

Meeting Summary
 Snohomish Basin Salmon Recovery Technical Committee
 Web Conference
 9am – 12pm, November 3, 2020
****Special Session: Snohomish Hatchery Panel***

In attendance (*Panelist names are italicized*):

Name	Group/Affiliation
Mindy Rowse	NOAA
Nicholas Chambers	?
Luke Hanna	?
Pete Verhey	WDFW
Roser	?
<i>Alex Sweetser</i>	<i>NWIFC</i>
Anne Savery	?
Dave Beauchamp	USGS Western Fisheries Research Center
DFinne	?
Hflo490	?
Iris Kemp	Long Live the Kings
Jessica Olmstead	DNR
<i>Adrian Spidle</i>	<i>NWIFC</i>
Alex Pittman	Snohomish County
Amber Moore	Puget Sound Partnership
Brett Shattuck	Tulalip Tribes
Carson Moscoso	Snohomish Conservation District
Channing Syms	WDFW
Chris Ewing	King County
Colin Wahl	Tulalip Tribes
Cory Zyla	Snoqualmie Watershed Forum
Daniel Howe	Snohomish County
Daryl Williams	Tulalip Tribes
Dawn Presler	Snohomish County PUD
Denise Krownbell	Seattle City Light
Doug Hennick	Wild Fish Conservancy
Eli Tome	Forterra
Elisa Dawson	Snohomish County
Elissa Ostergaard	Snoqualmie Watershed Forum
Elizabeth Butler	RCO
Emily Davis	Snoqualmie Watershed Forum
Erin Murray	PSP
Gretchen Glaub	Snohomish County
Gus Kays	King County

Jackie White	Staff to CM Lambert
Jamie Glasgow	Wild Fish Conservancy
Jason Gobin	Snohomish County
Joe Coutu	WDFW
Joe Hovenkotter	King County
John Klochak	King County
Josh Chamberlin	NOAA Fisheries
Josh Kubo	King County
Keith Binkley	Snohomish County PUD
<i>Ken Currens</i>	<i>NWIFC</i>
Kevin Lee	WDFW
Kirk Lakey	WDFW
Kollin Higgins	King County
Kurt Nelson	Tulalip Tribes
Lindsey Desmul	WDFW
Liz Ablow	Seattle City Light
Lorin Reinelt	King County
Mark Ruebel	King County
Marty Jacobson	Ecology
Matt Baerwalde	Snoqualmie Indian Tribe
Matt Distler	Oxbow Farm & Conservation Center
Micah Wait	Wild Fish Conservancy
<i>Mike Crewson</i>	<i>Tulalip Tribes</i>
<i>Mike Haggerty</i>	<i>Mhaggerty Consulting</i>
Mike Rustay	Snohomish County
<i>Morgan Robinson</i>	<i>NOAA Fisheries</i>
Paul Schlenger	ESA
Rick Reinlasoder	King County
Rodney Pond	Sound Salmon Solutions
Ryan Bartelheimer	Snohomish CD
Ryan Lewis	Snoqualmie Indian Tribe
Susan O'Neil	ESA

Meeting Summary:

Introductions and Opening Remarks

Colin opened the meeting. Colin noted there is an opportunity to provide input on the Technical Committee's public comment on the Department of Ecology's Toxics in Fish Implementation Strategy. The comments will be officially submitted on Friday, Nov 6th.

Colin noted that we will be discussing hatcheries today. He noted that the impetus for this meeting is that a Salmon Plan Update for the Snohomish Basin is underway and many changes have occurred since the Salmon Plan was developed in 2005 in terms of how hatcheries are managed. Colin noted that this is a great opportunity to hear from the experts.

Colin reviewed expectations for the meeting and discussed how they developed the agenda for this meeting. This included querying the Technical Committee for questions (Colin received 22 questions), which he then proceeded to discuss with panelists and helped to prepare presentations. Colin then reviewed the agenda.

