GREEN / DUWAMISH AND CENTRAL PUGET SOUND WATERSHED

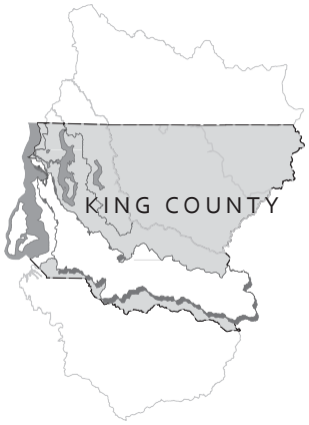
Algona
Auburn
Black Diamond
Burien
Covington
Des Moines
Enumclaw
Federal Way
Kent
King County
Maple Valley
Normandy Park
Renton
SeaTac
Seattle
Tacoma
Tukwila

King Conservation District
Vashon/Maury Island Community Council
Covington Water District
Port of Seattle
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington Department of Natural Resources
U.S.Army Corps of Engineers
Green-Duwamish Urban Waters Partnership

Washington Environmental Council
Green/Duwamish Watershed Alliance
Trout Unlimited/Mid-Sound Fisheries Enhancement Group
Save Habitat and Diversity of Wetlands (SHADOW)
American Rivers

The Boeing Company
Master Builders Association
King County Agricultural Commission

January 18, 2018




Mr. Steve Leider, Fishery Biologist
National Marine Fisheries Service, West Coast Region
510 Desmond Drive SE, Suite 103
Lacey, WA 98503

RE: Duwamish-Green Hatcheries Draft EIS

Dear Mr. Leider,

Thank you for the opportunity to comment on the *Draft Environmental Impact Statement for 10 Salmon and Steelhead Hatchery Programs in the Duwamish-Green River Basin*. Effective, scientifically-sound management of salmon and steelhead is of critical importance in ensuring effectiveness of habitat-based actions being implemented in the Duwamish-Green River Basin under direction of the WRIA 9 Watershed Ecosystem Forum, a state-designated citizens' committee and coalition of local governments and other stakeholders that has been planning and implementing actions to recover the ESA-listed Green River Chinook salmon population since 1998. Although Chinook-focused, the WRIA 9 mission includes conserving and restoring other salmon species and steelhead stocks and making the watershed healthier for people and fish.

In 2005, with broad consensus among stakeholders, the 17 local governments of the Green River watershed approved the *WRIA 9 Salmon Habitat Plan: Making Our Watershed Fit for a King* (hereafter referred to as the "the SHP"). It was federally approved in January 2007 as part of the broader Puget Sound wide Chinook Salmon Recovery Plan. While the Plan focuses on the habitat "H" of the four primary factors of decline (harvest, hatcheries, and hydropower/dams being the other three factors), successful recovery will require integrating all four "H's", as indicated by the federally-adopted Puget Sound Chinook Salmon Recovery Plan, of which the WRIA 9 Salmon Habitat Plan is a chapter.

We are providing comments on both the DEIS and each of the 10 HGMPs. Our concerns focus on adequacy of identifying, assessing, and avoiding or minimizing effects of the HGMPs on the Basin's natural salmon and steelhead. We recognize and strongly support the need for providing meaningful Treaty and non-Treaty fisheries.[i] We remain concerned about consequences for the long-term health, conservation, diversity, and productivity of the natural stocks of fish and effectiveness of WRIA 9's habitat actions and investments to improve habitat to levels necessary for the recovery of Chinook salmon. Much of our concern is with the potential for additional, incremental loss of genetic diversity in Green River salmon and steelhead that hatchery programs would likely cause. Just recently we note the reported finding of significant historic loss of genetic diversity in Columbia River Chinook salmon (Service 2018). In that regard and to help ensure coordinated efforts to revitalize our much-loved Duwamish-Green River Basin, we provide you with the attached comments, concerns, and recommendations. Please contact Doug Osterman, WRIA 9 Salmon Recovery Manager, at 206-477-4793 or Doug.Osterman@kingcounty.gov with questions.

Sincerely,
WRIA 9 Watershed Ecosystem Forum Co-Chairs:

Bill Peloza
Councilmember, City of Auburn

Marlla Mhoon
Councilmember, City of Covington

cc: WRIA 9 Watershed Ecosystem Forum

Financial support provided by signers of Watershed Planning Interlocal Agreement for WRIA 9 including: Algona, Auburn, Black Diamond, Burien, Covington, Des Moines, Enumclaw, Federal Way, Kent, King County, Maple Valley, Normandy Park, Renton, SeaTac, Seattle, Tacoma, Tukwila

**WRIA 9 – Executive Summary of Comments and Concerns with Draft Environmental Impact Statement for 10 Salmon and Steelhead Programs in the Duwamish-Green River Basin and the 10 HGMPs**

- Alternatives, supporting information, and conclusions in the Draft Environmental Impact Statement (DEIS) and the Hatchery and Genetic Management Plans (HGMPs) are not well-aligned with goals and actions of the WRIA 9 Salmon Habitat Plan (SHP). They do not accurately portray conditions in the Basin or the WRIA's concerns about hatchery and natural fish interactions. In addition, they may not be sufficiently precautionary in favor of the listed species in considering effects of the alternatives. The fact that the SHP is a locally and federally approved plan with considerable scientific background and the large amount of local, state, and federal funding being spent on habitat actions, we recommend that WRIA 9 issues and information be considered before the DEIS is finalized.
- More specifically, we have concerns regarding:
    - Adequacy of disease control programs
    - Adequacy of statistical evaluation methods
    - Hatchery effects and influence
    - Release date timing viability
    - Unclear descriptions of release strategies
    - Outdated approaches to management
    - Incorrect assumptions about predation and competition
    - Lack of specificity on measuring outcomes and ensuring "random" selection
    - Downplay of reduced fitness concerns arising from mixing/interbreeding
    - Absence of citations to support statements and basis for criteria
    - Outdated citations
    - Oversimplification of the causes of decline of steelhead production
    - Differing predation potential ratios used in DEIS and HGMPs
    - Lack of empirical evidence to support integration benefit contentions
    - No assessment of climate change effects in HGMPs
    - Assignment of "negligible negative effect" ratings

**WRIA 9 - General Comments and Concerns with Draft Environmental Impact Statement for 10 Salmon and Steelhead Programs in the Duwamish-Green River Basin and the 10 HGMPS**

**Supporting Salmon Recovery and the WRIA 9 Salmon Habitat Plan**

In their final supplement to the Puget Sound Chinook Recovery Plan (National Marine Fisheries Service 2006), the National Marine Fisheries Service (NMFS) highlights the importance of integrated watershed-level planning for species recovery. The WRIA 9 Salmon Habitat Plan (SHP), "Making Our Watershed Fit for a King" (WRIA 9 Watershed Ecosystem Forum 2005) is the federally-recognized, locally-adopted Chinook recovery plan for the Duwamish-Green River Basin, yet the HGMPs only briefly mention the SHP. As noted in detail below, they do not substantively assess, integrate or include SHP recommendations for avoiding or minimizing effects of hatchery fish on natural fish in the Basin even though this was an explicit recommendation of the final supplement (page 30). Under "Factor E. Other natural or man-made factors affecting continued existence," the final supplement specifically notes that

hatchery programs be operated in a manner consistent with individual watershed and region-wide approaches, use appropriate criteria for integration of hatchery and extant populations, and use appropriate ecological, genetic, and demographic risk containment measures. However, in the HGMPs we see little effort to establish consistency with the SHP, protect and utilize extant populations (i.e., wild populations of rainbow trout in upper watershed that are genetically similar to wild steelhead below the dams) or to utilize advanced measures to contain risk of adverse interactions with hatchery fish. In sum, while the DEIS dutifully describes past and current planning efforts, it does not appear cognizant of the limited degree to which watershed-scale integration of hatcheries and recovery efforts has actually occurred. (To some degree, this is reflected in statements on current and future habitat that we feel are outdated.)

