, returns to natal system, escapement, drainage-wide escapement, run reconstruction) for consistency and clarify where terms differ in meaning.

Alternative 5 Methodology

The SSC reviewed the sections added to the DEIS that relate to Alternative 5, which was added for consideration by the Council in April 2024. Alternative 5 would implement in-season corridors triggered by area-specific PSC limits.

The SSC appreciates the efforts of the analysts to describe the potential benefits and associated costs of implementing the three mutually-exclusive options for in-season corridor caps under Alternative 5, both in isolation and in conjunction with other alternatives and options. The DEIS provides clear descriptions of the fundamental considerations for this alternative, including: (1) the large differences in average B season bycatch rates per metric ton of pollock among the proposed corridors, which are nearly four times higher in Cluster 2 when compared with the Cluster 1 or the Unimak corridors, (2) the average genetic composition of chum within each corridor, and (3) differences in realized corridor usage among pollock fishery sectors with higher reliance on the Cluster 1 and Unimak corridors by the shoreside and mothership sectors.

The DEIS also describes the development of a fleet movement model, similar to that utilized with the Bristol Bay Red King Crab EA/RIR, for evaluating the potential impacts of re-distributing effort weekly in response to options under Alternative 5, using haul-level information. In the development of this fleet movement model, the analysts considered reallocating effort in the event of a corridor closure based on either PSC rates or pollock catch per unit effort. Ultimately, the utility of this fleet movement model was limited because the shoreside and sometimes mothership sectors only fished within a single corridor, providing no basis for redistributing displaced effort across space to evaluate impacts on realized PSC. The SSC commends the analysts for their diligence in exploring the feasibility of using an explicit movement model in analyzing this alternative and the clear description of how and where data limitations preclude explicit quantitative analyses.

As an alternative to an explicit fleet movement model, the DEIS provides clear descriptions of differences across space and within the B season of potential pollock landings displaced and PSC rates for chum salmon, Chinook salmon and Pacific herring to contextualize the impact of potential pollock fishery effort displacement under the Alternative 5 options. **The SSC supports the authors' approach in stepping back to holistically consider the impacts of this alternative in the absence of a spatially-explicit fleet movement model.**

The descriptive analysis suggests that under Alternative 5, Option 3 (the Cluster 2 chum salmon PSC limit) presents the least risk of adverse outcomes associated with effort redistribution. Closures in Cluster 1 or the Unimak corridor could displace effort into Cluster 2 which typically had a higher overall chum salmon bycatch rate in the past.

The SSC highlights that behavioral responses to inseason area closures, either preemptively occurring prior to a limit being exceeded or following a corridor closure, will be sector and vessel-specific and that any delays in B season fishing activity until after the August 31 corridor end date will have implications for Chinook salmon PSC. Further, the SSC highlights the challenge in predicting future behavioral responses or impacts in a dynamic marine environment and the inherent challenge in defining static management boundaries in the face of uncertain changes in future species'

distribution. The DEIS notes that responses to closure could disproportionately affect the CV sector due to their need to operate near processing facilities.

There was some SSC discussion surrounding the necessity of understanding how heterogeneity within sectors, specifically vessel-specific differences in size and capability, might lead to asymmetric impacts of the Cluster 1 and Unimak corridors under Alternative 5. For additional SSC comments on vessel-specific impacts, including safety considerations, see General Comments above. Potential safety impacts may be a particular concern under Alternative 5, considering increased risks of distant fishing on smaller inshore vessels.

The SSC suggests exploring information on week-area bycatch rates specifically from 2022, 2023 and 2024, where vessels operated under voluntary IPA provisions for chum bycatch management. This information can provide insight into the ability of the fleet, particularly the inshore sector most likely to be impacted by Alternative 5, to avoid triggering a corridor closure and needing to reallocate effort to areas where pollock and PSC catches are less certain. While only three years of information are available, an understanding of short-term effects of the changes to IPA provisions will better inform Council decision-making.