Participants then split into break-out rooms and discussed why they came to the meeting and what they are most interested in. A few examples of takeaways from the breakouts included that this type of discussion is rare across Puget Sound Lead Entities and it gives them hope for better integrated recovery, an interest in learning more about monitoring and H-integration in general, and an interest in learning more about H-integration after the disbanding of the Regional Integrated Technical Team (RITT).

Colin then introduced all panelists and the topics they'd be speaking on today.

Snohomish Hatchery Programs – Mike Crewson (Tulalip Tribes)

Colin introduced Mike Crewson (Tulalip Tribes) and noted that Adrian Spidle (NWIFC) and Ken Currens (NWIFC) helped develop the presentation. He noted the goal of the session is to present an overview of the purpose and justification for hatchery programs, status and trends data, what has changed since the 2005 Salmon Conservation Plan (the Salmon Plan) was developed, and how hatcheries are being monitored.

Mike Crewson began by emphasizing his great pride in and the significant effort he has put into the Tulalip Tribe's hatchery program. He noted the scope of the program is very expansive and that today's presentation was difficult to narrow down. He also noted that this 2020 presentation is a 15-year update by co-managers and invited other co-managers to weigh in throughout his presentation.

Mike noted that the original intent of these programs was to provide meaningful harvest in local recreational and tribal commercial ceremonial and subsistence fisheries. He noted these programs serve other purposes too, such as serving as key Indicator Stocks to assess local natural populations. Mike recognized that these programs can only partially address the impacts of ecosystem degradation and no one is claiming that hatcheries can replace those impacts, but they are the mitigation for those impacts. He noted addressing those impacts ultimately require protection and restoration actions outlined in the Salmon Plan.

Mike also shared an overview of the hatchery programs in the context of Treaty Rights. He emphasized that the co-managers' Snohomish Hatchery Program is indispensable to Tulalip Tribes.

Mike provided background on what has changed since the Salmon Conservation Plan was developed in the mid-to-late 2000s. He noted that all hatchery program monitoring aspects from the Salmon Plan have been retained and improved. These improvements pertain to both the scope and scale of monitoring efforts. He noted that monitoring efforts are closely

coordinated in objectives with hatchery co-managers. Mike directed participants to the monitoring objectives and methods that are documented in the Hatchery Genetic Management Plans (HGMPs) for salmon and 2 additional HGMPs for steelhead. He noted that all HGMPs have been evaluated in NOAA, NMFS, ESA, and NEPA assessments, completed in 2017 and currently being updated in 2020 (for salmon programs). He noted that the summer steelhead program is being phased out.

In terms of what has changed since 2005, Mike noted there have been general improvements in hatchery methods. He called attention to Tulalip's adaptive management program. Mike noted that basin co-managers have agreed on every number since the 1960s, which no other basin can claim in the Puget Sound. He noted that 7,300 samples have been taken since the program began.

Mike further described improvements in the number and scope of hatchery and fishery stock assessment, describing sample collections since 2005 and improvements in laboratory sample analysis. For instance, he noted that today, 100% of samples collected each year are analyzed, whereas prior to 2005, maybe 100-200 adult samples would be analyzed out of concern for subcontracting expenses. He noted this improvement is important as it helps to ensure precision and accuracy. He noted that these data are entered into a comprehensive database. Mike emphasized how big of an improvement this was, as there was no data when he arrived, aside from a binder with just 1 year of data.

Mike noted other important changes in hatchery operations and associated monitoring are too expansive for today's discussion and the available time. He referred participants to HGMPs, NMFS and NEPA scoping evaluations, and ESA assessments for more information.

