

# M E M O R A N D U M

**TO:** Scott Brewer

**FROM:** Larry Lestelle

**DATE:** October 18, 2022

**RE:** Status review of the Hood Canal summer chum ESU's populations for the State of Salmon 2022 report

I have reviewed the materials that were provided to us that are being used as part of the Status and Trends Analysis for the State of Salmon (SOS) report being prepared by WDFW and the GSRO. My comments and suggestions related to these materials follow.

Some of my comments here are taken from the 2018 Guidance Report that was prepared by a technical team for the Hood Canal Coordinating Council (HCCC). I would suggest sending that report, along with the 2014 Guidance Report, to the team working on the SOS report.

1. The SOS analysis treats a recovery goal (i.e., delisting criteria, as used by NMFS) as a single, fixed number for an abundance threshold for a population. However, the Puget Sound TRT (PSTRT) identified the abundance criterion for the two summer chum populations as a family of values associated with possible combinations of intrinsic productivity and capacity parameters that define a stock-recruitment curve; values vary depending on average exploitation rate (Sands et al. 2009).
  - The range of average spawning escapements that would be associated with thresholds to define the 5% risk level for the two populations based on the viability analyses performed by the PSTRT are shown in the following table (from Sands et al. 2009, page 39); ER is the assumed fishery exploitation rate, Prod is intrinsic productivity, Cap is capacity, and Esc is the expected average spawning escapement (different values of exploitation were assumed to show the effect on viability thresholds):

**SJDF population**

ER	Prod = 3.0		Prod = 4.0		Prod = 5.0		Prod = 6.0	
	Cap	Esc	Cap	Esc	Cap	Esc	Cap	Esc
0.0	4,300	5,100	3,700	4,800	3,300	4,500	3,300	4,700
0.1	5,300	5,400	4,500	5,100	3,900	4,700	3,700	4,600
0.2	6,500	5,500	5,300	5,100	4,700	4,800	4,500	4,800
0.3	9,500	6,400	7,100	5,600	6,300	5,400	5,500	5,000

**Hood Canal population**

ER	Prod = 5.0		Prod = 6.0		Prod = 7.0		Prod = 8.0		Prod = 9.0	
	Cap	Esc	Cap	Esc	Cap	Esc	Cap	Esc	Cap	Esc
0.0	17,000	20,600	15,000	19,100	14,000	18,400	13,500	18,300	13,000	17,900
0.1	20,500	21,500	18,500	20,400	17,500	20,000	15,500	18,300	15,500	18,600
0.2	27,000	23,900	23,500	22,000	21,000	20,700	20,000	20,200	17,500	18,200
0.3	35,000	25,300	29,000	22,500	27,500	22,300	25,500	21,500	24,000	20,800

**Biostream Environmental**

- The SOS analysis performed by WDFW assumed that the recovery goals for the SJDF and Hood populations are 5,100 and 21,500 spawners respectively. As seen in the table above, these numbers are within the ranges that would be associated with combinations of capacity, intrinsic productivity, and exploitation rates used in the PSTRT analyses – but it is not correct to assume that those two numbers were ever adopted as accepted recovery goals.
  - I assume that the WDFW staff that prepared the SOS analysis identified the two numbers used as goals as a way of simplifying their analysis as part of the overall statewide effort that they were tasked with doing. This is understandable – but my point here is meant to avoid any possible misinterpretation or misapplication that might be made from the SOS report.
2. The recovery goals employed in the SOS analysis are from outdated viability analyses.
- The recovery goals being used in Step One of the SOS analysis are derived from an outdated viability analysis. That analysis was originally prepared by the PSTRT in 2007 (draft report; Sands et al. 2007), and then published in final form without any changes as a NMFS report in 2009 (Sands et al. 2009).
  - The NMFS final supplement to the HCCC recovery plan (2005) accepted the results of the PSTRT’s viability analysis in describing recovery goals (i.e., delisting criteria, as used by NMFS in the supplement) (NMFS 2007). But NMFS made it clear that the goals were likely to be updated as new information became available, as seen in the following statements:
    - Page 25 – *“The co-managers and HCCC continue to collaborate with the PSTRT on developing approaches that will further clarify the relationship between the interim recovery goals and the PSTRT’s viability criteria. Additional quantitative analyses to determine historical habitat capacity, for example, may be conducted during the initial phase of Plan implementation. Results from those analyses would provide a third analytical approach for verifying the co-managers’ interim goals and PSTRT viability criteria, the rebuilding strategy between the two, and making informed refinements if necessary as part of the adaptive management program.”*
    - Page 28 – *“For this reason, NMFS considers the population viability criteria to be an adaptively managed part of the recovery plan. As new data and modeling results become available, the population viability criteria will be refined over time as necessary. NMFS also expects that management objectives for diversity and spatial structure will be further refined over the next several years as part of recovery plan implementation.”* (emphasis added here by me)
3. The viability analyses have been updated since the PSTRT’s original work as well as associated viability thresholds.
- The viability analysis has been updated three times since 2010: (1) in the 2014 Guidance Report (Lestelle et al. 2014), (2) in the 2018 Guidance Report (Lestelle et al. 2018), and (3) for a report provided to NMFS in 2020 to inform the 5-year status review (Lestelle 2020).
  - All of the modeling done as part of these updates was performed by Norma Sands using the VRAP model in exactly the same manner as it was employed by the PSTRT (Sands et al.

