The Washington Department of Fish and Wildlife (WDFW) developed the Soos Creek Fall Chinook Hatchery and Genetic Management Plan (HGMP), placed a draft version on our web page on December 5, 2012, announced its availability, and solicited public comment through January 18, 2013.

A total of ten individuals and organizations subsequently provided comments to WDFW during the public comment period. The comments ranged from short paragraphs to extensive reviews, and were received from: Mr. Andy Appleby and Dr. Peter Paquet representing the Hatchery Scientific Review Group (HSRG) – Washington; Mr. Frank Urabeck, representing the Puget Sound Hatchery Action Advisory Committee (PSHAAC); Mr. Doug Osterman representing the WRIA 9 Watershed Ecosystem Forum; Mr. Andrew Marks representing the Coastal Conservation Association; and from seven members of the general public via e-mail. Their comments are posted under a separate cover, and our responses are appended below.

Summary Response to Public Comments

1. The Two-Stage Broodstock Strategy

The Co-managers in the Green-Duwamish Basin share a common interest in improving the status of salmon populations as well as have interests to provide stable and viable fisheries for both treaty and non-treaty fishers. Given the recent poor returns of Chinook to the basin, the Co-managers met to develop an innovative solution to address the challenge of attaining shared fishery and conservation objectives. The solution reached called for increased production to implement a two-stage integrated brood stock approach which would enable production for harvest to be maintained while creating a strategy to rebuild the natural spawning population.

Biological Phases of Restoration

Under the HSRG concept of Biological Phases of Restoration, different hatchery actions will be taken depending on the phase indicated by the status of natural-origin Chinook salmon. When the average number of returning natural-origin Chinook salmon is low, the actions are structured to reduce the demographic risk. Specifically, the actions will be to colonize the habitat with adults originating from the most highly integrated hatchery program utilizing an upriver acclimation site. On the other hand, when the average number of returning natural-origin Chinook salmon is adequate, the actions are structured to reduce the genetic risks to the natural population by promoting local adaptation through utilizing the integrated hatchery fish as the broodstock source for the harvest program.

Which phase is in operation is determined by the strength of the natural-origin return. Due to the recent low returns, the program will begin under the Colonization Phase and hatchery operations will continue to support that phase until enough natural-origin fish consistently return to implement the Local Adaptation Phase. That change is triggered when the three-year average number of natural-origin spawners grows to 1,500. At that point the hatchery operations will change to support the Local Adaptation Phase. Alternatively, should the number of natural-origin spawners decline enough, then the hatchery operations will again revert to supporting the Colonization Phase. Such a decline is triggered when the three-year average number of natural-origin spawners declines 900. The trigger of 900 was chosen as a close surrogate for the critical escapement threshold of 835 (Table 8 - NMFS PS Chinook RMP Review 2011). The 1500 trigger into the Local Adaptation Phase value was chosen to be high enough over the low trigger to indicate a population response to the brood stocking

strategy but not so low that the program would alternate too quickly between the two phases to provide some stability in operations.

Two-Stage Integration

In the program described in the updated HGMP, the integrated group of one-million fish will receive all the natural-origin broodstock gathered. The purpose of this group will be to colonize the habitat with the most highly adapted fish under the Colonization Phase and therefore, during the Colonization Phase these fish will be released upriver at Palmer Ponds. During the Local Adaptation Phase, the purpose of this group will be to provide broodstock for the harvest program and therefore, during the Local Adaptation Phase, these fish will be released at the Soos Creek Hatchery.

In this HGMP, the program with the most highly integrated brood stock is defined as that program incorporating the maximum number of natural-origin returning (NOR) adults available collected for brood stock. That program will be the one-million production released at Palmer Ponds during the Colonization Phase and also remain the one-million production released at Soos as the brood stock source for the hatchery program during the Local Adaptation Phase. Note, so as not to mine the natural-origin population, the maximum number of natural-origin brood used is limited by 20% of the NORs.

The program and the trigger points just described are outlined in HGMP Table 10.7.1 in the HGMP:

Table 1. HGMP Table 10.7.1: Number released, by mark type and age/location, Soos Creek fall Chinook program.

Brood Year/ Escapement level	Mark Type	Releases		
		Sub-yearlings (Soos)	Yearlings (Icy)	Sub-yearlings (Palmer)
2011	AD only	2,800,000	300,000	950,000
	AD+CWT	200,000	-----	50,000
	CWT only	200,000	-----	-----
If 3-year average of natural-origin spawners drops below 900	AD only	2,800,000	300,000	-----
	AD+CWT	200,000	-----	-----
	Otolith Marked	-----	-----	1,000,000
	CWT only	200,000	-----	-----
If 3-year average of natural-origin spawners rises above 1,500	AD only	2,200,000	300,000	1,000,000
	AD+CWT	200,000	-----	-----
	CWT only	200,000	-----	-----
	BWT only	600,000	-----	-----

2. Performance of Two-Stage Broodstock Strategy

Under Assumptions of productive habitat (Beverton Holt: Productivity = 4.5, Capacity = 14,000), WDFW developed two scenarios, one to represent the BASE pre-2000 hatchery operations and one to represent the two-stage brood stocking strategy described in the updated HGMP. To compare the performance of each, a model developed by an HSRG member, was used to track ending population size of natural-origin Chinook and also hatchery reform metrics such as the proportion of natural influence (PNI). For each simulation, 1000 repetitions of 100

years each were run under assumptions of habitat conditions that remained static over the 100 years as well as under assumptions of habitat that improved over the course of 100 years. Decadal oscillation in marine survival was also reflected in each simulation.

To describe productivity, each simulation used a Beverton-Holt model to describe habitat conditions with a starting productivity of 4.5 and a starting capacity of 14,000. Initial fitness was assumed to be 50% to represent a hatchery depression effect, while reproductive success of hatchery fish was deemed to be 80% of natural fish. For the simulations where habitat was assumed to improve, it was assumed to improve at a rate of 1% per year (beginning after the first 10 years) until it improved in productivity and capacity by 100% (e.g. maximum productivity of 9.0 and maximum capacity of 28,000).

The HGMP scenario incorporates a two-stage brood stocking approach that applies two concepts developed by the HSRG: Two-Stage Integration and Biological Phases of Restoration. The two-stage integration concept divides the hatchery production into two groups. The smaller of the two groups receives all of the natural-origin brood stock and thus, is the most highly integrated hatchery production. Where that production is released and its purpose is determined by the Biological Phases of Restoration. The two Biological Phases of Restoration considered here are the Colonization Phase and the Local Adaptation Phase. In the Colonization Phase, the objective is to seed the habitat with the most highly integrated fish. Thus the most highly integrated group of fish are released higher in the watershed at Palmer to assist them in recruiting to the natural spawning grounds. In the Local Adaptation Phase, the objective is to use the most highly integrated fish to produce broodstock for the harvest program, thereby creating a situation where the harvest program is also highly integrated but one generation out. Thus, in the Local Adaptation Phase, that group of fish is release on-station at Soos Creek Hatchery where they will recruit to become the broodstock of the harvest program. This relationship between the two-stage brood stocking strategy and the Biological Phases of Restoration will act to seed the watershed with the most adapted fish and when the habitat is able to return enough fish, will act to integrate the harvest program.

Table 2. Summary of the components of the two models of hatchery operations.

PROGRAM ELEMENT	BASE MODEL	HGMP MODEL
Release Size	3.2M Sub-yearlings - 300K Yearlings	4.2M Sub-yearlings - 300K Yearlings
Facilities	Soos, Icy	Soos, Palmer, Icy
Broodstock Strategy	None	Two-Stage Integration
NOB Recruitment	Passive	Active
Adult Bussing Hatchery	None	Up to 5,800 NS

Table 3. Simulation results under the assumption of productive habitat (productivity = 4.5, capacity = 14,000) that does not improve over time.