A primary goal of the SHP is making salmonid populations viable by improving their abundance, distribution, productivity, and diversity, *aka* Viable Salmonid Population (VSP) parameters, sufficient to warrant de-listing and provide meaningful fisheries. The SHP was developed to help ensure all groups – habitat and fish managers and land use authorities – are working in the same direction and that investments in habitat restoration and protection and programmatic actions, such as comprehensive growth management and shoreline management plans, are likely to produce improvements in all VSP parameters and, therefore, lead to the conservation and recovery of listed Chinook salmon. The SHP identified three key non-habitat goals that are relevant to the long-term viability of the Basin's salmonid populations.

One goal is to establish a spring-run of Chinook above the Howard Hanson Dam (HHD) to replace the run that was there prior to the construction (*ca* 1908) of the (further downstream) Tacoma Headworks Dam. Neither the DEIS nor Chinook HGMPs address this or the effect of implementing the HGMPs on attaining it despite being a goal of the federally-approved SHP and specifically called out in the National Oceanic and Atmospheric Administration (NOAA) supplement that hatchery programs address extant populations. The preferred alternatives for establishing fish runs above HHD rely on hatcheries. They do not include or assess benefits of an option where adults are passed upstream of HHD to let them naturally spawn and establish populations with minimal or no hatchery intervention, assuming downstream passage is provided. Of particular concern to WRIA 9 is any lost or diminished opportunity to establish upper watershed stocks, such as a spring-run of Chinook or an upriver steelhead run, with relatively little hatchery influence. Establishing these runs would be good for diversity and long-term productivity. This would also benefit integration. Based on recent examples (Elwha and Big White Salmon Rivers to name a few), there is good reason to believe that salmon and steelhead will rapidly recolonize new or lost habitat once passage is provided.

A second goal is to increase all VSP parameters, especially productivity and diversity. We are concerned about the long-term effects of an integrated hatchery approach – and of hatchery practices in general – on the genetic diversity and productivity of the Basin's naturally spawning Chinook and coho salmon and steelhead trout. It seems inevitable (and illogical to conclude otherwise) that the continual interbreeding of natural-origin (more fit) with hatchery-origin (less fit) fish over generations will degrade genetic diversity and productivity and result in less fit fish than could be produced through a greater emphasis on habitat and natural selection processes. A key to making an integrated approach work is ensuring that the proportion of hatchery-origin spawners on natural spawning grounds does not exceed 30%, below which it is presumed (but not proven) that adverse effects of interbreeding are minimized. Yet between 1970 and 2014, this threshold was only met 3 times and in most years was greater than

40% (Figure 8, WRIA 9 2015). In any event, integration is largely untested and there is little evidence available to judge effectiveness.

We note that in assessing consequences for population viability for the EIS alternatives (DEIS Table 37), conclusions are heavily driven by abundance and distribution benefits while downplaying long-term effects on genetic diversity and productivity. Short of a severe population crisis that might require something like a captive broodstock program, it is illogical to conclude that the long-term viability of a population of natural-origin fish is benefitted by breeding with high numbers of less-fit hatchery-origin fish. In their response to comments on the draft 2013 Soos Creek Chinook HGMP, the Washington Department of Fish and Wildlife (WDFW) indicated that hatchery fish are counted as being 80% that of natural-origin fish in their population modeling. This would indicate that for every successful spawning event between a hatchery-origin and natural-origin fish the net result is something less than the quality of the natural-origin fish. This logic, when applied to almost 45 years of data showing high numbers of hatchery-origin spawners spawning with wild fish, would suggest that hatchery programs have been and continue to be a drag on population productivity and viability in the long-term.

The third SHP goal is to avoid interactions among juvenile hatchery and wild Chinook, particularly in the Lower Green River and Duwamish River transition zone.[ii] Studies from 2001 to 2003 by King County found evidence of swamping/overcrowding and reduced growth rate of smaller wild juveniles in the presence of larger hatchery juveniles in the lower river/transition zone (King County 2013). The Soos Creek Chinook HGMP states June release dates reduce the likelihood of interaction with the majority of natural-origin juvenile Chinook and, therefore, predation/competition is assumed to be low. However, release dates started in early to mid-May and in only half (6 out of 12 years), release continued into June (the latest release date in twelve years was June 11 in 2010). Furthermore, holding juvenile Chinook in the hatchery longer may not be realistic due to concerns with warm water and disease (*Furunculosis*). As a result, reducing the current overlap in timing of out-migrating hatchery and wild juvenile Chinook may not be achievable and there will be continued effects of hatchery fish on natural fish in the lower river.

WRIA 9 concerns about hatchery effects were expressed in a 2005 Strategic Assessment Report (SAR) drafted to provide guidance to the WRIA in response to requests from the Shared Strategy and Puget Sound Technical Recovery Team (WRIA 9 Watershed Coordination Services and Technical Committees 2005; Shared Strategy 2001; PSTRT 2003). The SAR noted that although management of hatchery production and harvest resides with NOAA Fisheries, WDFW, and the Indian Tribes, there are considerable data indicating that hatchery production and harvest rate can significantly affect productivity (and diversity) of natural salmon populations. The SAR information raised the question of whether to emphasize conservation of naturally- spawning Chinook salmon, along with their higher productivity and greater potential to adapt to changes in habitat and climatic factors, or whether to maximize production of hatchery fish to enhance harvest opportunity.

The SAR identified several hatchery and harvest-related hypotheses (actions) with potential to enhance productivity of natural Chinook salmon. One action (Non-Habitat Hypothesis 1) identified the use of live-capture harvest techniques to significantly reduce hatchery fish straying to the spawning grounds, thereby enhancing productivity of natural spawners. This action would limit interbreeding of hatchery- and natural-origin fish and limit the production of progeny exhibiting reduced survival. Moreover, the large number of hatchery fish on the spawning grounds currently confounds evaluation of productivity

of the natural population. Removal of stray hatchery fish would enhance accuracy and precision of productivity estimates needed to evaluate effectiveness of habitat-based actions.

A second action (Non-Habitat Hypothesis 2) involved measures to minimize interactions between hatchery and natural Chinook salmon juveniles and adults. Studies in 2002 and 2003 suggest that the release of large numbers of juvenile hatchery Chinook salmon may result in reduced growth and displacement of natural Chinook salmon in mainstem and off-channel habitats in the Duwamish estuary (King County 2013). Productivity of natural Chinook salmon may be enhanced by reducing competition among juveniles for food and space and by enhancing the attractiveness of the hatchery to returning adults (i.e., reduce competition on spawning grounds).