Mike described improvements to monitoring and management of adult Chinook, including: changes to broodstock sources (e.g. to local natural Skykomish summer Chinook at both hatcheries). He also described efforts to improve sampling, such as testing experimental rearing and release methods. He noted that they greatly expanded post-release juvenile monitoring in estuary, nearshore and new offshore marine sampling. Mike noted that staff will conduct intensified sampling (e.g. record relative abundances, size, growth [otolith and scale collections and laboratory analyses]). He described other improvements, including how coded-wire tagging has been greatly expanded, improvements in release practices, and how steelhead rearing and release practices have been improved. Another improvement Mike described was a new effort to monitor juvenile salmon of natural-origin and hatchery-origin before and after release.

Mike provided an overview of production goals over the past two decades. He emphasized that yearlings get 4 times the survival as sub-yearlings. Mike noted that they are trying to reduce the program size. He noted their production level is around 2.4 million and that they are trying to move up to a higher production level. He shared commentary on various release goals. He noted they are authorized to release up to 2 million coho, but they have no intention of doing so. Mike described goals for chum salmon: the goal is for 8 million fish, but the hatchery has never really gotten to this goal; they are closer to 6 million. Mike noted that 391,000 chum

were released last year and that the run was 90% below average. The run continues to collapse. Mike discussed steelhead release goals (2000-Present). He noted that the segregated program for winter steelhead is being phased out.

He shared ideas on the Broodstock Management Strategy by species and race. Mike noted that all Chinook and coho salmon programs are being integrated. He shared an overview of the Snohomish Region Monitoring and Adaptive Management Strategy and outlined four main steps for the monitoring strategy.

Mike shared status and trends results of selected populations, including the Skykomish and Snoqualmie Chinook Escapement Trends (1965-2019). He noted that if you look at the larger dataset, you might conclude there's been no major change, but when you focus in on recent years, there are steep declines. Mike also provided an overview of data illustrating the difference between natural-origin fish in the Snoqualmie and Skykomish. He noted that while hatchery-origin fish is declining in both basins, they aren't declining at the same rate, meaning that a key reason why hatchery-origin fish make up a higher fraction of populations in basins like the Snoqualmie is because natural-origin decline is occurring at a faster rate than hatchery-origin. He highlighted data gaps from 2001-2006.

Mike shared thoughts on risk management in the context of the monitoring and adaptive management program. He described the hatchery risk monitoring results, including genetic risks in the context of Tulalip hatchery chinook pHOS (proportion of Hatchery-Origin Spawners). He noted the Tulalip fraction in Snoqualmie averaged 10.4% from 1997 through 2006, but that since then, it has declined to just 3.4%, due to continuous improvement in the integrated broodstock program. Mike noted that anything that kills a wild fish will increase pHOS. Mike provided general background on how calculations for pHOS are derived.

Mike shared data from WDFW's incidental harvest and exacerbation of harvest-related effects. He emphasized that fisheries remain highly mark-selective. Mike shared how Tulalip shifted harvest activities to the benefit of wild fish.

Mike described how abysmal recent years have been in terms of returns. He connected this point to a discussion on how environmental conditions affect hatchery risks and how hatchery risks compare to the risk of other impacts (climate change, flooding, habitat, or harvest). He noted that 2019 was the lowest escaping going back through 60 years of records. He noted these were the four-year old returns from the 2015 Blob. Mike described how marine survival was extremely poor in 2015. He noted that combined environmental conditions such as lower than normal summer low flows and high temperatures led to many systems being above state temperature standards. Mike emphasized that these low returns are not due to hatchery production and that we should really care about these other drivers and factors more.

Federal Regulation - Morgan Robinson (NOAA)

Colin then invited Morgan Robinson to introduce herself. She noted she's part of NOAA's West Coast Region hatchery branch. Their main mandate is to ensure hatcheries are operating as

required under the Endangered Species Act (ESA) and National Environmental Policy Act (NEPA). Morgan explained that she is here today to speak about the National Marine Fishery Service (NMFS) Analysis of Snohomish Basin Hatchery Programs under these Acts.

Morgan shared an overview of 47 listed species in NMFS West Coast Region. She noted that in her branch, they mostly focus on hatcheries and their analyses focus on ESA-listed salmonids. She is the lead biologist for a number of consultations across Puget Sound.