PROGRAM ELEMENT	BASE MODEL	HGMP MODEL
Ending NOS at 100 years	835	1,467
Average change in fitness	0.00%	8.12%
Median annual harvest	7,921	8,602
% Years with PNI > 0.5	2%	30%
Average PNI over 100 years	19%	43%
Average PNI years 51-100	19%	44%

Table 4. Simulation results under the assumption of productive habitat (productivity = 4.5, capacity = 14,000) that improves by100% (productivity = 9.0, capacity = 28,000).

PROGRAM ELEMENT	BASE MODEL	HGMP MODEL
Ending NOS at 100 years	1,742	2,781
Average change in fitness	2.31%	32.22%
Median annual harvest	9,453	10,726
% Years with PNI > 0.5	12%	60%
Average PNI over 100 years	30%	56%
Average PNI years 51-100	36%	66%

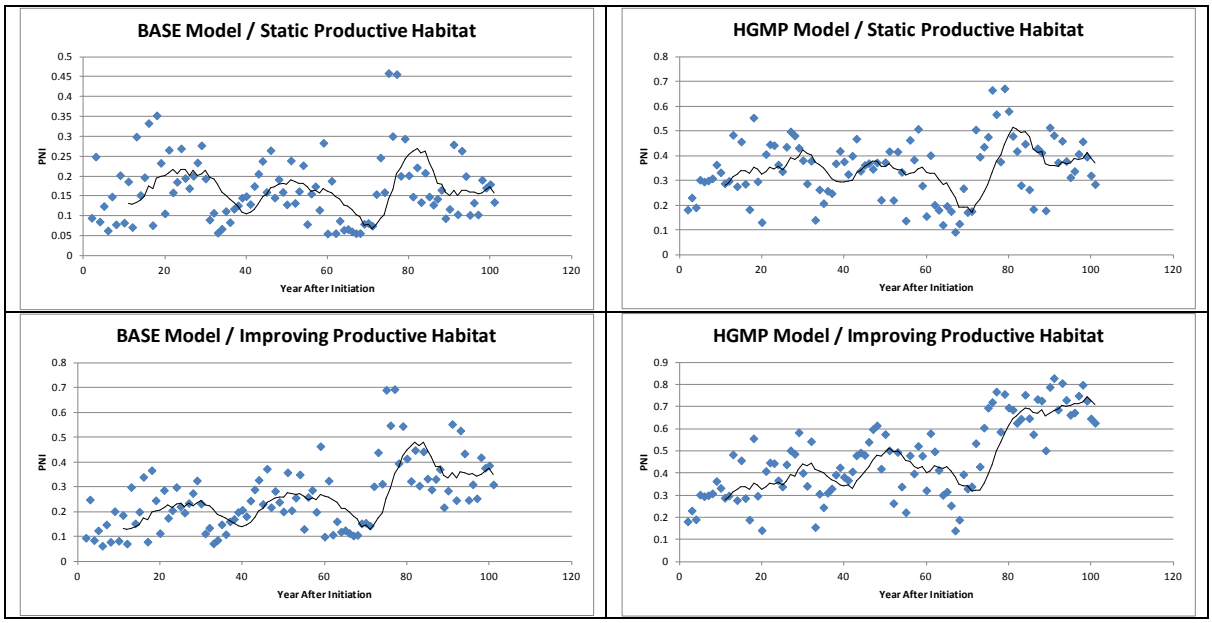

Figure 1. PNI progression through time for one run of 100 years under each program (BASE, HGMP) assuming no habitat improvement over time and assuming 100% habitat improvement over time.

3. Marking and Tagging

Mass-marking and Missed Clips

The goal of the marking and tagging program at Soos Creek Hatchery is to mark or tag 100% of the Chinook released from the facility. However, there is a recognized failure rate -- or missed clip rate, associated with any given pond cultured at the facility. Fish are checked for quality control both during clipping and prior to release. Any clip that does not remove the entire adipose fin, adipose fins that regenerate, and fish that accidentally receive no clip are estimated during quality control checks and count towards the missed clip number.

Ventral Fin-Clipping and Otolith Marking

During the Colonization Phase, the intent is for the one-million “highly-integrated” fish is to colonize the upper watershed to provide a jump-start to natural production, utilizing fish that are most adapted to the river. This means that the marking protocol designated for those fish would be selected to avoid mortality in mark-selective fisheries. To fully-implement the Green River Chinook broodstocking program during the Colonization Phase, it will be necessary to be able to differentiate these integrated fish so that when they are recovered at

collection points (TPU trap, Icy trap, Soos Creek trap), they can be returned to the river to colonize the natural spawning grounds. As both coded-wire tags (CWTs) and adipose fin-clips are already used to identify hatchery and Double Index Tagged (DIT) fish, the next reasonable alternative is the ventral fin-clip. However, a higher mortality with vent clipping is recognized and some loss of efficiency in implementing the program must be weighed against the impacts of that higher mortality. Based on input received during the comment period for this HGMP, we have reconsidered and re-evaluated the costs versus the benefits and have come up with the alternative option to otolith mark the highly integrated production during the Colonization Phase. The implications are that during brood stocking activities in the Colonization Phase, it may be that the highly integrated fish from the Palmer production may be incorporated into the brood stock as a natural-origin fish. However, it will be possible, via the otolith mark, to monitor after the fact the proportion of natural-origin fish used as brood stock. During the Local Adaptation Phase, 600K of the highly-integrated fish will be released from Soos Creek Hatchery with blank-wire tags (BWTs) with the remaining 400K being used for the DIT program. During that phase, all fish with a tag (CWT or BWT) will be the primary broodstock for the harvest production.

Table 5. Clipping Regime for both Biological Phases

	Colonization Phase	Local Adaptation Phase
1M Highly Integrated Production	Otolith Marked	Blank Wire Tag
300K Yearlings at Icy	Adipose Clip	Adipose Clip
2.8M Production	Adipose Clip	Adipose Clip
200K (Marked half of DIT)	Adipose Clip + CWT	Adipose Clip + CWT
200K (Unmarked half of DIT)	CWT	CWT

4. Smolt Release Timing at Soos Creek Hatchery

Chinook smolts are released out of Soos Creek Hatchery once they exhibit signs of smolting behavior, and reach size-at-release goals (80 fish per pound). One of the key recommendations of the HSRG was to release hatchery fish which are exhibiting smolting behavior to foster rapid migration to saltwater, thereby reducing residency and competition with other salmonids. At the Soos Creek Hatchery, smolting behavior is typically observed for Chinook beginning in May; smolt releases typically start in late-May, with a peak in early- to mid-June. Smolt releases typically begin as “volitional” releases, where fish are given the opportunity to leave the pond on their own for several days or up to a week, before being “forced”. As fish growth is often commensurate with the age of the fish, fish releases are staggered, with a typical range of around four weeks between the first release and the last release. Growth patterns and smolting behavior can also be greatly affected by the weather patterns and water temperatures, which can be different from year to year. The water temperature profile in Soos Creek begins to warm considerably in late-May and into June. It has been observed that the prevalence of fish pathogens at Soos Creek Hatchery increases as the water temperature increases, yet another factor that is weighed when determining the optimal release time for fish from the hatchery.

5. Genetic Diversity

As a management goal the targeted effective breeding population size (N_e) for the Soos Creek Hatchery program is 9,688, (approximately 2,422 adults spawned each year X four-year generation length for Chinook salmon = 9,688 (N_e)). The genetic diversity and long-term adaptive potential of hatchery salmon populations may be conserved when the N_e is maintained

above 200 to 500 individuals (FAO - UN 1981; Allendorf and Ryman 1987; Nelson and Soule 1987). Waples (1990) suggested that 100 effective breeders per year (for Chinook salmon with a four year generation length, and Ne of approximately 400 fish). At Soos Creek, the number of effective breeders is much higher than those standards. See also HGMP section 8.5.

Cited References:

Allendorf, F.W. and N. Ryman. 1987. Genetic management of hatchery stocks. Population Genetics and Fishery Management 141-159. Ryman N. and F. Utter, (editors). University of Washington Press. Seattle, Washington.

Bergstedt, R. A. 1985. Administrative Report No. 85-3. Mortality of fish marked by fin clipping: an annotated bibliography, 1934-1981. Great Lakes Fishery Laboratory, U.S. Fish and Wildlife Service, Ann Arbor, MI.