2009). Dr. Sands was recently retired from NMFS when we published the 2014 Guidance Report, and subsequently worked under contract to HCCC for the 2018 Guidance Report and for the 2020 update. Dr. Sands was the chair of the PSTRT during the period when consultation was occurring on the Hood Canal summer chum ESU.

- Co-authors on one or both of the guidance reports issued in 2014 and 2018, besides myself and Dr. Sands, included Thom Johnson (retired from WDFW but then working for Point No Point Treaty Council), Mark Downen (WDFW), and Richard Brocksmith (HCCC).
- The three updated viability analysis reports were distributed to relevant co-manager staff, as well as to relevant NMFS staff. Meetings occurred with the co-manager entities and NMFS to present the results of these updates.
- Even though associated thresholds for the 5% risk threshold changed appreciably under the updated viability analyses, there was never an effort to have “updated recovery goals” formally adopted by either the co-managers or NMFS. It was not considered to be needed since recovery planning was on-going and these agencies were either involved directly or were being kept informed. As noted above, the NMFS recovery plan supplement (2007) stated that updates to the viability analyses could be expected.

4. Results of updated viability analyses.

- A comparison of minimum abundance viability thresholds for the SJDF and Hood Canal populations from the three viability analyses performed up through 2017 is given in the table below (reproduced from Table 5 in Lestelle et al. 2018):

**Table 5. Minimum abundance viability thresholds for the SJDF and Hood Canal populations of summer chum as given in Sands et al. (2009) derived using the VRAP model and as updated in the current analysis (2017 update). ER is exploitation rate and P is intrinsic productivity. Escapement values are arithmetic means as in Sands et al. (2009). Results from Lestelle et al. (2014) are also shown for comparison.**

Population	ER	Assessment	Range of average escapements		Capacity range	
			Low	High	Low	High
SJDF	0%	Sands et al. 2009	P=6 4,700	P=4 4,800	P=6 3,300	P=4 3,700
		Lestelle et al. 2014	5,700	6,200	5,100	6,300
		2017 update	6,300	6,600	4,600	5,400
	10%	Sands et al. 2009	4,600	5,100	3,700	4,500
		Lestelle et al. 2014	5,600	6,100	5,800	7,100
		2017 update	6,600	7,000	5,400	6,400
Hood Canal	0%	Sands et al. 2009	P=8 18,300	P=6 19,100	P=8 13,500	P=6 15,000
		Lestelle et al. 2014	8,700	9,100	7,000	7,800
		2017 update	4,800	4,900	3,600	3,900
	10%	Sands et al. 2009	18,300	20,400	15,500	18,500
		Lestelle et al. 2014	8,700	9,600	8,000	9,300
		2017 update	5,000	5,100	4,200	4,500

- The results show that the minimum viability spawning escapements in the 2017 update compared to the PSTRT values increased for the SJDF population and decreased for the

Hood Canal population. The largest amount of change from the PSTRT analyses occurred in the Hood Canal population, dropping by well over 50%.

- It bears noting why these changes occurred. Lestelle et al. (2018) stated (page 45):
  - *“The changes in the viability thresholds are due mainly to longer data sets used in the analysis, which produced more precise estimates of CV (coefficient of variation). This is most evident for the Hood Canal population. For the analysis reported in Sands et al. (2009), high variability in the data set (CV=134%, Table 4) for this population was largely due to the extremely high return from the 2000 brood year (3.5 times as high as the next highest return). The new data added to the data set for both the 2014 and 2017 updates were more within the usual range of data, which has dampened the CV. Such an extreme outlier brood year has not occurred within the data record for the SJDF population, and therefore the amount of change in the CV between the different analyses has been much less.”*
- The 2017 viability update (presented in the 2018 Guidance Report, i.e., Lestelle et al. [2018]) provided a summary of average spawning escapements of natural-origin summer chum at the time when the update was made (reproduced from Table 6 in that report):