**Updating Current and Potential Future Conditions**

When describing habitat conditions, the DEIS and HGMPs do not adequately consider the great deal of progress, work, financial investments, and land use and regulatory changes in WRIA 9 to implement the priority actions of the WRIA 9 SHP. Thus, it makes assumptions and uses out of date information about the overall habitat trajectory that do not appear to be grounded in an accurate assessment. Over nearly 20 years, under guidance of NOAA Fisheries and the Washington Department of Fish and Wildlife, we have put considerable effort into researching and improving the understanding of the Duwamish-Green Basin ecosystem functions. As described in the Salmon Habitat Plan Implementation Progress Report, WRIA 9 has made over $136 million in habitat investments and significant progress was achieved on 54 of 162 high priority salmon habitat projects between the Plan's adoption in 2005 and 2014 (WRIA 9 2015). Since 2014, there has been an additional $14 to 15 million in habitat investments. The WRIA 9 forum members have learned and shared a lot and have acted together to implement habitat projects and programs to protect and restore habitat throughout the watershed based on scientific assessments and federally-approved priorities for recovering the Chinook salmon population of the Duwamish-Green Basin. Through our many mutually-supported and implemented efforts, habitat conditions have likely begun to stabilize and, in general, should be improving rather than degrading as assumed in the DEIS.

Several habitat reports and studies may be useful for the DEIS to consider:

- The WRIA 9 Status and Trends Monitoring Report assessed change in a variety of land use indicators over five years from 2005 to 2010 (WRIA 9 Implementation Technical Committee 2012). Nearly ten years ago results were indicating relatively stable or small change in benthic invertebrates, forest cover and impervious surface, with most adverse change attributed to development within designated urban growth areas.
- As noted above, the WRIA 9 Implementation Progress Report documented numerous habitat investments and activities between 2005 and 2014 (WRIA 9 Watershed Ecosystem Forum 2015).
- The federally-approved Programmatic Habitat Assessment (PHA) conducted as part of the FEMA NFIP BiOp described and quantified the effects of likely development in the future as well as the effects of many of habitat actions in floodplains under King County jurisdiction (King County 2012). The PHA applied a somewhat conservative "overstate potential for bad and understate potential for good" approach to estimating area affected by development and restoration in order to minimize potential for Type II Error, i.e., concluding regulations were effective when in fact they might not be. The PHA concluded that the net effect of ongoing and future habitat protection and restoration activities in combination with strong development regulations

(critical areas, stormwater, erosion, and sediment control ordinances) was likely sufficient to protect and promote recovery of listed species in King County's rural-zoned floodplains. This finding is important because rural-zoned lands are where most of the remaining productive habitats and habitat protection and restoration opportunities remain.

- The Regulatory Effectiveness Monitoring for Developing Rural Areas project, a study funded under the 2008 Puget Sound Initiative, assessed environmental response to rural land use and land cover change and regulatory compliance using high resolution (6ft) photos in nine rural-zoned watersheds consisting of six "treatment" watersheds, where new development was subject to updated (2005) Critical Area Ordinance (CAO) regulations, and three forested, undeveloped "control" watersheds between 2007 and 2012 (Lucchetti et al 2014). To put contemporary land cover change in perspective, land cover scenarios representing historic (back to ~ 1900) and hypothetical future full-build-out conditions were constructed and a watershed Hydrologic Condition Index (HCI) was developed to compare potential change in stream flow high pulse counts (a key watershed hydrology metric) across time-based, rural land cover scenarios (Lucchetti and Burkey 2014). (As with the County's PHA floodplain assessment, the study minimized potential for Type II Error by somewhat overstating the footprint of future build-out.) The study concluded that future development in rural areas was not likely to cause much change in watershed hydrology, particularly in comparison with urban areas, and that the area and effect of non-compliance was likely very small. The study concluded that the effectiveness of habitat restoration in rural streams should not be undermined by future development, assuming zoning, regulations, and compliance rates do not change. As with the PHA, an important aspect of this study is that it characterized land use in rural areas, which is where much, if not most, of the existing habitat protection and restoration value exists in WRIA 9.

Similar studies in urban areas have not been done. We acknowledge that much more work needs to be done in urban areas to improve and increase habitat, however, significant strides have been made to strengthen regulations, remediate historic land use effects, and restore habitat functions in the context of many constraints. As a result, it is likely that most conditions are, or logically should be, stabilizing or slightly improving in urban areas of the Basin.

In summary, considering the amount of land protected in critical and sensitive areas, new stringent development regulations (critical area, stormwater, erosion and sediment control), and numerous habitat restoration projects and passage around the HHD, we feel that conditions are likely on a trajectory of improvement rather than degradation in WRIA 9. The 2017 State of the Sound report notes progress toward a variety of targets (vital signs) has been made but there is still much to do (Puget Sound Partnership 2017). The report also notes the need to better integrate Chinook recovery with local plans and to build resilience in systems. These are issues we echo in this comment letter.

**Being Precautionary**

Precaution is important when planning for endangered species, yet it is hard to discern whether – or the degree to which – the HGMPs and DEIS alternatives are being precautionary. Statistical methods are not presented in the HGMPs. Language in both documents seems to understate concern when evidence is limited (e.g., efficacy of integration), lacking (e.g., disease transmission to wild fish) or, at times, conflicting (e.g., studies reaching different conclusions on competition between hatchery and wild Chinook juveniles in the lower river). The HGMPs describe a number of monitoring and evaluation

procedures to track concerns. It is not clear, however, which elements, if any, of this monitoring is required (versus recommended) or if funding is sufficient to ensure it will happen to the degree needed to detect changes or effects. Lack of a clear study design, statistical methods or power analysis provides no ability to assess likelihood of monitoring efforts in detecting effects the HGMPs purport to avoid. A plan such as a Quality Assurance Project Plan (QAPP, e.g., Lucchetti and Latterell 2008) is recommended to allow the reader to understand limitations of the monitoring programs being proposed. A QAPP typically includes detail on study design, statistics, and a power analysis to assess likelihood of detecting effects. An approach that minimizes Type II error (e.g., generally "overstate potential for bad and understate potential for good") is recommended as a way to minimize the potential for concluding no effect when an effect happened (false negative).

**Conclusions**

In summary, alternatives, supporting information, and conclusions in the Draft Environmental Impact Statement (DEIS) and the Hatchery and Genetic Management Plans (HGMPs) are not well-aligned with goals and actions of the WRIA 9 Salmon Habitat Plan (SHP). They do not accurately portray conditions in the Basin or the WRIA's concerns about hatchery and natural fish interactions. In addition, they may not be sufficiently precautionary in favor of the listed species in considering effects of the alternatives. The fact that the SHP is a locally and federally approved plan with considerable scientific background and the large amount of local, state, and federal funding being spent on habitat actions, we recommend that WRIA 9 issues and information be considered before the DEIS is finalized.