Morgan provided an overview of NEPA (1970). Morgan emphasized that before, during, and after consultations, NOAA requires a lot of co-managers. She noted NEPA requires federal agencies to evaluate the environmental consequences of their actions or actions the Federal government is permitting others to undertake, that NEPA is not regulatory, and that NEPA documents are intended as a planning exercise and as a public information product. Morgan noted that NEPA considers a broad “Human Environment” when comparing alternatives (e.g. fish and wildlife species beyond ESA-listed species; economic impacts; impacts to cultural and heritage resources; water quantity and quality; social justice).

Morgan then provided an overview of the ESA (1973). She noted that the ESA gives joint authority to NMFS and the US Fish and Wildlife Service (FWS) to ensure an action is not likely to jeopardize the continued existence of any endangered species or threatened species. She provided a definition of ‘take’ and how a ‘take exemption’ can be secured by undergoing a consultation (i.e. by submitting a HGMP). Morgan provided an overview of how an ESA authorization for hatchery programs is obtained, and the role of submitting HGMPs and the iterative consultations with Federal partners.

She then described which NEPA documents have been created for Snohomish hatcheries. Morgan described how a detailed Environmental Assessment (EA) was prepared and that the outlined action was determined to not have a significant effect, resulting in a ‘Finding of No Significant Impact’ (FONSI) in 2017. She noted a supplemental EA is now being proposed. She also noted that NMFS prepared a Biological Opinion (BiOp) that evaluated effects of the hatchery operations outlined in the HGMPs. Morgan then provided more detail on important aspects of BiOps (e.g. proposed action, environmental baseline, analysis, terms and conditions, Incidental Take Statement, re-initiation trigger, and annual reporting requirements). She noted BiOps are also iteratively developed between co-managers and NMFS.

Morgan then described the areas of analysis that NMFS focuses on for hatchery programs, including: effects of broodstock collection, effects of hatchery fish and their progeny on the spawning grounds and rearing areas, migration corridors, estuaries, oceans, research and monitoring, operation and maintenance, and the effects on fisheries due to hatchery programs (via NOAA’s Harvest Branch). She noted that NMFS uses this information to produce a Viable Salmon Populations (VSP) approach (e.g. how do hatchery programs impact stock abundance, diversity, etc.). Morgan shared key points on which areas are considered in the Snohomish BiOp. She noted a range of areas, including identifying the purpose of the hatchery program in

the context of the “all-H integration” strategy. Morgan also provided an overview of NMFS’s role in moderating and monitoring hatchery effects.

Morgan noted that Snohomish Salmon Hatcheries were officially authorized in 2017; currently, discussions on re-authorization have been initiated to authorize increases production, add a native chum program, and perform estuary monitoring research. She noted how facility upgrades will improve water quality. Even in the face of production increases, Morgan noted that there isn’t another program in Puget Sound that has this complex of an integration strategy. She then provided an overview of annual reporting requirements from co-managers.

Discussion

Emily Davis (Snoqualmie Watershed Forum) asked if the most recent version of the HGMPs are available to read, and if so, where they can access them. Morgan noted that NOAA does not release Tribal documents; it’s part of the trust relationship (unless they are ordered to do so by a judge). She noted what they do release are NOAA documents. Draft documents are generally not shared with the public. She noted that it doesn’t mean you can’t see these documents, you just need to request those from co-managers.

Morgan noted that the BiOps and EAs do contain a lot of the same info as HGMPs. So you can get a good understanding of what was included in those HGMPs. She encouraged participants to establish relationships with co-managers if you are seeking this info.

Emily asked if the results from the RRS study are available. Morgan noted that they summarize the results of that in the 2017 BiOp and referred participants to co-managers regarding if the results will be published. Mike Crewson added – in regards to HGMPs - that the hatchery plans have been kept more up to date than other watersheds, and there is a new one for 2020 and it may be the best source of info on the hatchery programs, as they are living documents.