The SSC offers the following additional recommendations:

- In all figures comparing PSC rates and pollock landings across weeks within seasons (e.g. Figures 3-22, 3-30), it is useful to clearly define the week associated with the August 31 end date for Alternative 5 corridor closures, should they occur, to highlight how fishing effort might be re-distributed within the season.
- Further consideration, to the extent practicable, of whether conservation benefits accrued under Alternative 4 (IPAs) might be limited by Alternative 5 (corridors), given potentially more limited information and decreased flexibility for the fleet to actively respond to PSC risk.
- Expanded discussion of the cumulative impacts of multiple potential static closures including the Winter Herring Savings Areas in addition to the corridors defined under Alternative 5.

Economic and Social Impacts

The authors addressed all of the major SSC comments on the April 2024 economic analyses and the Social Impact Assessment (SIA), including the request to synthesize key portions of the SIA into the main body of the DEIS. The SSC finds that the document is largely adequate but requests that the following enhancements be considered to the extent practicable.

Language Related to the Direction of Impact and Uncertainty

The SSC suggests reconsidering language that implies directionality related to impacts. Specifically, language like “Uncertainty in the Potential Benefits for WAK Chum Salmon Savings” is misleading when discussing the impact on WAK bycatch, where there is a question of direction of impact (see “Uncertainty and Direction of Impacts” section below). Changes could be made to be consistent with language like “Effects of the Alternatives on Chum Salmon” that already appears in the text.

Uncertainty and Expected Direction of Impacts

The uncertainty in fleet response and WAK chum bycatch permeates the impact analysis of the alternatives. As outlined in the report, the RHS program can move the fleet to areas of lower total chum, but potentially higher WAK chum. The strategies available to avoid triggering Alternative 5 corridor closures will reflect similar responses to an imperfect proxy.

The SSC recommends an expanded analysis and discussion of how incentives to reduce total chum bycatch and uncertainty interact with the range of Alternative 2 and 3 caps. Specifically, the outcomes for WAK chum will vary in the degree to which the fleet is incentivized to move to avoid total chum bycatch. The retrospective tables show variability in the prevalence of WAK chum within total chum bycatch and therefore uncertainty when considering future fleet WAK bycatch.

The SSC supports the use of Table 1-5 describing expected impacts of Alternatives 2 and 3, but suggests the analysts expand the discussion of how uncertainty in WAK bycatch varies with a cap to better justify the directions of the arrows. This discussion could build on the current retrospective analysis and consider the relationship between cap size and expected impact. For example, at a total chum cap of zero there would be no uncertainty in Alternative 2 performing better than Alternative 1 in terms of chum bycatch savings. At very low caps, Alternative 2 would have a higher likelihood of reducing WAK chum bycatch compared to Alternative 1, under the assumption that outcomes from past years fully characterize potential outcomes under Alternative 1. On the other hand, very large caps (e.g. the 550,000 cap, which is higher than the chum bycatch in all previous years) are unlikely to induce fleet behavior change relative to Alternative 1, so no impact on WAK chum bycatch would be expected relative to the status quo.

For the intermediate caps analyzed in the document, fleet behavior is likely to change as the fleet seeks to avoid total chum bycatch. For higher caps within the intermediate range, uncertainty in the composition of bycatch introduces uncertainty over the WAK chum bycatch relative to the status quo. However, for lower caps in the range examined, the analysts could build on the retrospective analysis to make some inference about the likely impact of Alternative 2 relative to the status quo. For example, for a 100,000 chum cap and the highest (annual, spatially aggregated) prevalence of WAK salmon in overall chum bycatch (25.1%, Table 3-12), meeting this cap would result in WAK bycatch of 25,100 fish. This is below the level observed in 11 of the last 13 years. Assuming the range of past WAK chum ratios represents ranges under future environmental and behavior conditions, this suggests that such a cap is very likely to lead to WAK chum savings relative to the status quo.