FAO-UN (Food and Agriculture Organization of the United Nations). 1981. Conservation of the genetic resources of fish: problems and recommendations. Report of the Expert Consultation on the Genetic Resources of Fish, 9-13 June 1980. FAO Fisheries Technical Paper 217. Rome, Italy. 43 pp.

Nelson, W.R. and M. Soule. 1987. Genetic conservation of exploited fishes. In; Population genetics and fishery management: 345-368. Ryman, N and Utter F (editors.). University of Washington Press. Seattle, Washington.

NMFS (National Marine Fisheries Service). 2011. Evaluation of and recommended determination on a Resource Management Plan (RMP), pursuant to the salmon and steelhead 4(d) rule: Comprehensive management plan for Puget Sound Chinook: harvest management component. U.S. Department of Commerce, NOAA. FINWRl2010/06051. 244 pp. Table 8: see p 44.

Report SFEC (06)-1 2006. Special Assignment Review of Marking for Coded Wire Tags and Mark Selective Fishing.

Waples, R.S. 1990. Conservation genetics of Pacific salmon II. Effective population size and rate of loss of genetic variability. Journal of Heredity 81(4): 267-276.

6. Predation on Chinook Salmon in the Nearshore Environment

Juvenile Chinook salmon have been shown to make extensive use of estuarine and nearshore waters in the Puget Sound (Fresh 2006), during which period they feed on a wide variety of items. As Chinook grow they become increasingly piscivorous (>70-mm FL), and may consume fish with fork lengths of up to 51% of their fork length, with larval and juvenile Pacific sand lances are the most numerous fish preyed upon in nearshore areas and Pacific herring in offshore areas (Duffy et al. 2010). While juvenile Chinook may prey upon other salmonids (primarily juvenile pink and chum salmon and some juvenile Chinook), these were typically much smaller prey items and between 5 and 33% of the fork length of the individual (Duffy et al. 2010). Given that yearling Chinook average 155mm FL at release and smolt trap data indicates that juvenile Chinook in late-April average ~55mm FL, which is larger than the predation threshold size, any predation impacts to sub-yearling Chinook should be minimal. Furthermore a study in the lower Duwamish River and estuary by Ruggerone et al. (2006) that found less than 0.5 hatchery yearling Chinook were captured per seine set during the release period, indicating hatchery

yearling Chinook salmon rapidly migrated through the lower river and estuary, reducing predation and competition concerns.

7. Competition with Chinook Salmon

Nearshore Environment

The yearling program at Icy Creek has been sized to minimize potential predation and competition impacts, while providing meaningful harvest opportunities. Given the size of the program (300,000) and smolt-to-adult survival, it is not foreseen that the goal of 2,040 adults (before harvest: see HGMP Table 3.3.1.1 HGMP) produced by this program would have an appreciable impact on the overall food base in the Puget Sound.

The Transition Zone

The potential for negative competitive and predative effects caused by program sub-yearling Chinook on listed Chinook salmon juveniles in the Puget Sound nearshore is mitigated by releasing program sub-yearlings from May to June each year. As sub-yearling Chinook releases are below the threshold size for predation concerns, any predation impacts on natural-origin sub-yearlings should be minimal. While the release goal is in June, warm water temperatures in Soos Creek may lead to earlier releases in May to minimize the possibility of any disease issues. As such releases in mid to late June are not typically possible due to these concerns.

As the abundance of juvenile Chinook salmon in the nearshore environment of the Puget Sound peaks between April and June, this release date allows the majority of natural-origin Chinook to have entered or cleared the nearshore areas prior to the release of sub-yearlings. Ruggerone et al. (2006) looked at the growth and feeding rates of juvenile Chinook in the lower Duwamish River and estuary during May and June to determine if hatchery release had an impact on the growth rate of juveniles. However, the data was inconclusive and showed that while growth decreased in natural-origin Chinook when hatchery fish were present, it began to do so in early May, before hatchery sub-yearling releases. Additionally Rice et al. (2005) found that unmarked Chinook were more widely distributed than marked (adipose fin-clipped or coded-wire tagged) Chinook with respect to time, space, and individual size. This suggests that wild Chinook use estuarine habitats more extensively than do hatchery fish and may further reduce interactions.

Cited References:

Duffy, E.J., D.A. Beauchamp, R.M. Sweeting, R.J. Beamish and J.S. Brennan. 2010. Ontogenetic diet shifts of juvenile Chinook salmon in nearshore and offshore habitats of Puget Sound. Transactions of the American Fisheries Society 139:803–823.

Fresh, K. 2006. Juvenile Pacific salmon in Puget Sound. Technical Report 2006-06. Puget Sound Nearshore Partnership. Olympia, Washington. 21pp.

Rice, C., C. Greene, K. Fresh, D. Lomax, E. Beamer, R. Henderson and R. Reisenbichler. 2005. Spatial and temporal distribution of marked and unmarked juvenile Chinook salmon in nearshore surface waters of Puget Sound: preliminary results.

Ruggerone, G.T., T.S. Nelson and J. Hall. 2006. Habitat utilization, migration timing, growth, and diet of juvenile Chinook salmon in the Duwamish River and estuary. Salmon Recovery Funding Board King Conservation District. Seattle, Washington. 75 pp.

WDFW Response to Comments by HSRG – submitted to WDFW January 18, 2013.

Comment 1. ***Section 2.2.2, page 12-13****. The HGMP identifies the populations' biological significance as "Category 2a."*

> *"NMFS critical escapement threshold for natural-origin fall Chinook in the Duwamish-Green River is 835, and 5,523 for the population to be considered rebuilding (NMFS 2011)".*

a. *It is unclear which, if either, of these goals are the management targets.*

b. *Productivity goals were not provided, however, past and current estimates of productivity were included (Table 2.2.2.1, page 13).*

WDFW Response: The escapement thresholds indicated in HGMP section 2.2.2 are not goals or targets for the management of the hatchery population, but instead are viability thresholds for the listed population as determined by NOAA Fisheries. These thresholds set targets in regards the recovery of the listed population in regards. However, the critical escapement threshold of 835 has been used base to develop the trigger of 900 natural-origin spawners used for the transition to the conservation phase (see ***Biological Phases of Restoration***, page 1). HGMP section 2.2.2 has been updated to provide further clarity regarding population thresholds.

Comment 2. *The HGMP lacks specific quantifiable goals for contribution to specific fisheries. Section 1.7 identifies the goal of program as "Harvest Augmentation" and Section 1.10 "Performance Indicators" Table 1.10.1 further identifies "co-manager harvest" and "Program contributes to fulfilling tribal trust responsibility mandate". Managers should specify numbers of fish contributed to specific fisheries, or at a minimum the total number of fish expected to be harvested.*

WDFW Response: Salmon hatchery programs support state sport, state commercial, Treaty commercial, and Treaty ceremonial and subsistence fisheries. Unlike the State's lowland lake trout fisheries where such metrics as are being asked for make sense, the complexities of the salmon life history and salmon harvest management overlaid with Endangered Species Act conservation restrictions do not lend themselves to the creation of specific quantifiable goals for contribution to specific fisheries. The State sport and treaty harvests occur in all of Puget Sound as well as in the freshwater environments. The marine fisheries are supported by a host of hatchery programs throughout Puget Sound, whereas the freshwater fisheries are supported mostly by the local production. In order to create a fishery package for salmon harvest management, there are conservation objectives for specific stocks that must be met. Therefore, the success of fisheries is not only dependent on the size of hatchery programs but also on the fishery package in place that meets all the conservation objectives. For example, it may be that one year the harvest in a particular fishery is less in order to limit the harvest on a population that is not meeting its conservation objective. In another year the harvest might be higher because the limiting stocks did not curtail fisheries where a particular hatchery program's fish are caught. That and the number of different fisheries supported by each hatchery program and

the number of different hatchery programs that support each fisheries make the concept impractical for salmon programs.