**Table 6. Average numbers of natural-origin spawners for the SJDF and Hood Canal populations for three time periods. Averages are shown for both the arithmetic mean (AM) and geometric mean (GM).**

Population	Years	AM	GM
SJDF	1990-1999	660	563
	2000-2009	5,674	4,723
	2010-2016	9,612	8,912
Hood Canal	1990-1999	5,027	2,662
	2000-2009	21,000	16,089
	2010-2016	25,697	22,029

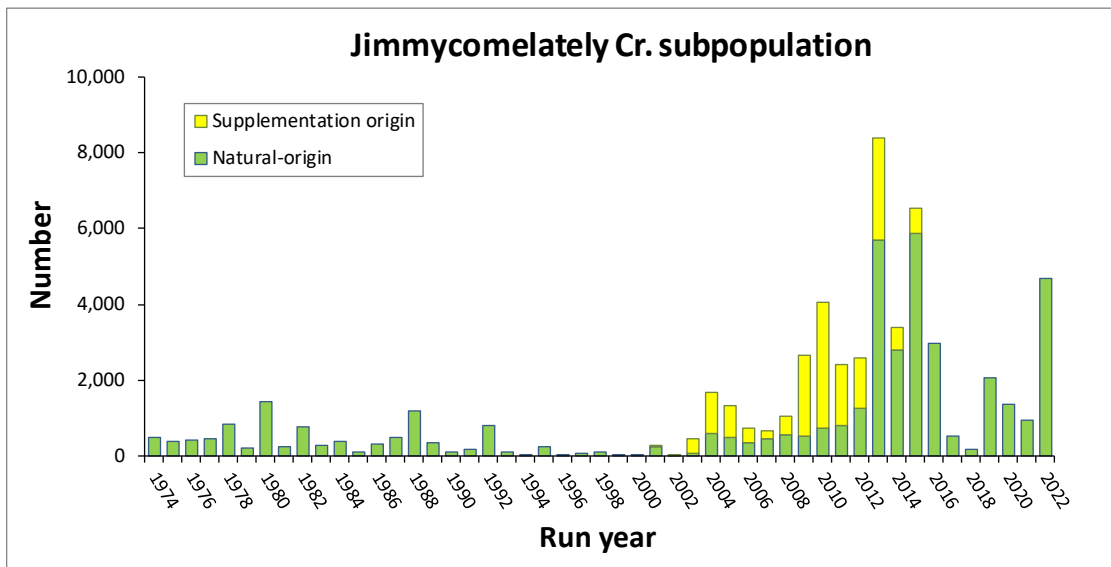
- It bears noting that both the arithmetic and geometric means exceed the minimum viability thresholds produced in the 2017 update for both populations by substantial amounts.
  - Furthermore, it bears noting the differences between the arithmetic means and the geometric means, with the geometric means always being less than the arithmetic means and in some cases by a very appreciable amount.
5. Use of recent 5-year means does not address the PDO effect.
- The SOS analysis as it pertains to the Hood Canal summer chum ESU fails to recognize the effect of PDO shifts on population performance – but the PDO is a major influencer of population performance. Much attention has been given to this in recovery planning and viability analyses for the ESU (see the two guidance reports issued by HCCC).