**WRIA 9 - Specific Comments on Draft Environmental Impact Statement for 10 Salmon and Steelhead Programs in the Duwamish-Green River Basins**

Summary

**General Comments**

As noted in the DEIS, the purpose of the DEIS is to disclose, analyze, and consider a broad range of environmental issues and a full range of reasonable alternatives and not to suggest or reach conclusions relative to ESA analysis. In that regard, the WRIA 9 Watershed Ecosystem Forum has concerns that the alternatives did not address or inadequately addressed several issues, including:

- Implications for establishing an upper watershed spring Chinook population as recommended in the WRIA 9 Salmon Habitat Plan. Although the Chinook Fish Restoration Facility (FRF) would not necessarily preclude that action in the future, hatchery programs are extremely difficult to stop or modify once they become established.
- Delaying release of relatively large juvenile hatchery Chinook to mid- or late-June to avoid interaction with out-migrating smaller wild juveniles. The possibility for this is hampered by warm water and disease in the hatchery. Studies from 2001 to 2003 by King County et al (2013) suggested a swamping and/or competition effect of large hatchery juvenile Chinook on the smaller wild juvenile Chinook in the lower river, especially in the transition zone.
- Benefits of modifying hatchery environments to a more naturalistic (e.g., NATURES) condition.
- Ensuring with confidence, minimal interaction of indigenous wild steelhead with introduced summer-run steelhead to prevent or minimize adverse genetic and fitness effects when interbreeding.
- Relying on spawners to choose their mates instead of random selection.
- Ensuring that disease transmission to natural fish is not presently occurring and will not occur in the future. The HGMPs rely on hatchery health guidelines, which appear to apply to a controlled hatchery environment. There was no discussion of lack of reliable local assessments, implications of reliance on a single, relatively general and older reference (Steward and Bjornn 1990), and known difficulty in detecting or remediating effects of disease outbreaks in wild fish.
- Using something other than “integration” (except for summer-run steelhead) to address hatchery effects. Lacking evidence to the contrary and given the persistently high (> 30%) numbers of hatchery-origin Chinook on spawning grounds, it is difficult to see that integration will result in anything but a somewhat slower than historic rate of degradation in diversity, productivity, and fitness of natural fish as they breed and interact with less fit hatchery fish over time. Other concerns with integration are that it may result in lower ability of local populations to adapt to future challenges, such as climate change, and mask the effectiveness of habitat protection and restoration actions.
- Being precautionary by minimizing Type II Error, i.e., concluding no effect when in fact an effect may have occurred. In the HGMPs, statistical procedures to detect effects the HGMPs hope to avoid or minimize, such as adverse shifts in spawn timing or reduced life history and genetic diversity, are not presented. As a result, it is unclear how effective the monitoring might be. Considering that integration is an experiment and that each hatchery is a part of that experiment, something like a Quality Assurance Project Plan (QAPP), commonly required for many research and experimental projects, would help to understand study design and statistical

methods that might be used to collect data and guide decisions. The Chinook and steelhead HGMPs (section 11.2 in the Plans) provide no sense of what would be done if a problem is detected and note that "risk aversion measures will be developed in conjunction with monitoring and evaluation plans" (although some leave this blank or simply say "N/A") which themselves are not sufficiently detailed to assess.

- Pg. S-5 Lines 1-3 – States "The hatchery programs would use hatchery capacity as described in HGMPs and would be adaptively managed over time to incorporate best management practices as new information is available." Based on HGMPs (see specific comments) it is not at all clear that effects would or could be sufficiently detected – or what changes would or could be made in time to reverse or remediate effects before significant damage is done to VSP parameters, mainly diversity and productivity. The HGMPs use phrases like "statistically significant" but provide no study design, level of significance, power analysis, etc., to have any sense how likely effects would be detected or, if detected, what would change. Without this information, confidence is low that proper assessments will be accomplished. A formal QAPP (or similar document) is recommended as guidance to confirmation that monitoring is sufficient to detect change.

- Pg. S-8 Line 5 – Does undetectable mean no effect? The concern here is that being undetectable is not proof of lack of effect. Disease is a concern and there does not appear to be a program to track diseases outside of the hatchery. Without a directed program assessing disease in natural fish in natural habitats, it seems an actual problem would be "undetectable." Similarly, competition for food, space, and predation are not easy to prove one way or the other, particularly without a rigorous program to do so, but yet would still have consequences for wild fish recovery.

Chapter 1

- Pg. 1-15 - Project Area – Some Vashon streams (Judd and Shinglemill Creeks) are – or used to be – stocked with coho from the Green River hatchery system.

- Pg. 1-29 – Re: The Population Recovery Approach (PRA) for Chinook. As a Tier 2 population, are the listed Green River required or expected to show any improvement or just be stable? Also, is there a PRA for steelhead?

Chapter 2

-Pg. 2-5 Alternative #3 - Effect of Termination – The NMFS states that termination of hatchery programs would not lead to substantial progress toward conservation and recovery. Presumably this is because NMFS' past assessments indicate many of the conditions that led to listing are not being remedied. However, habitat conditions are, or logically should be, improving due to relatively new, extensive, and much stronger regulations and habitat protection and restoration projects. Many of these regulations did not exist, were insufficient or poorly implemented to be effective prior to ~ late 1980s/early 1990s when the Washington State Growth Management Act and programs such as King County's Basin Planning Program started affecting zoning, regulations, and capital investments to protect habitat.

Chapter 3

-Pg. 3-13 Line 23 – Should mention harvest as a factor affecting VSP parameters.

-Pg. 3-15 2nd para – NMFS concludes that for the Green River there is a "…current and continuing degradation and loss of habitat…" See previous comments about need for the DEIS to better describe current habitat conditions and actions in WRIA 9.

-Pg. 3-15 Line 27 – Suggest deleting "have the potential to." Hatcheries invariably affect natural-origin salmonids. The concern is whether the effects are significant.

-Pg. 3-17 Lines 5 & 6 – See previous comment on "risk-averse." Since the PS Hatcheries DEIS, it appears that current hatchery release levels are only lower due to decreases in hatchery releases of steelhead and pink salmon. These do not appear to be "risk-averse."

-Pg. 3-8 Line 27 – Suggest adding "and space" after "preferred food" to reflect that crowding caused by very high numbers of juvenile hatchery Chinook also occurs, creating added stress and possible disease transmission to wild juveniles.

-Pg. 3-19 - Table 10 –

- Genetics: suggest removing words "can" and "may" as they give the impression that there is uncertainty and effects may not occur. As suggested earlier, it seems illogical to suggest these change mechanisms don't occur. The issue is whether effects are significant and, if so, can they be reduced to an acceptable level of effect?
- Population Viability Benefits: Statements on retention of genetic fitness and the maintenance or increase in productivity seem too strong. Empirical evidence is lacking to support contention that integration will provide these benefits and not undermine diversity and productivity, albeit at a slower rate than past practices.

-Pg. 3-20 Lines 8-10 – Re: PS Hatcheries DEIS. Has the DEIS been finalized and, if not, is it appropriate to use it to make conclusions such as this? Is there a record of whether and how the NMFS responded to comments? Does the NMFS consider the DEIS to be Best Available Science? The issue is whether it is appropriate to use conclusions contained in a DEIS, where it is uncertain if or how public comments were addressed?