The Hatchery Science Review Group (HSRG 2003) has noted that well-defined program goals and performance measures provide an important foundation for fostering continued improvements in hatchery management. WDFW concurs, and has initiated an effort that extends beyond the requirements of the ESA to provide specific, numeric performance measures for key program characteristics. These are expected to include, as suggested by several respondents, performance measures related to the proportion of fish on the spawning grounds originating from hatchery production and smolt-to-adult survival rates for hatchery releases.

Comment 3. ***Sections 3.2 and 3.4, pages 19 and 21****. The HGMP cites* U.S. v Washington *and the* Puget Sound Salmon Management Plan *(PSSMP 1985) as providing the legal framework for coordinating hatchery programs in the Region. However, these plans are aimed at coordinating harvest and harvest opportunity and do not reflect the conservation issues that may arise from large scale hatchery programs in most of the watersheds within Puget Sound.*

Several salmon recovery planning processes are listed, but no description is provided as to how they may affect hatchery production at Soos Creek Hatchery.

WDFW Response: Section 4 in the *Puget Sound Salmon Management Plan* (PSSMP) explains the Equilibrium Brood Program, which describes hatchery programs and the co-manager process of how changes may be made to those programs. Sections 9 and 10 of the PSSMP discuss harvest and harvest allocation. Therefore, the PSSMP addresses both. Chinook were not yet listed under the Endangered Species Act when PSSAMP was published, however, so it is true that it does not reflect current conservation issues. Nevertheless, those court decisions guide the current co-management process in both harvest and hatcheries management under the concerns regarding ESA-listed species.

In addition to those documents, the Fish and Wildlife Commission developed Policy C-3619 with the intention of ensuring compatibility between hatchery production and salmon recovery plans. To that end, the department utilized a model built to assess the impacts of different hatchery programs on reform metrics such as PNI and pHOS. That model includes the status of habitat and the impacts of fisheries, both mark-selective and non-selective. The model was used in the development of the programs described in the HGMP and the results of those model runs are shown in **Table 3** and **Table 4** in ***Performance of Two-Stage Broodstock Strategy***, pages 3-4.

Comment 4. ***Section 1.7, page 3****. The program is identified as a Harvest program. However, there appears to be intent to use this program to maintain the numbers of fish spawning naturally (Conservation) by planting hatchery adults into the watershed (Section 7.5, page 29). This attempt at re-colonization should be discussed at the beginning of the HGMP under Section 1.7 "Purpose (Goal) of program."*

WDFW Response: The goal of the Soos Creek program is to provide fish for harvest consistent with conservation objectives. While returning fish from the highly-integrated portion of the program may be used for supplementation, the intent is to advance the program from the Colonization Phase into the Local Adaptation Phase in order to promote harvest opportunities while reducing risks to the natural population (see ***Two-Stage Integration***, page 2)

Comment 5. *The rationale to support the differential use of "highly" and "limited" integrated juveniles is not explained. The number of smolts planted at locations changes when integration levels change is not justified. No scientific rationale is provided for the definitions of "highly" or "limited" integration rates.*

WDFW Response: See ***Two-Stage Integration***, page 2.

Comment 6. *The program is identified as an integrated program (Section 1.6, page 3). However, the level of integrated target (PNI) is not provided. Broodstock is described as "highly integrated" or "limited," with no definitions/rationale provided (Section 10.7, page 37).*

WDFW Response: The achievable PNI is based on the productivity of the watershed. At the current time, the Co-managers do not feel that the habitat is strong enough for the population to support itself and are pursuing a two stage integration strategy as a result. (PNI estimates based on the BASE Model and HGMP Model are provided in ***Performance of Two-Stage Broodstock Strategy,*** page 2-4). See also ***Two-Stage Integration***, page 2, for more details regarding the descriptions of the "highly-integrated" and "limited" groups.

Comment 7. ***Section 6.2.3, page 27****. The current production goal of 4.5 million smolts appears to be based on facility capacity and not on varying natural origin abundance. While the level of NOR returns do prescribe the number of smolts released by location, they do not affect the number released.*

WDFW Response: There is capacity among the Green River facilities cluster to raise more than 4.5-million sub-yearling Chinook. The 4.5-million was sized to provide a Stage One highly-integrated program that could serve as broodstock for the 3.2-million sub-yearling harvest program in order to implement the Two Stage Broodstock Strategy. The level of NOR returns serves as the trigger that determines whether the hatchery operations are adjusted to serve the Colonization Phase or the Local Adaptation Phase.

Comment 8. *While PNI and pNOB is presented for 2008-2011 broods (table 6.2.3.1, page 28), no targets for PNI, pNOB, or pHOS were identified and no reference to the WDFW Hatchery and Fishery Reform Policy (which sets HSRG standards as targets) is made. In fact Table 1.10.2 ("Performance Indicators" addressing risk), while identifying as a Performance Standard, the proportion of hatchery origin adults on the spawning grounds (Standard 3.5.3), concludes that this standard is "Not applicable."*

WDFW Response: The Soos Creek HGMP is a Co-manager-approved document and does not specifically indicate policies from either entity as the treaty tribes have their own hatchery reform policy. PNI are pHOS are monitoring measures and targets for these metrics are not requested in the HGMP format.

Comment 9. ***Table 3.3.1.1, page 20*** *provides recent average harvest in Eastern Pacific fisheries and a total exploitation rate of approximately 62% (sub-yearlings). Given that the hatchery typically exceeds its broodstock requirements by 1,500 (Hatchery Performance Summary Table, WDFW 2009) and the natural spawning escapement is approximately 40% hatchery fish (Table 2.2.2.6, page 15), it does not appear that hatchery fish are managed to achieve "full" use.*

WDFW Response: Fisheries targeting the Soos Creek Hatchery Chinook are managed with constraint regarding the exploitation on natural-origin Chinook. This may result in excess fish escaping to the hatchery in some years, and these surplus fish serve several proposes. Up to 5,800 excess fish returning to the hatchery may be used as backfill to the spawning grounds,

with the highly integrated fish being prioritized for this use, when natural escapement does to meet its target levels. Additionally, surplus fish may be donated to food banks, used for nutrient enhancement, or sold to a certified fish buyer to help fund regional fisheries enhancement groups.

Comment 10. ***Table 7.4.2.1, page 29****. The program has achieved broodstock goals for at least the last 12 years.*

WDFW Response: This statement is correct and the hatchery is currently meeting its egg-take goals.

Comment 11. ***Section 3, page 19*** *of the HGMP describes the coordination of hatchery production in the Region to achieve adherence to U.S. v Washington, which provides the legal framework for coordinating these programs, and the Comprehensive Management Plan for Puget Sound Chinook (WDFW 2004) for defining artificial production objectives. Neither of these documents addresses genetic or ecological impacts of hatchery production on natural populations. In addition, Section 3.4 (Relationship to habitat protection and recovery strategies) incorrectly, we believe, identifies the Soos Creek Hatchery program as being included under the co-managers' non-Chinook Resource Management Plan (RMP) for Puget Sound region non-Chinook salmon hatchery programs.*

WDFW Response: While U*.S. v Washington* (1974) and the *Comprehensive Management Plan for Puget Sound Chinook (WDFW 2004)* define artificial production objectives as they relate to harvest, these documents do not address genetic or ecological impacts of the hatchery production on natural populations. Instead these issues are discussed in the HGMP. Genetic effects of the program are addressed in HGMP section 2.2.3 and ecological impacts are addressed in HGMP section 3.5.

The HSRG is correct that the non-Chinook Resource Management Plan (RMP) was incorrectly identified in HGMP section 3.4 and this issue has been corrected.

Comment 12. ***Section 4.2, page 24****. NPDES guidelines with regard to effluents are generally being adhered to but there have been a few instances at Soos Creek Hatchery where particulates did exceed the permitted level (see Table 4.2.1). Funding for an effluent treatment pond to correct this problem was made available in 2012. No such NPDES violations have been reported for the Icy Creek and Palmer Ponds facilities. Water intake screens are in compliance with the federal and state criteria established in 1995 and 1996 but the screens at Soos Creek Hatchery are currently not in compliance with more recently mandated standards for juvenile fish passage. Funding to correct this problem was made available in 2012.*

WDFW Response: This statement is correct, although there have been some instances of NPDES requirements being exceeded and the intake screens at the hatchery are not in compliance with the current guidelines, funding has been secured to address both of these issues.