Colin noted that there will be more opportunities to discuss after the next presentation.

H-Integration – Ken Currens (NWIFC)

Ken Currens (NWIFC) presented an overview of H-integration in the Snohomish Basin. His presentation aimed to discuss how these evaluations are integrated across all 4 H’s (habitat, harvest, hatchery, hydropower), what the history and basis for H-integration is and how it fits with consultation, and how the current work dovetails with the previous strategy.

Ken emphasized that he thinks H-Integration “is the single greatest challenge in salmon recovery”, and that the presentation would be high-level. He provided a definition of H-integration originally from the Puget Sound Technical Recovery Team (TRT): “... is the coordinated combination of actions among all sectors – harvest, hatchery and habitat – that together work to achieve the goal of recoverin self-sustaining, harvestable salmon runs.” .

Ken began by posing the question “why is H-integration so hard?” He noted that we continue to perpetuate the myth that habitat is one “H”, when it isn’t—habitat covers many jurisdictions,

many pressures, and many stressors. Ken shared a Drivers, Pressures, State, Impact, Response (DPSIR) Model for Salmon Recovery and emphasized the importance of thinking about the pressures identified in this model. He noted that each of these pressures has different sets of decision-makers, stakeholders, legal mandates, and economic incentives that need to be addressed if you want these pressures to change (e.g. energy production, transportation corridors, invasive species, etc.). He also noted that H-integration is not just a technical problem: there is a nexus between equity (Policy and Legal) and efficiency (Technical), and there are very few win-win solutions. Ken noted this is what political scientists call “wicked problems”, aka very complex problems which are dealt with through accommodation and compromise and we end up in a general zone where no one is entirely satisfied. Ken also noted that it is very difficult to find common denominators across different sectors and ecosystem elements (e.g. hatcheries and habitat) that will enable us to make apples-to-apples comparisons between these Hs.

Ken then provided an overview of six steps for H-Integration from the National Academy of Science and Puget Sound RITT. Step 1 is to identify the people that need to participate and how to involve them. Ken noted it isn’t the people on this call. Step 2 is to gain a shared understanding of how the system works – habitat conditions and fish populations together. Step 3 is to gain on common goals and outcomes. Ken noted the key isn’t to develop a model, it is developing these common goals. Step 4 is to examine, evaluate and select a suite of complementary actions across the H-s to achieve those outcomes. Step 5 is to document rationale, implementation steps, and expected outcomes. Step 6 is to build and implement a verification, effectiveness and accountability monitoring system.

Ken provided a thought experiment: “What happens if we think about habitat the way we think about hatcheries?” He described the concept of “genetic load” (i.e. selection for a phenotype in an environment that is not the optimum has fitness consequences that are a load on the population; e.g. the Ford Model, the All-H Analyzer (AHA) Model, Hatchery Science Review Group (HSRG) guidelines and metrics are based on this concept). Ken noted that the environments we’re interested in are the hatchery environment and the wild environment. He noted that this is not the only selection of fish: changing environments are also important (e.g. climate change; wild vs. “new wild”). He noted this requires a selection load between an old environment and new environment.

Ken then provided a few examples. First, he described the estimated egg-to-fry survival v. flood recurrence interval for Chinook Salmon in the NF Stillaguamish River. He noted that the authors of the study largely believe changes are primarily due to a changing climate (survival is different due to changing flood intervals and magnitudes). Ken asserted that this is an example of a genetic load from anthropogenic environmental change, and that we can think about habitat in the same way, if we have the data. Ken then shared the example of Sandy O’Neil *et al.* 2015 study on toxic contaminants in juvenile Chinook salmon migrating through estuary, nearshore, and offshore habitats of Puget Sound, and noted how we could apply similar thinking. Ken asked: “What would happen if we held genetic load from habitat changes to HSRG standards”, with the example of habitat change from temperature. He noted the fitness trait would be