-Pg. 3-22 Line 15 – Suggest inserting "may" between "programs" and "produce" to reflect uncertainty.

-Pg. 3-23 Lines 8-9 – Restoring spring Chinook above the HHD is a high priority goal for the WRIA 9 Salmon Habitat Plan but has not been included in any DEIS alternative. There is also no assessment of the effect DEIS alternatives may have on restoring a spring Chinook run. Given that the SHP is federally-approved it would make sense to include this action in the alternatives or, at a minimum, assess the effect of implementing the HGMPs in attaining it at some later time.

-Pg. 3-29 Line 17 – In reference to integration the PNI metric, the DEIS notes that the integration approach "…has not been empirically tested and is speculative." Where appropriate, we suggest DEIS

wording better reflect the uncertainty of the integration approach.

-Pg. 3-38 Lines 12-14 and Pg. 3-29 Lines 11-13 – In a multi-year study of juvenile fish use in the lower Green River, King County swamping and reduced growth effects of juvenile hatchery Chinook on wild juvenile Chinook in the transition zone of the Lower Green River were identified (King County 2013).

-Pg. 3-47 Lines 15 & 16 – Re: Suggest increasing effect rating from moderate to high. King County has studied juvenile fish use in the lower river and detected reduced growth rate and displacement of wild juvenile Chinook when large numbers of juvenile hatchery Chinook were in the lower river transition zone.

-Pg. 3-63 Line 2 – A "negligible negative effect" rating for masking effect is low considering that one-fifth of the hatchery Chinook, the species of greatest concern, are not marked and the ratio of hatchery-origin fish on spawning grounds is high. Recent draft data collected in 2016 by WDFW for WRIA 9 indicates the proportion of unmarked hatchery fish may be as high as ~ 25%. In other words, 1 in 4 hatchery-origin fish on spawning grounds would not be identified and instead counted as natural-origin. Suggest a moderate to high negative effect rating for this effect.

-Pg. 3-68 Lines 4-7 – The rating for effect of fishing is "negligible negative," but this is for the existing program. The stated goal of the hatcheries, however, is to promote and, presumably, increase fishing and harvest. Therefore, if the hatcheries are successful, wouldn't incidental or even directed fishing mortality be likely to increase? If the rating is to assess likely future effects, then suggest changing rating of harvest effect to low to moderate negative effect.

-Pg. 3-70 Line 11 – While the goal of integration is to promote natural over hatchery based selection, there remain high levels of hatchery Chinook on spawning grounds. Furthermore, procedures such as random mate selection and highly artificial hatchery environments indicate hatchery selection and other effects will continue under the proposed programs.

-Pg. 3-75 Line 9 – As noted for random mate selection done by hatchery staff, the distribution of carcasses by humans is not natural selection. It is understood, however, that this is better than not putting them back in the environment, assuming no disease transmission.

<u>Chapter 4</u>

-Pg. 4-15 - Table 30 – Suggest that the genetic effects ratings for effect of hatchery fish on fall-run Chinook salmon should be High Negative for Existing Conditions and Alternative 1, High Positive for Alternative 3 and Moderate Negative for Alternative 4. A Moderate Negative rating for Alternative 2 seems tenuous in that it relies on being able to track and remediate negative effects through adaptive management. Arguably, the track record for adaptive management is not good. The Green River has an extensive history of hatcheries and a relatively large hatchery program. Therefore, it seems reasonable to conclude that significant decline in genetic diversity has already occurred.

-Pg. 4-79 – Suggest that the Moderate Positive population viability benefit rating of the Soos Creek fall-run Chinook salmon hatchery to natural-origin fall-run Chinook and the Moderate Negative rating for eliminating the program be reversed (positives become negative and *vice versa*). The ratings are heavily

driven by abundance and distribution benefits while downplaying long-term effects on genetic diversity and productivity. Short of a severe population crisis that might require something like a captive broodstock program, it is illogical to conclude that the long-term viability of a population of natural-origin fish is benefitted by breeding with high numbers of less-fit hatchery-origin fish. In their response to comments on the draft Soos Creek Chinook HGMP, the WDFW indicates that hatchery fish are counted as being 80% that of natural-origin fish in their population modeling (see response to PSHAAC Comment 5.b. Pg. 17). In sum, for every successful spawning event that involves a hatchery-origin and natural-origin fish the net result is something less than the quality of the natural fish. Therefore, while providing abundance and distribution benefits in the near-term, hatchery programs have been a drag on population productivity and viability in the long-term.

Chapter 5

-Pg. 5-7 Line 13 – Suggest adding “in concert with hatchery and harvest effects” between “…other factors)” and “have affected overall…”

-Pg. 5-7 Lines 16-17 – As noted above, suggest NMFS revisit and update statements about Green River habitat conditions using more recent information.

**WRIA 9 - Comments on Green River Hatchery Genetic Management Plans (HGMPs)**

*All HGMPs were reviewed but attention was primarily on Chinook and Steelhead programs as they affect listed species and, therefore, are the primary conservation concern. Issues raised in WRIA 9 comments on previous draft Soos Creek Fall Chinook HGMP were assessed and restated as necessary (January 22, 2013 letter to Brian Missildine from Doug Osterman).

**General Comments – applicable to all or most HGMPs**

Climate Change – Climate change effects were not assessed in any HGMP. Because the HGMPs remove a portion of fish from natural selection pressures, they are not likely to increase long-term genetic diversity of the affected naturally spawning salmon and steelhead populations or their resilience in the face of future climate or other environmental changes. For Chinook, there has already been (pre-1960) a three-week shift in peak spawner timing toward earlier timing and warmer water (Ruggerone and Weitkamp 2004). Climate-related effects of this historic shift may already be evident as it is our understanding that Chinook pre-spawn mortality was observed in 2015 below the Soos Creek hatchery. Can the HGMPs be modified to restore the historic spawn timing for Chinook? How has spawn timing for other species been affected by past harvest and hatchery practices and could those effects be reversed?

Fish Restoration Facilities – There is no assessment of the benefits of <u>not</u> using a hatchery and simply moving adults upstream of HHD to let them spawn and establish populations naturally, assuming downstream passage is provided. Of particular concern, is lost opportunity to establish upper watershed stocks with relatively little hatchery influence, which would be good for diversity and long-term productivity and in that way also benefit integration. Based on recent examples (Elwha and Big White Salmon Rivers to name a few), there is good reason to believe that salmon and steelhead will rapidly recolonize new or lost habitat once passage is provided

Random – Random selection of broodstock – and other randomized selections – is used throughout these programs to ensure human selection bias is minimized but no method is described how this will happen or be ensured. Also, while arguably better than human selection, random selection is not the same as natural selection and so genetic diversity and fitness will likely decline.

Statistical significance – Phrases such as “statistically significant” are invoked in several places. However, no details (e.g., study design, p-levels or power analyses) are provided to give the reader a sense for how statistical analysis will be conducted or the likelihood of detecting change when in fact a change has occurred. Generally, to be conservative in favor of the resource (in this case, listed species), it is recommended that study designs minimize Type II Error.