Comment 13. *Fish appear to be released at a time and size aimed at maximizing survival for fall Chinook reared at Puget Sound hatcheries. However, using the ventral clip for the 1.0 million sub-yearling releases at Palmer Ponds does not maximize survival. The marking system used by the tribes and WDFW everywhere else in the state involves either the adipose clip where harvest is the designated purpose or CWT-only where maximizing adult returns for a conservation purpose is desired. Previous WDFW/USFWS study with sub-yearling Chinook*

releases for three brood years showed an average of 47% fewer adult returns of ventral fin clipped compared to adipose clipped fish.

WDFW Response: See ***Ventral Fin-Clipping and Otolith Marking***, page 4.

Comment 14. *The HGMP describes a process for updating information on survival, contribution to fisheries and contribution to natural spawning areas for this program. However, due to lack of clear conservation and harvest goals, it is unclear how these data will be used to modify the program.*

WDFW Response: The format of the HGMP as set by NOAA Fisheries does not require this information in this document (see also ***Comment 2***, page 8, such changes to the program would be subject to Co-manager negotiation prior to being implemented.

Comment 15. ***Section 12, page 40***. *No on-going research was identified*

WDFW Response: The format of the HGMP as set by NOAA Fisheries does not require this information in this document (see also ***Comment 2***, page 8, such changes to the program would be subject to Co-manager negotiation prior to being implemented.

Comment 16. *There is intent described in the HGMP to modify the program due to changing numbers of returning NORs, however, the scientific rationale for doing so (changes in release numbers by location) is not provided.*

WDFW Response: See ***Biological Phases of Restoration***, page 1.

Comment 17. ***Section 1.16, page 11***. *This program has been ongoing since 1901 and there is no indication that it will be discontinued, regardless of risks. Section 1.16 identifies alternatives considered for attaining program goals, but elimination of the program was not considered.*

WDFW Response: Elimination of the Soos Creek Chinook program is not considered a viable option by the Co-managers and as such was not discussed in HGMP section 1.16.

WDFW Response to Comments by Andrew Marks, representing the Coastal Conservation Association (CCA) – submitted to WDFW January 17, 2013.

Comment 1. *…the draft Green River HGMP does not align with key policy setting targets such as PNI, pNOB, and pHOS. Further, WDFW staff and the PSHAAG members designated the Green river as 'contributing' while the current HGMP lacks a clear population designation (primary, contributing, or stabilizing) as referenced in the Commission's Policy.*

WDFW Response: See ***Comment 5***, ***Comment 6***, pages 15-19; and ***Comment 8***, page 10.

Comment 2. *The basis for this concern is that these fish, for several reasons, are a legacy population that in recent years have maintained a relatively healthy wild component. The bottom line of the PSHAAG's consensus for the Green River was to implement an approach, consistent with HSRG recommendations, which preserved and enhanced the wild population while providing hatchery fish that would sustain higher harvest rates than the wild population. This approach would require reducing the hatchery influence on the wild population and implementing a selective fishing program and/or a weir on the Green River to target the removal of hatchery stocks – processes not addressed in the draft HGMP. This is particularly concerning and troubling to CCA members of the PSHAAG.*

WDFW Response: See ***Biological Phases of Restoration***, page 1; and response to PSHAAC ***Comment 5.a***, page 17.

Comment 3. *In addition to the obvious conservation concerns, recreational fishermen have a special interest in Green River Chinook. Washington's salmon sport fishery was essentially born on Elliott Bay and most of the funding for the current Green River hatchery programs comes from recreational sources. We note that the HGMP includes a release of 1,000,000 ventral marked hatchery Chinook from Palmer Ponds into the upper Green. These fish would be available to the tribal fishery but, lacking an adipose clip, not to salmon anglers. t appears that the documented excessive mortality resulting from use of the ventral clip (47% higher than an adipose clip) would negate any potential survival benefits resulting from exemption from sport harvest and we would suggest that the adipose clip or CWT only form of identification. These two methods are currently used statewide for other conservation programs.*

WDFW Response: See ***Ventral Fin-Clipping and Otolith Marking***, page 4; and response to PSHAAC ***Comment 3.c***, page 14.

Comment 4. *It is abundantly clear to us that that in order to make any sense out of the co-management process and implement a strategy for recovering ESA-listed populations, the basic issue of "a fish is a fish is a fish" must be resolved. The contention of some interests, including the Mukleshoots, that hatchery origin natural spawners are legally and biologically sufficient must be resolved. It appears to us that both the science and most recent federal court decisions clearly recognize a difference between natural origin and hatchery origin spawning as it relates to ESA-listed populations. This fundamental issue is at the heart of the flaws with the Green River-Soos HGMP.*

WDFW Response: See response to PSHAAC ***Comment 4.a***, page 15; ***Comment 5.b***, page 17; and ***Comment 7***, page 19.

Comment 5. *We also question the HGMP's compliance with the Commission's Hatchery and Harvest Reform Policy.*

WDFW Response: See response to PSHAAC ***Comment 5***, page 15.

Comment 6. *In addition, in light of the recreational funding received by Green River hatchery programs we believe the sport fishing regulations should be amended to allow retention by sport fishermen of Chinook salmon which are either ventral fin or adipose fin clipped.*

WDFW Response: See response to PSHAAC ***Comment 3.c***, page 14.

WDFW Response to Comments by Frank Urabeck on behalf of PSHAAC – submitted to WDFW January 20, 2013.

Comment 2. *While I understand that the HGMP tracks the standard format provided by NOAA-F, there still should be a cover sheet or some other provision in the plan for the public to understand the context of Green River HGMP in terms of the overall ESA process, and the respective roles of the department, tribes and NOAA-F, leading to a federal government approved plan. What this means in terms of legal protection for defined hatchery actions, the provisions for adaptive management, and how long the plan has standing, should be spelled out…*

WDFW Response: WDFW plans to post a summary/abstract for each HGMP on the website.

Comment 3. *Agree all our actions, department, tribal, NOAA-F and sport fishing/conservation stakeholders, should focus on advancing the conservation and recovery of wild Green River Chinook, while restoring and enhancing meaningful Green River hatchery Chinook harvest by both tribal and non-tribal fishers.*

a. *Unfortunately, the strategy laid out in the draft HGMP is unlikely to do this.*

WDFW Response: The model output of this strategy (**Table 2**, **Table 3** and **Table 4**, pages 3-4) shows that there is a benefit to both the natural population and maintaining harvest values.

b. *There is little reason to believe that implementation of the plan would result in significant increases in natural origin Chinook and expanded terminal area harvest opportunities on hatchery Chinook by sports in the near term.*

WDFW Response: WDFW is committed to Hatchery Reform to improve the status of natural fish in the Green River, while also placing a high value on fishing opportunity and treaty rights.

c. *There is no question that tribal harvest would likely gain. This raises the issue of fairness and balance, especially as the public is footing most of the bill, and sports angler license fees cover much of the cost of the Soos Creek hatchery Chinook production.*

WDFW Response: While the State provides funds for the production released at Soos Creek Hatchery, the production released at Palmer Ponds is funded by the Muckleshoot Indian Tribe. There should be no loss of sport fishing opportunity in the program described in the HGMP, as the harvest program remains at 3.2-million Chinook smolts. The additional production is tailored to improve the integration metrics for the harvest program, which in turn will improve the status of natural population. Also, these fish are caught in other fisheries besides Elliot Bay (see HGMP Table 3.3.1.1 for a list of fisheries where this production is typically caught).