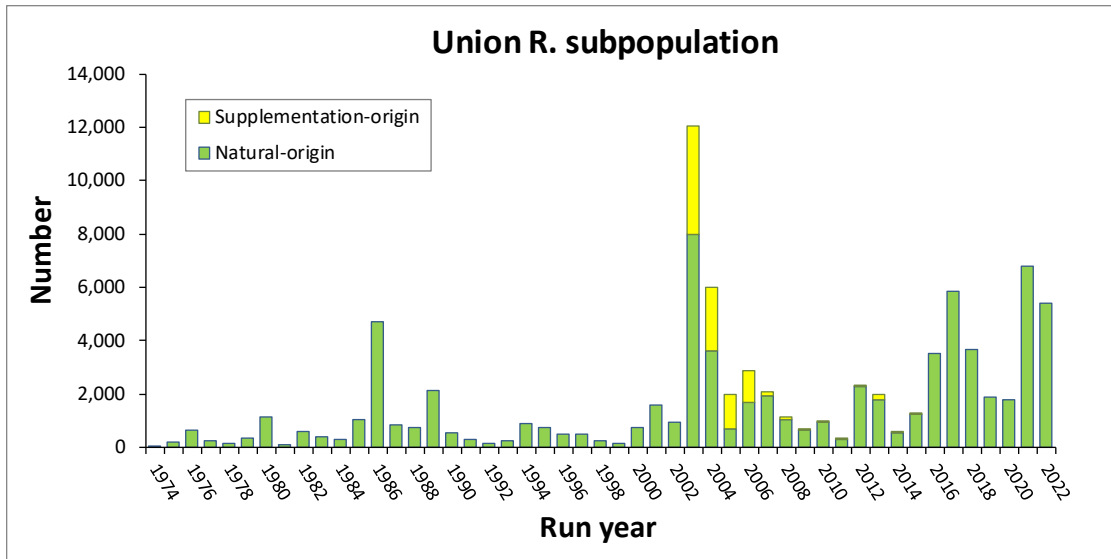
- The effects and role of the PDO need to be taken into account in assessing population performance, viability, harvest regimes, recovery actions, and delisting.
  - Use of the most recent 5-year geometric mean in the SOS analysis is subject to sending a wrong message about population performance if transition years are included and not explained. In this update for the SOS report, this is what happened. The previous report (2020 update) included some very high year production—but in this current update all five years had dropped much lower due to a regime change. This is the reason why the 2018 Guidance Report used longer periods to calculate averages for comparisons (see Table 6 above).
6. The trend lines for the summer chum populations are the steepest of all DPS units except one.
- It is important to note that the trendline for the Hood Canal summer chum DPS is the steepest among all of the DPS units reviewed in the SOS report except for one unit, that being Snake River fall Chinook.
7. Use of geometric mean values in the SOS report for Hood Canal summer chum is inconsistent with the calculation of the viability threshold metrics used by PSTRT.
- The PSTRT in Sands et al. (2009) computed the threshold spawner abundance metrics as arithmetic means, not geometric means. I have discussed this matter at some length with Dr. Sands. She acknowledges that the VRAP model should be configured to calculate the geometric mean, but the fact is that the version she has used is coded to produce the arithmetic mean. See the following pages and footnotes in Lestelle et al. (2018) for relevant discussion: footnote 17 on page 35, page 43 and related footnote 25, Table 5 on page 44 and related footnote 26.
  - If VRAP had calculated the geometric means and then been used in the Sands et al. (2009) report, the thresholds would have been lower—therefore, if such values were used in the SOS report, then the percentage of how much of the recovery goals have been achieved would be higher. More simply, the conclusion would be that the two summer chum populations are closer to recovery than appears using arithmetic means as reported in the SOS report.
8. Recovery status needs to consider more aspects of VSP parameters besides abundance.
- As the authors of the SOS report realize, consideration of recovery status needs to be given to the full set of VSP parameters that define viability. Abundance alone is insufficient. The 2019 Guidance Report for the Hood Canal summer chum ESU devotes substantial analysis and discussion to spatial structure. This aspect of viability is very important to assessing status of the ESU.
  - Two subpopulations that were considered to have been extirpated at the time when the ESU was ESA listed have rebounded – one naturally (Skokomish) and one by reintroduction (Chimacum).
9. Substantial recovery planning and related work is on-going for the summer chum ESU.

- HCCC met recently with NMFS, including with Scott Rumsey, the Acting Regional Administrator for NOAA Fisheries’ West Coast Region, to discuss current ESU status and efforts to achieve delisting. As part of the discussion, we provided an overview of the various efforts that have been taken to update relevant analyses, including viability analyses, and the patterns of subpopulation abundance through time. Discussion included how best to communicate current status for the sake of recovery planning.
- A collaborative process was very recently initiated between HCCC and the relevant co-managers to review and update all relevant aspects of the recovery effort needed to achieve delisting. This process is expected to result in some form of an updated recovery plan, which would necessarily include updated recovery goals and related viability thresholds.

10. What is the message to be given through the SOS report for the status of the Hood Canal summer chum ESU?

- The 2020 version of the SOS report concluded that the ESU is approaching its recovery goal.
- The preponderance of available information indicates the status remains unchanged, if not being even closer to the goal. The Step One for the draft SOS report appears to conclude that the population performance of the ESU has slipped from where it was when the 2020 SOS report was issued. Such a conclusion would be inconsistent with the preponderance of available information.
- The returning run sizes in 2022 for the subpopulations that comprise the two ESU populations are coming in strong. Data are still being collected and finalized numbers will be assembled over the next 6 weeks. But to illustrate, the following two charts show the run size patterns for two of the subpopulations—the most northern one (Jimmycomelately, part of the SJDF population) and the most southern one (Union, part of the Hood Canal population). Spawner information for these two subpopulations is collected from trap counts and therefore was readily available to be included here.





## References

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