Disease – Deferral to hatchery fish health guidelines and a relatively old citation (Steward and Bjornn 1990) are used to suggest that disease transmission to wild fish is unlikely. No data are presented and no testing is proposed to corroborate lack of transmission and support the statement that transmission is unlikely. However, detecting diseases in the wild is highly unlikely unless a directed program is in place to do so.

Land Use – The HGMPs’ reliance on hatcheries appears to be driven by a strong perspective that basin habitat is heavily and irretrievably degraded. See comments elsewhere on a different, more

contemporary perspective.

Habitat Productivity – Salmon productivity is a primary measure of habitat effectiveness. If the fish using those habitats are less fit over time then the effectiveness and production benefits of WRIA 9's habitat actions will be reduced. Another concern is that assessments of habitat effectiveness based on productivity may be confounded by hatchery effects and may result in a false conclusion that habitat actions are not as effective as they otherwise would be if used by higher quality natural-origin fish.

Near- vs Long-term Trade-offs – As described, it seems that the HGMPs may reduce long term diversity and productivity in exchange for short term abundance, productivity, and distribution benefits.

**Chinook HGMPs**

1. **Soos Creek Fall Chinook Hatchery Program (integrated)**
-Date submitted: April 3, 2013

-Pg. 4 - Table 1.8.1 – Disease transmission – Says "hatchery practices and operations designed to stop" introduction or spread of diseases. It seems speculative and optimistic to say "stop" as it's not clear that, if transmitted, diseases would be readily detected in the wild. The sole citation on disease, Steward and Bjornn (1990), is old. Is it the most recent and best citation to make this statement?

-Pg. 4 - Table 1.8.1 – Competition and Predation – HGMP document notes that "fish are released at time, size and life history stage to foster rapid migration to marine waters" but this does not guarantee such behavior and, in any event, migration is not "instantaneous." As a result, impacts to wild fish are inevitable when there is overlap in migration distribution and timing. As noted in WRIA 9's previous comments (January 22, 2013 letter to Brian Missildine from Doug Osterman), "Data collected as part of the Salmon Habitat Plan clearly indicate that the release timing of most of the Soos Creek Hatchery sub yearling Chinook coincides with the time when large numbers of wild juvenile Chinook are using the estuary in May" and "that hatchery sub yearlings move quickly into the transition zone, eat the same food and can overcrowd the natural fish… displacing [them] and reducing their growth. A strong correlation was observed between the two- to three-week residence of hatchery sub yearlings in the transition zone, and an abrupt decrease in the natural Chinook salmon growth index." WRIA 9 suggested moving release date to mid- to late-June but the HGMP indicates "June" and is not specific to time within June. Furthermore, warming water and disease concerns may make it difficult to significantly move release timing of the hatchery juveniles to avoid overlap in the lower river/transition zone areas.

-Pg. 5 - 3.1.2 - Table 1.10.1.1 – "…program provides mitigation for lost fish due to development…" If the mitigation does not produce fish equivalent to wild fish then fitness, survival, and productivity of the population(s) in question will be reduced and the effectiveness of the mitigation lessened. While many improvements over historic practices have been made to minimize effects, hatcheries are still an imperfect replacement for habitat and natural selection. As a result, fish produced from hatcheries have potential to degrade the overall productivity of the total population. The concern is that potential productivity benefits provided by regulations and habitat protection and restoration may be reduced when used by less-fit fish.

-Pg. 5 - 3.3.2 - Table 1.10.1.1 – "…to allow for statistically significant evaluation…" What p-level? Has a

power analysis been done? If so, what is likelihood of detecting an adverse change if in fact one occurs?

-Pg. 6 - 3.4.1 - Table 1.10.1.1 – "collection of broodstock… randomly throughout entire return period." How will randomness be achieved and ensured across the entire run? According to Weitkamp and Ruggerone (2004) the return has already been shifted 3 weeks early from historic timing largely due to past hatchery practices that spawned a greater proportion or early arriving fish. What consideration has there been to shift return timing back to something more like the historical timeframe, which would be better under a future warmer climate?

-Pg. 7 - 3.3.1 - Table 1.10.2.1 – "Hatchery program contributes to an increasing number of spawners returning to natural spawning areas." Does this not tacitly indicate that there is increasing hatchery influence on natural spawners? This would create more hatchery interactions and effects and would not be consistent with natural processes that maintain or increase diversity of natural spawning populations.

-Pg. 7 - 3.3.2 - Table 1.10.2.1 – "…statically significant…" See previous comment on p-level and power analysis.

- Pg. 7 - 3.4.3 - Table 1.10.2.1 – Stability of life history patterns is identified as a goal. This raises several questions regarding statistical procedures, likelihood of detecting a change/effect, what would be done if an adverse effect is found, why is stability desired and would all changes necessarily be bad? A goal of the WRIA 9 Salmon Habitat Plan is to increase life history diversity in ways that would increase fitness, productivity, and resilience in the face of future change, such as warming climate. It seems that the large numbers of hatchery fish in the system would tend to thwart that goal and reduce or simplify rather than increase life history diversity in ways that might be important for long term survival of the species.

-Pg. 8 - 3.5.1 - Table 1.10.2.1 – If genetic variation is not monitored how would you know there is no effect?

-Pg. 8 - 3.7.1 - Table 1.10.2.1 – Re: Disease. See previous comments.

-Pg. 9 - 3.7.6 - Table 1.10.2.1 – How much shift in spatial and temporal distribution is considered significant and what is the ability to detect a shift if in fact one occurs (p-level, power analysis)? What timeframe for "historic distribution" is being used for baseline? What can or would be done if a shift is detected?

-Pg. 11 - 1.16 – The PSSMP is over 30 years old. Does – or should – it be revised in light of conservation needs? Is management being driven by an outdated approach to management? Also, note that Alternatives 1 and 2 would have reduced risk to natural-origin fish but were not pursued in favor of increased fishing potential.

-Pg. 13 2nd para – Document states "Several of the risk factors identified by Good et al (2005) are still present, including high fractions of hatchery fish in many populations and widespread loss and degradation of habitat." The high fractions of hatchery fish do appear to persist on the Green River as seen in Table 2.2.2.9 pg. 16, where the most recent [2005 to 2009] estimates of hatchery-origin fish on spawning grounds are above the 30% goal of the WRIA 9 Salmon Habitat Plan. However, with respect to

habitat, the HGMP should be updated to account for the habitat restoration and protection actions noted previously.

-Pg. 16 - Table 2.2.2.9 – Are there more recent data than 2009? If so, what do they show and how has the percent of natural fish changed? The concern is proportion of hatchery-origin fish spawning with natural-origin fish which, after the 2005-2009 (5 yr.) time period when natural-origin spawners averaged 3,077fish/per year, abundance dropped dramatically in the subsequent three years (2010 to 2012) to only 498 fish/year (WRIA 9 January 22, 2013 letter to Brian Missildine from Doug Osterman).

-Pg. 18 1st Para – "Seiler et al (2002) reported none of the yearling Chinook sampled…" None out of how many were examined? What, if any, additional sampling has been done below the trap to corroborate this and how applicable are the trap data to understanding/predicting interactions in the lower river, estuarine, and nearshore marine waters? The concern, as previously expressed by WRIA 9 is potential for high predation where wild sub-yearlings concentrate and are susceptible to predation by larger yearling Chinook (WRIA 9 January 22, 2013 letter to Brian Missildine from Doug Osterman; Brennan et al 2004; King County 2013).