Comment 4. *An escapement goal should be established for harvest management that is based on natural origin Green River Chinook rather than continuing to rely on the goal of 5,800 natural and hatchery origin Chinook spawners, which has not been met in recent years.*

WDFW Response: Fisheries Management issues that pertain to sport opportunities are undertaken annually in the public process known as North of Falcon (NoF). Conservation criteria, such as the escapement goal of 5,800, that inform the NoF process, are developed in the Resource Management Planning (RMP) process. The current RMP is effective for fisheries set through the 2013 NoF process; a new RMP process for Puget Sound Chinook is under development for future years, and part of the process includes an advisory group that meets regularly with WDFW staff.

a. *Also, dumping surplus hatchery Chinook into the Green River at the Whitney Bridge, to achieve the aggregate Chinook natural spawner goal, as has been done the last three years, and is planned for the foreseeable future, does not seem to be consistent with the FWC Policy C-3619 or the HSRG recommendations for the Green River.*

WDFW Response: Research clearly shows that habitat is limiting natural production and recovery (Kerwin and Nelson (WRIA 9) 2000; HSRG 2003). Using the hatchery to reduce demographic risks to the population and releasing supplemental adults in the upper watershed to spawn naturally drives the adaptation and fitness of the integrated stock to the natural environment. Recovery is a watershed by watershed process. In this system we determined this as the best path forward with our Co-managers to promote both conservation and harvest values. These fish are Green River stock, and are the native stock that would be used to recover the population if a hatchery program were to be developed today for recovery. The model output of this strategy (**Table 2**, **Table 3** and **Table 4**, pages 3-4) shows that the recovery of the natural population will be experienced in a more expedient manner than with the historical program.

Comment 5. *The draft plan is not in compliance with FWC Policy C-3619 in that it does not fully use the principles, standards and recommendations of the HSRG to enhance the productivity and abundance of the wild population of Green River Chinook.*

WDFW Response: The Fish and Wildlife Commission developed Policy C-3619 with the intention of ensuring compatibility between hatchery production and salmon recovery plans. To that end, the department utilized a model built to assess the impacts of different hatchery programs on reform metrics such as PNI and pHOS. That model includes the status of habitat and the impacts of fisheries, both mark-selective and non-selective. The model was used in the development of the programs described in the HGMP and the results of those model runs are shown in **Table 3** and **Table 4**, pages3-4 in the introduction section of this document.

The HSRG recommendations and current status of compliance are shown in **Table 6** (see also ***Comment 4.a*** on page 15).

Table 6. Current status of WDFW compliance with HSRG recommendations for Green River Chinook programs.

HSRG Recommendation	Current Status
Conduct a stomach content study of hatchery-origin yearling Chinook from the Icy Creek Pond that are caught downstream in the Green River smolt trap or other sites in the lower river, to determine if these fish are preying on other salmonids. Use the results of this study to determine what, if any, changes should be made to the program.	A stomach content survey was conducted on fish captured at the Green River screw trap in 2000. The data from this survey is presented in **Table 8** (page 23), in WDFW's response to WRIA 9 comments. Data from Seiler et al. 2002 and Buckley 1999 does not indicate that predation from yearling Chinook is a significant factor in reduced production of sub-yearling Chinook. No further studies on stomach content have been conducted by WDFW since 2000.
Modify the yearling program to allow collection of returning adults. This could be accomplished by constructing adult recapture facilities at Icy Creek and Newaukum Creek.	Although a fish collection trap has been present at the Icy Creek rearing pond since 2003, it was only marginally successful. In spring 2012, modifications were made to the trapping system that included adding a Denil extension to the outlet drain of the Icy Creek rearing pond, and a fish trap installed behind the outlet

	screens. This trap has proven much more successful: at total of 202 hatchery-origin Chinook were trapped and removed of in fall 2012, the most ever at this facility.
Release all components of the program volitionally.	At Soos Creek Hatchery, Chinook are provided the opportunity for volitional release whenever possible. Typically this involves anywhere from a few days to a week of volitional release opportunity before fish are "force" released by slowly drawing down the pond level. There are occasions where this is not possible, due to space constraints at the facility and the need to mass-mark all of the Chinook produced at the facility. At Icy Creek Rearing Pond, all fish are given the opportunity to volitionally out-migrate for two weeks prior to being force-released by slowly drawing down the pond level.
Design and construct an adult holding and sorting pond that is not in the mainstem of Soos Creek at the Soos Creek Hatchery. This new facility should include bypass facilities for efficiently passing adult fish upstream, and a weir for diverting upstream migrating fish into the holding pond.	As of March 2013, Soos Creek Hatchery is in the permitting and design phase of a full hatchery renovation (see also HGMP Table 5.8.1). Part of this renovation includes removing the existing in-stream weir and holding facilities and replacing them with a new weir and an off-channel series of adult holding ponds. These new ponds will have sorting and holding capability that will allow separation of natural-origin fish from hatchery-origin fish, as well as upstream return chutes to pass fish upstream of the weir structure.
Continue to evaluate semi-natural rearing methods to increase survival and reduce potential domestication.	Semi-natural rearing methods were implemented for several years at the Soos Creek Hatchery. Many of the techniques used for the study, such as addition of gravel pavers in the raceways, made the pond difficult to clean and perform good fish culture, and were not practical for large-scale hatchery programs.
Manage this program to allow natural-origin fish to drive adaptation, to the extent possible in this highly-urbanized watershed. In order to do this, the goal should be for natural fish to constitute an average of at least two-thirds of the naturally spawning population.	The goal of this hatchery program is to advance the conservation and recovery of wild Chinook salmon in the Green River consistent with *U.S. v Washington* (1974) and the *PSSMP* (1985). To accomplish this, the HGMP outlines a conceptual approach developed by the Hatchery Scientific Review Group (HSRG). The approach identifies two ***Biological Phases of Restoration***, the Colonization and Local Adaptation Phases, as well as a ***Two-Stage Integration*** plan (see ***Performance of Two-Stage Broodstock Strategy*** on page 2).
Determine the natural spawning escapement and its composition (hatchery- and naturally-origin), and the number and composition of the resulting recruitment.	The spawning escapement in the Green River is enumerated annually and its composition is determined via carcass sampling. Natural production is enumerated annually with a screw trap on the mainstem Green River, and all hatchery releases are mass-marked. In addition, 2013 is the second year operation of a smolt

	trap, which was installed by the Muckleshoot Indian Tribe for enumerating smolts on Soos Creek, a major tributary of the Green River.
Select broodstock for the yearling releases to represent the entire run timing. Use BKD control strategies consistent with this selection process.	Due space constraints, Soos Creek Hatchery does not have the separation capability to isolate a full spectrum of the egg-take for the yearling program. The program is currently taken from the median egg-take. BKD prevention measures include an Aquamycin treatment prior to fish marking and transfer to Icy Creek, coupled with reduced fish rearing densities in the rearing ponds.
Continue to incorporate natural-origin spawners in the hatchery broodstock consistent with HSRG guidelines.	Natural-Origin Recruits (NORs) are incorporated into the egg-take at up to 20% of the total natural run size. NORs are recruited from the Soos Creek trap, Icy Creek trap, and the Tacoma Public Utilities (TPU) Fish Collection Facility.

a. *Also, the department and the tribes are not mandated by the draft plan to pursue mark selective harvest in both the tribal and sports terminal area fisheries and through use of a seasonal main-stem weir that— like the Nisqually River weir – that would allow removal of hatchery Chinook and continued passage to spawning gravels of unmarked natural-origin Chinook.*

WDFW Response: Tribes are sovereign governments. In most cases, when Native Americans hunt or fish pursuant to their Tribe's treaty or executive order reserved rights, whether on or off the reservation, they are not subject to state regulation and are governed instead by regulations issued by the Tribe. A system of cooperative resource management has developed over the years in recognition of both the State and the Tribes overlapping interests in the use and conservation of fish and wildlife resources. Conservation disputes are generally worked out collaboratively, and rarely with the imposition of unilateral state conservation mandates.

For State fisheries, Fisheries Management issues that pertain to sport opportunities are undertaken annually in the public process known as North of Falcon (NoF) (see **Comment 4**, page 14).

b. *The plan seems to treat all Chinook the same, i.e. saying that a "fish is a fish is a fish." This flies in the face of FWC Policy C-3619.*

WDFW Response: The model used to evaluate the proposed program assumes that the fitness of a hatchery-origin Chinook is 80% of a natural-origin Chinook.