aerobic scope as it is important for migrating salmon, and that some have taken aerobic scope to determine fitness curves. Specifically, he provided an example for sockeye salmon on the Fraser River in British Columbia, which showed that phenotypic optimum is closely tied to current local environmental conditions and populations differences reflect local adaptation. He noted this suggests that sockeye on the Fraser River have been under strong selection for aerobic scope and that it's a fitness trait. Ken described how he proceeded to calculate genetic load for different temperature changes using this aerobic scope fitness curve (e.g. to adapt to climate impacts, by using the Burger-Lynch Rule, temperature change must hold to $<3^{\circ}\text{C}$ over the next 100 years on the Fraser River if sockeye salmon are to survive). Ken noted that thinking about management approaches from this perspective allows for common denominators.

Ken then provided an overview of the *Phases of Recovery Concept* (e.g. low to high: preservation, recolonization, local adaptation, recovered). He noted that while the concept is useful, it is not easy to apply as: recovery is not linear; HSRG phases are not the only states that populations can be in; in their experience, they could not define transition between stages; and there's no clear biologically defined thresholds (or at least, these thresholds are extremely rare).

Ken described how their work is interested in the transition between phases defined by when trade-offs change between "Hs". Ken and Alex Sweetser, a research fellow at NWIFC, just did extensive 1:1 interviews with managers, decision-makers, analysts from Puget Sound tribes, WDFW, NOAA, HSRG, and consulting firms. The goal of their work is to identify trade-offs and sensitivity to changes in different conditions using an analytic process network (ANP) model within a DPSIR framework. Ken provided a simplified example that illustrated the sensitivity for node recolonization, comparing preservation, mitigation, and recolonization against the overall priority and importance of change in habitat conditions.

Discussion

Colin asked **what we can learn from the AHA-modelling effort?** Ken noted that the AHA model is not a predictive model, it's a heuristic model, and its useful for thinking about the strategies to deal with the problem it was designed for. It's not useful for predicting what will happen, it's just not that kind of model. It is useful for turning different management dials. As a critic, Ken noted that it doesn't have good dials to turn on the habitat side, but it does have better dials on the hatchery side.

Colin asked **if Ken and Morgan are part of a genetics work group as well?** Ken noted they have 6 or so people who used to regularly meet. Meeting frequency has slowed, but they are returning to it. Morgan noted that they do have a meeting that contains HSRG members, NOAA scientists, geneticists from NFMS, and they have guest speakers periodically. She noted that a key retirement (a co-chair of the group), COVID impacts, and other challenges have prevented regular meetings, but they are ramping back up.

Where do sociocultural factors come into the DPSIR model? Ken noted that these factors come in under the impacts aspect. He noted that changes in pressures lead to changes in state, and that it's people who ultimately respond (at least in the DPSIR model).

John Klochak (King County) asked **what defines natural-origin fish integration in regards to hatchery releases.** Adrian Spidle (NWIFC) responded that natural-origin fish integration is equal to using natural-origin fish (that emerged from the gravel) as part of broodstock, and that this is done at Wallace River Hatchery. He noted that the Tulalip Hatchery's 1-generation-out integration means that Tulalip's broodstock is 100% Wallace origin, but the Wallace fish are integrated, so Tulalip broodstock was integrated but its progeny will not be; however, those non-integrated progeny are never spawned, they are intended to be 100% harvested as part of the terminal fishery in Tulalip Bay.

Matt Baerwalde (Snoqualmie Indian Tribe) asked **if he heard Mike C. correctly in that it is important to have gene flow toward the natural population and if so, was he referring to mean gene flow from the hatchery to the natural population.** Adrian responded that the point of an integrated program is that the natural system drives the hatchery, so the hatchery fish are allowed to contribute to natural production, or even encouraged to do so, especially in usable habitat that natural fish are not finding. This is offset, from a theoretical genetic standpoint, by incorporated natural origin fish to the hatchery broodstock at a greater rate than hatchery fish contribute to natural production.