Evaluation of Alternative 4

The SSC recommends the analysts clarify the difference in potential impacts between Alternative 1 and Alternative 4. As indicated in the presentation, an Alternative 1 must represent current conditions; however, recent past and current conditions include any changes that fleets made due to the Council request to industry to take immediate steps to avoid chum salmon in the 2022 B season following the high chum salmon bycatch year in 2021. It also includes the recent series of changes to the fleet IPAs, including those that align the fleet IPAs with Alternative 4. The SSC suggests reframing Alternative 4 and its expected impacts, which in current form attributes future benefits to Alternative 4 implementation but considers associated ongoing costs to be part of the status quo. The SSC recommends interpreting the impact of Alternative 4 as removing the possibility of reverting to pre-2022 status under Alternative 1 by removing some or all of the Alternative 4 provisions. Then, the impact of Alternative 4 is that the fleet:

- Continues to incur any costs associated with the IPA provisions; and
- Continues to implement actions that generate either WAK savings or unintended increases in WAK bycatch.

The text, tables, and figures should all be consistent in the presentation of the expected impacts.

Combined Effects

The SSC recommends changes related to analysis of the alternatives outlined above carry forward into the analysis of combined effects.

Further Context
Public comment and SSC discussion paralleled an SSC comment from April 2024 regarding business and community level interdependencies between pollock and other fisheries:

> **"…** *conditions have evolved with the closure of major crab fisheries, declines in Pacific cod, and downturns in the halibut and sablefish fisheries, all of which create uncertainty for processing operations and the communities in which they operate in general … these sector and community context conditions have the potential to substantially influence the nature and magnitude of potential direct, indirect, and cumulative impacts related to the proposed action."*

The SSC recommends to the extent practicable that the analysts further develop this issue as it is important to the qualitative if not quantitative characterization of vulnerability and resilience capacity at the community level for fishing communities substantially engaged in or dependent on the Bering Sea pollock fishery. This would be especially valuable for communities with substantial support service sector activity and infrastructure that supports multiple pollock fishery sectors, as discussed during the staff presentation and noted in public testimony. The SSC further specifically requests the analysts edit Table 4-2 to put the discussion of potential crew spending impacts in perspective relative to other potential community impacts.

Suggested edits to address minor errors and typos in the document have been provided directly to the authors.

SSC Member Associations

At the beginning of each meeting, members of the SSC publicly acknowledge any direct associations with SSC agenda items. If an SSC member has a financial conflict of interest (defined in the 2003 Policy of the National Academies and discussed in Section 3) with an SSC agenda item, the member should recuse themselves from participating in SSC discussions on that subject, and such recusal should be documented in the SSC report. In cases where an SSC member is an author or coauthor of a report considered by the SSC, that individual should recuse themselves from discussion about SSC recommendations on that agenda item. However, that SSC member may provide clarifications about the report to the SSC as necessary. If, on the other hand, a report is prepared by individuals under the immediate line of supervision by an SSC member, then that member should recuse themselves from leading the SSC recommendations for that agenda item, though they may otherwise participate fully in the SSC discussion after disclosing their associations with the authors. The SSC notes that there are no financial conflicts of interest between any SSC members and items on this meeting's agenda.

At this February 2025 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. On C1 Cook Inlet salmon SAFE, Dana Hanselman is second level supervisor of Lukas DeFillipo, and third level supervisor of Josh Russell. Dr. Hanselman is second level supervisor of Patrick Barry and Lukas DeFillipo on C2 DEIS on chum salmon bycatch management action. Robert Foy is the third or greater level supervisor for Lukas DeFilippo, Patrick Barry, Josh Russell, and Bridget Ferriss. Jason Gasper was involved with the early development of C2 DEIS Alternative 5. Finally, Mike Downs was the primary author of the Social Impact Assessment component of the February 2024 Amendment 16 Environmental Assessment/Regulatory Impact Review (EA/RIR) that is incorporated by reference in the C1 Cook Inlet Salmon SAFE, but was not involved in the 2025 Cook Inlet Salmon Harvest Specifications EA/RIR.