Comment 6. *The draft plan does not track the recommendations of the PSHAAC for the Green River HAIP. Request that elements of the PSHAAC recommendations be presented and discussed, at least, in the final HGMP or attached cover page, with reasons given for those advisor recommendations that were not carried forward as part of the plan.*

a. *Those recommendations that are moving forward should be documented as part of the HGMP.*

WDFW Response: The HGMP format was developed by NOAA for their evaluation of impacts to listed populations, whereas the PSHAAC was an advisory group convened to assist

WDFW in the development of Hatchery Action Implementation Plans (HAIPs). The recommendations of PSHAAC to WDFW are available and published on the WDFW website.

b. *In my view the plan in fact has a number of elements that are totally inconsistent with the PSHAAC recommendations, e.g. candidacy for higher viability goal (Contributing rather than status quo (Stabilizing)), implementation of new mark selective sports and tribal harvest fisheries, evaluation and implementation of two-stage integration, etc.*

WDFW Response: The PSHACC developed eleven recommendations for Green River fall Chinook in three different time periods – Near Term (Immediate), Short Term, and Long Term. Progress on each recommendation is summarized in **Table 7**.

Table 7. Status of Green River Chinook recommendations of the PSHAAC.

Near Term Actions (2011 – 2015)		
Recommendation	**Status**	**Comments**
1) Re-evaluate the productivity of wild Green R. Chinook, considering possible habitat degradation, e.g. effect of massive slide downstream of Flaming Geyser State Park.	✓	• WDFW maintaining smolt monitoring program. • WDFW and tribe compiling and reviewing population productivity data.
2) Develop a natural-origin escapement goal within the current aggregate escapement goal.	✓	• Draft HGMP includes natural-origin trigger for hatchery management. • WDFW and tribes initiating update of harvest plan.
3) Implement mark selective fisheries in pre-terminal and terminal area targeting Soos Creek origin hatchery Chinook.	✓	• Marl selective recreational fisheries for Soos Creek Hatchery fish currently occur in pre-terminal areas. • WDFW has proposed mark selective recreational fisheries as a component of MOU with Muckleshoot Tribe.
4) Update of PS Chinook Harvest Resource Management Plan and associated harvest impacts on the natural population.	✓	• WDFW and tribe initiating update of harvest plan with compilation and review of population productivity data.
5) Seek and secure capital funds to rebuild Soos Creek Hatchery.	✓	• 2012 Jobs Now bill included funding to initiate rebuilding of hatchery.
Short Term Actions (2015 – 2020)		
Recommendation	**Status**	**Comments**
6) Rebuild Soos Creek Hatchery inclusive of a Green River weir to assist in managing pHOS in the watershed.	-	• WDFW capital budget request included funding to complete rebuild of hatchery. • Draft HGMP does not include mainstem weir due to safety and tribal concerns.
7) Evaluate and implement two-stage integration.	✓	• Draft HGMP includes two-stage integration program implemented when natural population is in Phase 3 (local adaption).

8) Ensure natural-origin escapement goal achieved annually within aggregate.	-	• Achievement dependent on updated harvest plan and population productivity.
9) Re-evaluate the overall program performance with other changes occurring in watershed: a) Howard Hansen Dam operation/downstream juvenile fish passage. b) Habitat protection/restoration through salmon recovery. c) Soos Creek Hatchery survival and contribution to fisheries between 2015 – 2020.	✓	• Smolt monitoring program to assess freshwater productivity • Adult monitoring program to assess total productivity and other population parameters (Performance Standard 3.3.1). • Hatchery releases marked and tagged to monitor survival and contribution rates (Performance Standard 3.3.2)
Long Term Actions (2020 – 2025)		
pHOS at 30 percent or less.		
Program performance achieving at least contributing metric.		

Recovery of natural populations requires efforts from all the Hs (Habitat, Harvest, Hatcheries and Hydropower). With properly functioning habitat that improves over time, the model demonstrates that not only can the program achieve contributing standards, but it can also move significantly toward primary standards (**Table 4**, page 4).

Comment 7. *The rational for relying on surplus hatchery Chinook to be transported and released into the Middle Green River in order to achieve the 5,800 escapement goal needs to be better explained.*

WDFW Response: Meeting the 5,800 escapement goal with locally-adapted, integrated Chinook is a functional strategy for both meeting management and Hatchery Reform objectives.

a. *Also, explanation should be provided of what is magic about using "900" and "1,500" average natural origin spawners observed in the main-stem for decision-making on the number of limited integration and highly integrated sub-yearling hatchery Chinook subsequently released at Soos Creek and Palmer under the two triggers.*

WDFW Response: See ***Biological Phases of Restoration,*** page 1.

b. *If this strategy is implemented there needs to be very close annual monitoring with annual reports documenting the performance of the new strategy as measured by the number and spawning location of the natural origin spawners. Also to be documented should be the natural origin spawners used for hatchery broodstock and where they were collected, e.g. Soos Creek hatchery, Icy Creek, or the Tacoma Headworks.*

WDFW Response: WDFW has been tracking the location of natural-origin broodstock collected for the integrated Soos Creek Hatchery fall Chinook program in our Hatchery Headquarters Database since 2008.

c. *Because of the excessive mortality associated with a ventral clip...it really does not make sense to waste the Palmer facility production. An alternative, if every surviving adult from the one million sub-yearling Palmer production is critical to recovering natural origin*

production, would be for the tribes to fish selectively on only adipose marked hatchery Chinook – as sports are required to do in Puget Sound waters.

WDFW Response: See ***Ventral Fin-Clipping and Otolith Marking***, page 4.

Comment 8. *Several of us that were members of the PSHAAC believe there should be regular and consistent citizen oversight of hatchery management, given all the un-resolved issues and changes in play. Accordingly, I request the department consider chartering a new permanent oversight advisory committee like the SCPAG, that might meet quarterly or at least once every six months to discuss progress on all hatchery relegated issues, and particularly monitoring the performance of the HGMPs.*

WDFW Response: Thank you for your comment. We will take your request under consideration.

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HSRG (Hatchery Science Review Group). 2003. Hatchery reform recommendations for the Central Puget Sound. Long Live the Kings. Seattle, Washington. Available from: http://www.hatcheryreform.us/hrp_downloads/reports/puget_sound/reviews/HSRG_Recommendations_Central_Sound.pdf.

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Selective Fisheries Evaluation Committee (SFEC) 2006. Special assignment review of codedwire- tags and mark-selective fishing. Pacific Salmon Commission, Vancouver, BC. Report SFEC (06)-1. 32p.

WDFW Response to Comments by WRIA 9– submitted to WDFW January 22, 2013.

Comment 1. *Overall, we found that the document does not either acknowledge or recognize the federally- and state-approved Salmon Habitat Plan. For example, the WRIA 9 Lead Entity is not identified correctly, nor its role in and responsibilities for salmon recovery… It is essential that the HGMP integrate the collaborative habitat work of the Watershed Ecosystem Forum to recover the threatened Chinook salmon.*

WDFW Response: WDFW recognizes the importance of the WRIA 9 contribution and will highlight it further in HGMP section 3.4.

Comment 2. *The Soos Creek HGMP is not integrated with salmon recovery planning and implementation.*

WDFW Response: The plan described in the HGMP is structured to improve the status of the natural-origin population in both poorly-functioning habitat as well as in properly-functioning habitat (Kerwin and Nelson (WRIA 9) 2000; **Table 3** and **Table 4**, pages 3-4; see also response to PSHAAC ***Comment 4*** on page 14).

Comment 3. ***Section 1.10.1, pages 4-6****. This section does not include Tacoma Public Utilities (TPU) collection facility, which is more likely to encounter natural-origin recruits (NORs) than the three hatchery facility collection points.*

WDFW Response: Correct, TPU is not included in HGMP Tables 1.10.1 and 1.10.2, which identify "Performance Indicators" by risks and benefits. Rather, TPU is included in HGMP Table 1.8.1 as a Risk Aversion measure for collection of natural-origin broodstock (see also response to PSHAAC ***Comment 7.b*** on page 19).