Daryl Williams (Tulalip Tribes) noted that 2019 really showed the importance of maintaining the trap and haul facility at Sunset Falls. It also shows that the higher quality habitat above the falls can help mitigate for the climatic impacts that hurt salmon production downstream.

Heather Khan (Department of Ecology) asked **if annual reports are available for other agencies to review** (from the Important Aspects of Biological Opinions slide). Morgan clarified that NOAA/NMFS does not share tribal documents, but that most of the information they contain can be found in summarized form in the Biological Opinions.

Jamie Glasgow (Wild Fish Conservancy) noted that **Morgan mentioned the ESA BiOp standard of review is whether the proposed hatchery programs are likely to "jeopardize the continued existence of listed species" and asked if programs themselves can jeopardize recovery, despite having been determined to not jeopardize continued existence.** Morgan responded that they try to operate these programs in alignment with the Salmon Recovery Plan. She noted that narrative was added under the new Federal administration and updates to the ESA are currently under litigation, so there is new relevant language that they have not been privy to and that she is unable to share more on that. Morgan noted what she can share is that the Snohomish hatchery programs have not been found to be inconsistent with the ESA.

Kollin Higgins (King County) asked **if someone can provide Chinook data/context on how high are the hatchery Chinook stray rates within the Snoqualmie now.** Mike C. responded that the regional fraction has gone down. He noted the Tulalip fraction was what really dropped,

although the average is higher now due to (abnormally) high returns last year. Mike noted that it is clearly driven by a number of poor years. Morgan added that she was surprised to learn that the numbers of returning hatchery fish were quite low compared to what she had heard (e.g. 30 hatchery fish in the Snoqualmie River). She recognized that natural production in Snoqualmie has fallen away, so even small additions of hatchery-origin spawners has large impacts. Morgan wanted to emphasize that the escapement to Snoqualmie by the fall Chinook has really declined even in her short tenure here.

Kollin also asked **how the rate has changed since the 2005 plan, have the stocks that are straying into the Snoqualmie stayed consistent, and if straying is coming from out of basin stocks, where/how/who evaluates the combined impacts of individual out of basin and within basin strays into the Snoqualmie since the Snoqualmie doesn't have its own HGMP being a 'wild stock'**. Mike Haggerty responded that he may be able to partially answer this question. In 2017/2018 they did a dispersion analysis throughout the Puget Sound, looking at all of the donor and recipient populations, including 55 different Chinook populations. He noted they had a threshold they established, a 5% pHOS, and when that is exceeded, they look at contribution levels from each of the 55 programs, then looked at how programs may be changed over time and what their contribution rates might be into the future. With respect to the Snoqualmie, Mike noted that when they evaluated the Green River Chinook Program, they looked at increased production and what that would mean for pHOS in the Snoqualmie, but in the Snoqualmie it's evaluated by each of the proposed actions from each of the contributing watersheds. He added that when you look at the proposed action in the Snohomish watershed, and you look at the baseline and all of the contribution rates from different programs, the biggest contribution comes from the Green River sub-yearling fall Chinook program.

Kollin also asked **if the recent rates are above recommended levels (HRSR, AHA model or any newer guidance)**. Mike H. noted it would depend on who you ask. He noted that they use the population recovery approach from 2010 and that they are essentially the status quo. Mike C. noted this is an important point: HSRG guidelines are the PRA. They are equal and proponents of those guidelines will tell you they are not different, but Mike emphasized that they are. He noted that they are equating those to a population-based approach. Mike C noted that Tulalip never bought into that and they had an extensive response to that comment. He noted the best approach would be to come up with management actions that address those issues instead of writing off areas as a stabilizing population (which they've objected to all along). He noted there are a lot of problems with the entire approach, but he would ask the group one question: does Tribal input matter on this policy? If yes, they have been ignored on this particular policy. They've testified twice and written letters on it, and ultimately been rejected. Mike C noted this is not acceptable and they are still asking the state to help change that policy. Morgan noted the State defined the Snoqualmie as Tier 3, as a stabilizing population.