-Pg. 18 2nd para – Document states June release dates reduce likelihood of interaction with majority of natural-origin juvenile Chinook and, therefore, predation/competition is assumed to be low. This appears inconsistent with actual release dates shown in Table 10.4.1, where release dates started in early to mid-May and in only half (6 out of 12 years), release continued into June (the latest release date in twelve years was June 11 in 2010). On Pg. 36 it is also noted that warm water and low flows creates concern about *Furunculosis* (see comments elsewhere re: disease) making it difficult to hold fish into June. As a result, absent more definitive information, predation/competition should not be assumed to be low.

-Pg. 18 3rd para – See other comments re: disease transmission to wild populations.

-Pg. 18 5th para – "Preference to release fish integrated at the highest rate…" In real-time practice, how would this "highest rate" be measured?

-Pg. 18, Pg. 4 and Pg. 37 – Different release strategies are described depending on whether a three-year average of 900 or 1500 NORs is observed on the spawning grounds. What happens if the average is between these values? The description is not only confusing but the goal is also not clear.

-Pg. 21 – The WRIA 9 planning activities are mentioned, but only briefly. See previous comments re: contemporary habitat protection and restoration in WRIA 9.

-Pg. 29 - 7.3, Pg. 7 - Table 10.2.1 & Pg. 39 - 11.1.1 – Re: "100% mass marking." What is actual measured mark rate and what are implications of less than 100% marks? As noted in comments to previous draft HGMP, King County field studies indicate that about 4% of clipped fish were not actually clipped. When applied to the number of fish released, this could be as many as 160,000 juveniles that would be mis-identified on a regular basis and suggests that the already low numbers of wild fish could be even lower. Draft 2016 otolith data from WDFW adult spawners indicates the number of unmarked Chinook could be much higher than previously thought.

-Pg. 29 - 6.3 – "Broodstock is selected randomly…" How is randomization actually done in the hatchery setting? Also, while random selection may be better than human selection bias it is not what the fish would choose to do under natural conditions.

-Pg. 29 - 7.2 – Re: broodstock collection. It is noted that broodstock are collected across entire run but nowhere in the HGMP is it mentioned that the run timing has shifted (pre-1960s) by three weeks from historic run timing (Ruggerone and Weitkamp 2004). The implications of this historic shift are not discussed but may be serious if climate change models prove correct. In essence, selection has moved return timing into periods of increasingly warmer water. How will this affect the ability to safely capture and transport broodstock and what are the implications for disease? Are there alternatives that may shift run timing back to historic conditions and/or cooler temperatures?

-Pg. 30 - 8.1 – "Chinook for broodstock are selected randomly…" See previous comment on "random" selection.

-Pg. 31 - 8.2 & 8.5 – Random selection… see previous comment.

-Pg. 38 –-10.11 – Re: reducing risk of genetic and ecological effects resulting from fish releases. This section identifies several ways in which risk may be reduced but provides no assessment of how much reduction will actually be achieved or whether the risk reductions will be sufficient to reduce effects on listed species to a "no effect" or *de minimus* level.

- Pg. 39 – Re: local funding of WSPE trap. Is this guaranteed and, if not, how will it be ensured?

2. **Fish Restoration Facility – Green River Fall Chinook**
- Date submitted: July 29, 2014

<u>- General Comment re: FRFs</u> – If downstream passage is provided, why not move adults upstream and let them spawn naturally? This would eliminate hatchery effects. It appears that the primary motivation is to more quickly create a population above the HHD. However, this likely results in some hatchery effects.

<u>- General Comment re: "Random"</u> – As noted above, it is not clear how "random" selection will actually be achieved. Regardless, random selection is not the same as natural selection.

-Pg. 15 top of page – Re: Genetic effects discussion. The HGMP seems to downplay reduced fitness concerns arising from mixing/interbreeding of hatchery and wild fish in the wild because there is a lack of studies and Berijikian and Ford (2004) suggest that fish with shorter times in hatcheries may have reduced effect. However, lack of evidence is not demonstration of lack of effect and reduced effect is not necessarily an insignificant effect.

-Pg. 18 2nd para – "These factors have degraded or eliminated habitat areas and natural selection processes important for Chinook and other salmon, adversely affecting… abundance and productivity of the natural population…" It would be appropriate to also recognize reduction or loss of natural selection pressures resulting from hatchery practices on the fish themselves.

**Green River Steelhead HGMPS**

**General Comments – Steelhead HGMPs**

1. **Green River Native Winter (late) Steelhead Hatchery Program**
- Date submitted: October 13, 2014

-Pg. iii 3rd para – What is the implication of no funding to assess SARs and contribution to natural spawning population? If there's an effect of the hatchery program, how would it be detected?

-Pg. 3 4th Para – A reduction (from up to 55% *ca* 1984 to around 11% since 2005) in contribution of tributary spawning to overall wild escapement is attributed solely to habitat impact from development. Please provide a citation and/or data to support this statement. Is it possible that other factors (hatchery, harvest, climate and/or marine waters) may have contributed to this shift?

-Pg. 4 - Table 1.8.1 – Re: Broodstock collection. Hook and line selection of spawners not the same as natural selection.

-Pg. 4 - Table 1.10.1.1 – Re: Statistically significant evaluation. See comments on Chinook HGMPs.

-Pg. 6 - 3.4.2 – "Any lower natural production is offset by increased egg-to-fry survival and higher female/smolt ratio provided by hatchery rearing." This would increase likelihood of hatchery effects.

-Pg. 6. - 3.4.3 – Performance standard is said to not change life history characteristics but at same time notes that current condition is unknown and monitoring plan is still being developed. See previous statements concerning adequacy of statistical methods and the goal of stability of life history patterns.

-Pg. 7 - 3.7.4 – Re: Disease. See previous comments in comments on Chinook HGMPs on adequacy of controlling/detecting disease transmission to wild fish.

-Pg. 9 - 1.16 – Criteria for termination of program are provided but the basis for them are not provided.

-Pg. 14 – Re: Residualism. If steelhead juveniles do not smolt and leave volitionally, will the remainders be moved to non-anadromous lakes, as is proposed for the summer steelhead program?

-Pg. 18 & 19 – Relationship to habitat protection and recovery strategies. This discussion cites Judge 2011 but see more contemporary and basin-specific habitat information described above.

-Pg. 29 – Mating selection 8.1 – Here again, random selection is described but specifies no process to ensure. Also, random is not the same as natural selection.

-Pg. 30 - 9.1 – Egg take: Says current egg take is 50,000 but elsewhere says 33,000. Unclear what number is being proposed. Does the proposed program intend to reduce egg take to 33,000?

-Pg. 37 - Table 10.7.2 – Here again, egg take is noted as 33K but elsewhere 50K eggs is mentioned.

**2. Soos Creek (Green River) Hatchery Summer Steelhead Program (Segregated)**
- Date submitted: October 29, 2015

-Pg. i – What is basis for reductions in releases in number (> 12%) and release locations (> 13%) of early summer steelhead? While understandable that reductions may be beneficial, why these levels and why not even more reduction?

-Pg. ii 2nd para – Statements are made implicating lack of adequate – and/or failed – habitat protection and restoration measures. See previous statements about contemporary WRIA 9 conditions and actions to protect steelhead as sole or primary cause for steelhead decline and loss of fisheries.

-Pg. ii – Total Viability Analysis (TVA) is mentioned but is not described in enough detail to assess.

-Pg. 3 1st para – States production of steelhead has been diminished by "extensive loss and degradation of habitat" but makes no mention of how hatchery, harvest or marine conditions may have also contributed. As mentioned earlier, this is almost certainly an oversimplification of the causes for decline.

-Pg. 3 2nd para – See previous comment requesting data and or citation for this statement attributing loss of tributary steelhead spawning solely on habitat.

-Pg. 3 - Table 1.8.1 – Re: Disease transmission to wild fish. See previous comments.

-Pg. 4 - Table 1.10.1.1 - 3.2.1 – What is incidental catch and mortality rate of non-targeted winter steelhead? And how much incidental mortality is too much?

-Pg. 6 & 7 - Table 1.10.2.1 3.4.3, 3.5.1, and 3.5.3 – Re: Changes in life history characteristics, patterns of genetic variation and introgression rates, respectively. What is confidence that changes can be detected? What is Type II Error risk and how is it minimized? What would be done if adverse effect detected?

-Pg. 6 & 7 - 3.7.1 & 3.7.4 – Re: Disease transmission to wild fish. See previous comments.

-Pg. 14 1st para, last sentence – The following statement is made: "The potential risks of this hatchery program, therefore, have to be considered in the context of failure to implement steelhead protection and restoration measures commensurate with those measures imposed on steelhead hatchery and harvest programs that result in diminished fishing opportunities." Suggest this statement be removed or modified to better reflect the more complex nature of multiple effects (land and water development, harvest and hatchery effects, and climate changes) on salmon and steelhead.

-Pg. 14 2nd and 3rd para – Text on introgression, PEHC, etc., tacitly acknowledges hatchery effects and the need to better understand and measure risks and effects of hatcheries.

-Pg. 30 - Mating 8.1 – Re: Randomness. See previous comments.

**3. Fish Restoration Facility – Green River Winter Steelhead**
- Date submitted: July 18, 2014

General Comment re: FRFs – As noted previously, if downstream passage is provided, why not move adults upstream and let them spawn naturally? This would eliminate hatchery effects. Furthermore, Winans et al (2010) found rainbow trout populations above the HHD to be genetically similar to wild steelhead below the HHD. Therefore, rather than barren of fish, the habitat above the dam has a thriving population of rainbow trout that represents the extant winter-run steelhead population (a priority for ESA protection) that likely would spawn with and contribute to productivity of steelhead passed above the HHD. Elwha Dam removal and subsequent fish use above the dam suggests that steelhead will rapidly take advantage of previously blocked habitat.

**Green River Coho HGMPs**

**General Comments – Coho HGMPs**

**1. Soos Creek Hatchery Program**
- Date submitted – July 24, 2014

-Pg. 3 4th para – What evidence of success, other than anecdotal, is there from outplants of coho fry and smolts to surrounding areas, e.g., Des Moines, Miller and Walker Creeks?

-Pg. 3 5th Para – Program is identified as "integrated." See previous concerns re: integration.

-Pg. 8 – Re: Disease transmission. See previous concerns and comments on adequacy of disease control programs.

-Pg. 9 - 3.3.2 – Re: Statistical significance. See previous comments on statistical concerns.

-Pg. 11 - 3.4.2 – "Collection of NOB does not reduce potential juvenile production…" How would this be detected? And if wrong, how would it be remedied?

-Pg. 19 – Predation and competition: States that predation by coho smolts on juvenile Chinook is unlikely to be significant largely due to inability of the average-size coho smolts and pre-smolts to prey on the average-size sub-yearling Chinook. The concern, however, would be with larger-than-average-size coho juveniles preying on the smaller-than-average-size yearling Chinook. Based on known size distributions and prey-to-predator size ratios of 1/3 to 1/2, could potential predation rates be estimated rather than simply assumed to be low based on average-sized fish?

-Pg. 32 – Mating… randomness. See previous comments.

-Pg. 35 - Table 9.2.1.1 – Survival rates of fry to sub-yearling and sub-yearling to smolt are in range of mid-90%s, which are much (~ 10Xs greater) than natural survival rates. This is an example, one of many, of how a hatchery does not mimic the natural environment and results in lesser quality/less fit fish.

-Pg. 43 - 10.11 – Predation potential "1/3 size [of predator to prey] rule" is different from the "1/2 size

[of predator to prey] rule" used by NOAA in the DEIS. What is implication if the larger ratio is used?

**2. Keta Creek Complex - Green River Coho Yearlings**
- Date submitted: June 22 2017

-Pg. 8 – Statement is made that "reliance on natural production to attain program goals is infeasible due to habitat loss and degradation over a large proportion of the historic coho salmon distribution in the watershed." It is true that habitat has been lost and degraded but it seems likely that the quality and fitness of the fish has as well. In other words, effects to both habitat and fish are likely affecting productivity of the remaining runs.

-Pg. 16 – Re: Predation and relative body size. As noted above, the HGMP uses one predator-to-prey size (1/3) while the NOAA DEIS uses a different (1/2) size.

-Pg. 38 – Re: Predation concern of coho smolts preying on juvenile Chinook. Argument is made that predation will be minimized but extent to which it is minimized is not clear, especially of the body size rule, which is greater than the one HGMP uses.

**3. Marine Technology Center Coho Hatchery Program**
- Date submitted: September 17 2014

No specific comments. General comments related to disease and other hatchery effects apply.

**4. Fish Restoration Facility – Green River Coho**
- Date updated: July 21, 2014

- General Comment re: FRFs – If downstream passage is provided, why not move adults upstream and let them spawn naturally? This would eliminate hatchery effects. It appears that the primary motivation is efficiency, i.e., to more quickly create a population above the HHD. However, this comes with hatchery effects.

- General Comment – Disease and predation concerns mentioned above apply to this HGMP.

**5. Green River Fall Chum Salmon**

**6. Keta Creek Complex Fall Chum Salmon**
-Date updated: July 18, 2014

No specific comments. Stock and hatchery issues are not controversial at this time.

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[i] https://openjurist.org/694/f2d/1374/united-states-v-state-of-washington United States v. Washington, 506 F.Supp. 187, 189 (W.D.Wash.1980). The district court held that hatchery fish are included in the fish to be apportioned by the economic value of the fish harvest, the income of tribes and their members, and the projected availability of fish for harvest in future years.

[ii] The transition zone is defined as extending from river mile 10 (upstream of the Interstate 5 crossing of the Duwamish) to river mile 1 (between Kellogg Island and the West Seattle Bridge). This definition is based on information available to date and the conclusions of the majority of scientists who have provided input. Additional information and/or further analysis may lead to adjustments in the transition zone definition (Ostergaard et al 2014).