Kollin asked **given stray rates within the Snoqualmie, what are the expected effects on VSP parameters of the Snoqualmie stock**. Mike C noted that we are clearly seeing some major environmental effects on the population right now that are concerning (10-fold decline in abundance). He emphasized that those are not driven by hatchery impacts. He noted that the

hatchery program is impacted by environmental conditions, and that hatchery program numbers are declining, just not at the same rate as wild populations.

Jamie asked **what the consequences are when, despite best efforts, commitments made in HGMPs aren't met.** Morgan responded that there are two categories: (1) things a co-manager can control, and (2) things they cannot control. She noted that in the scenario where low returns occur, and co-managers have done everything right (everything within their control), there is no consequence. Morgan noted that they are working to build in flexibility into the program. If they can control the impacts and are blatantly ignoring their commitments, Morgan noted she would reach out to them (e.g. if they didn't report out on time; if there's something missing from the report that they agreed to; etc.). NOAA tries to take on more of an educational approach, she noted there haven't been any cases of blatant disregard of responsibilities. Mike C added that he's taken the HGMPs and overall program very seriously and they are meeting their terms and conditions.

Mike C shared the following comment in the chat: in our Snohomish study, genetic-based parentage analysis revealed that spawning location ($P < 0.00001$) and fork length ($P < 0.00001$) were highly significant predictors of reproductive success, origin ($P = 0.008$) and sex ($P = 0.042$) were significant factors influencing reproductive success, whereas brood year was not ($P = 0.622$).

As for what habitats were most productive, the results showed essentially the same results for genetically-effective spawners as we see in our redd count-based escapement estimates, where most of the production comes from the mainstems and larger tribbs- Reproductive success (RS) varied among locations, with the Sky mainstem and larger tribbs producing the most offspring than smaller tribbs as assigned from genetic parentage analysis.

Rodney Pond (Sound Salmon Solutions) shared the following comment: as the Executive Director of an org that sponsors and implements habitat projects and as a project manager myself I can attest that we are frequently left out of the conversations around habit at the planning level. I often feel that we are seen as "worker bees" and "implementers" awaiting opportunities to realize habitat projects. This disconnect leads to ongoing unrealistic expectations on the part of planners and policy makers of what is possible with implementation.

Jamie asked: **Mike mentioned several times the importance of not killing wild fish. While it's complicated (to say the least), is anyone working on reducing non-selective commercial harvest of Snohomish salmon in SE Alaska and elsewhere?**

Matt asked about **progress with steelhead plans in the basin.** Mike H. noted that the winter run program was authorized in 2015-2016 and haven't seen any changes to that proposed action. With respect to summer runs, Mike noted there's an integrated program with proposed release of 116,500 yearling summer steelhead smolt, and the broodstock source being the SF Skykomish summer steelhead captured at Sunset Falls.

Jamie asked **with 10x decrease in abundance caused by environmental factors, doesn't that make the known hatchery impacts (genetic, ecological, fishery) all the more significant? At that reduced abundance, might even minor loss of local adaptations, or reductions in reproductive success, or increases in competitive interactions between hatchery and wild juveniles, have a disproportionate impact on wild fish populations.** Mike C noted that as natural populations crash at this rate – although we're hoping for a turn-around based on this year's return – we still need a hatchery program.

Kollin shared the following comment: I would say that the PRA was not believed to be a good or accurate assessment and the Snohomish Forum I thought wrote a letter to say we don't think that the analysis was correct.

Colin closed out the meeting by thanking panelists for their efforts to prepare for the meeting and all members of the Committee for their questions.

Adjourned at 12:30pm.