Comment 4. ***Table 1.12.1, pages 10-11****. Spawner abundance data does not match NOAA reports in their Salmon Population Summary Database.*

WDFW Response: The values represented in HGMP Table 1.12.1 are escapement numbers that were agreed to through Co-manager discussions as part of the HGMP update process. They may be different from values NOAA has obtained in the past, as those have not gone through this process.

Comment 5. ***Section 1.16, pages 11-12****. This section indicates that providing fishing opportunities is a higher priority than recovery of the population under ESA. This section needs a detailed description of how the potential alternative actions could support delisting. Also, this section does not adequately address the impacts of the yearling program on both the Green River population and other Puget Sound populations that the yearling program fish interact with once they residualizes in Puget Sound.*

WDFW Response: WDFW does prioritize recovery over state fishing, as outlined in RCW 77.04.012, but is not the agency tasked with prioritizing treaty fishing rights vs. ESA recovery. Recovery is a function of both hatchery reform and properly-functioning habitat. **Table 2** (page 3) shows how the reformed program in the HGMP significantly improves the status of the natural-origin fish given properly functioning habitat. See also ***Predation on Chinook Salmon in the Nearshore Environment*** and ***Competition with Chinook Salmon***, page 6.

Comment 6. *Section 2.2.2, pages 12-16.*

a. ***Page 12****. This section states that National Marine Fisheries Service (NMFS) in 1999 considered this stock "not essential for recovery." This information is misleading and outdated.*

WDFW Response: The language in HGMP section 2.2.2 was confusing and will be clarified.

b. ***Page 13****. The HGMP notes that the risk factor of high fractions of hatchery fish spawning with the natural-origin fish is still occurring within the Green River, but addressing this issue is not directly discussed in any section… Reducing the numbers of hatchery fish to comprising less than 30% of the fish on the spawning grounds is a goal of the Salmon Habitat Plan.*

WDFW Response: The thresholds listed in the HGMP are based on NMFS critical and rebuilding values related to the listing.

c. ***Page 13****. Does not discuss the risk of hatchery fish spawning in the wild – habitat goal is to reduce the number of hatchery fish on the spawning grounds to less than 30% - issues with using natural fish in broodstock on low return years.*

WDFW Response: The risks are discussed in HGMP sections 2.2.3 and 1.10.2. The program will take no more than 20% of NORs forecasted from the mainstem Green River spawning grounds as recommended by the HSRG guidelines. This information will be included in HGMP Table 1.10.2, item 3.4.2. Will also include in HGMP section 2.2.3 "Broodstock Removal Effects."

d. ***Pages 12-16****. Average abundance at 5-year intervals is used throughout this section and other portions of the document when describing the most recent data available (i.e. HGMP Tables 2.2.2.1 [now 2.2.2.3] and 2.2.2.8 [now 2.2.2.9]), but the data used excluded the most recent three-years of data, which indicates lower numbers of NORs than previous years.*

WDFW Response: These HGMP tables are from the NOAA 2011 status review (Ford 2011) and were provided by NOAA fisheries. The block of data that would incorporate the most recent three years of data would not yet be complete.

Comment 7. *Section 2.2.3.*

a. ***Pages 16-18****. This section implies predation risks of the yearling program are low, though the level of risk is unknown; indicates that yearling are released at an average size of 155 mm in April, and move out of the upper system quickly with little interaction with wild fish; does not recognize the high potential for negative interaction in the transition zone of the estuary, where juvenile wild sub-yearlings are concentrated.*

WDFW Response: See ***Predation on Chinook Salmon*** in the Nearshore Environment and ***Competition with Chinook Salmon***, page 6. Data from Seiler et al. 2002, Buckley 1999 does not indicate that predation from yearling Chinook should be a significant factor in reduced production of sub-yearling Chinook (**Table 8** and **Table 9**). This is the best-available data.

Table 8. Fish prey items found in the stomach samples of fish captured in the Green River screw trap, 2000.

Data Categories	Species Sampled					
	Sculpin	**Steelhead**	**Trout Parr**	**Coho**	**Chinook 1+**	**Cutthroat**
# Sampled	**63**	**44**	**45**	**50**	**8**	**6**
Prey Found Chinook	34	6	0	0	0	0
Chum	297	23	7	16	2	1
Coho	5	1	1	0	0	0
Trout	4	0	0	0	0	0
Pink	28	3	4	0	0	0
Un-ID salmonids	262	2	23	10	1	1
Lamprey	7	0	0	0	0	0
Sucker fry	1	0	0	0	0	0
Dace	1	0	0	0	0	0
Prey/Sample	10.14	0.80	0.78	0.52	0.38	0.33

Source: Table 9 in Seiler et al. 2002.

Table 9. Weekly catches of non-targeted juvenile salmonids in the Green River screw trap, 2000.

Statistical Week			Catch						
No.	**Begin**	**End**	**Chum**	**Coho Fry**	**Pink**	**Sockeye**	**Trout 0+**	**Chinook 1+**	
								Unmark	**Marked**
7	2/7	2/13	0	0	0	0	5	0	0
8	2/14	2/20	13	1	4	1	3	0	0
9	2/21	2/27	29	12	2	0	10	0	1
10	2/28	3/5	27	15	1	0	7	0	0
11	3/6	3/12	306	52	25	8	3	0	0
12	3/13	3/19	6676	182	157	22	10	0	0
13	3/20	3/26	1561	112	217	2	15	0	0
14	3/27	4/2	6234	113	421	4	18	0	0
15	4/3	4/9	8369	49	271	6	53	3	0
16	4/10	4/16	36004	28	90	0	38	1	0
17	4/17	4/23	5083	2	11	0	29	4	562
18	4/24	4/30	3114	1	1	0	7	1	1123
19	5/1	5/7	1482	1	0	0	9	0	302
20	5/8	5/14	890	4	0	0	41	15	99
21	5/15	5/21	595	8	0	0	18	2	13
22	5/22	5/28	291	7	0	0	15	3	4
23	5/29	6/4	70	13	0	0	9	1	4
24	6/5	6/11	34	15	0	0	6	1	1
25	6/12	6/18	31	68	0	0	11	1	9
26	6/19	6/25	2	30	0	0	1	4	0
27	6/26	7/2	0	6	0	0	1	0	0
28	7/3	7/9	0	5	0	0	0	0	0
29	7/10	7/16	0	1	0	0	1	0	0
Season Total			**70781**	**725**	**1200**	**43**	**310**	**36**	**2218**

Source: Table 7 in Seiler et al. 2002.

Additionally, yearling fish contribute to a sport fishery at a 7.65% rate over brood years 2000-2005 (Steve Thiesfeld harvest data 2012). This program is funded by PSRE.

b. ***Pages 16-18***. *Since the yearling program purposely residualizes Chinook to stay in Puget Sound year round, the fish from those programs compete with returning NORs for the available food.*

WDFW Response: See ***Predation on Chinook Salmon*** and ***Competition with Chinook Salmon***, page 6.

Recent data suggests that the exponential growth of natural pink salmon in the Central and South Sound could be limiting the recovery of fall Chinook. Juvenile pink salmon enter the estuaries and nearshore of Puget Sound prior to most Chinook fry and parr (Topping and Zimmerman 2011) and the impact from highly increased pink fry predation on lower trophic level prey is believed to reduce growth and survival of larger zooplankton species and small fishes and larvae that are consumed by Chinook salmon. Bornhold 1999 showed that peak zooplankton production in Puget Sound and the Strait of Georgia occurs in April or May and that zooplankton abundance and body size decrease thereafter. Thus, many juvenile Chinook salmon enter marine waters during a period of declining availability of invertebrate prey, which may enhance the potential for inter and intra-specific competition (Ruggerone and Goetz 2004).

The size of the Soos Creek Hatchery yearling releases averages 300K. The estimated natural pink salmon fry production emigrating from the Green River in 2010 was and 9.6-million (**Figure 2**).

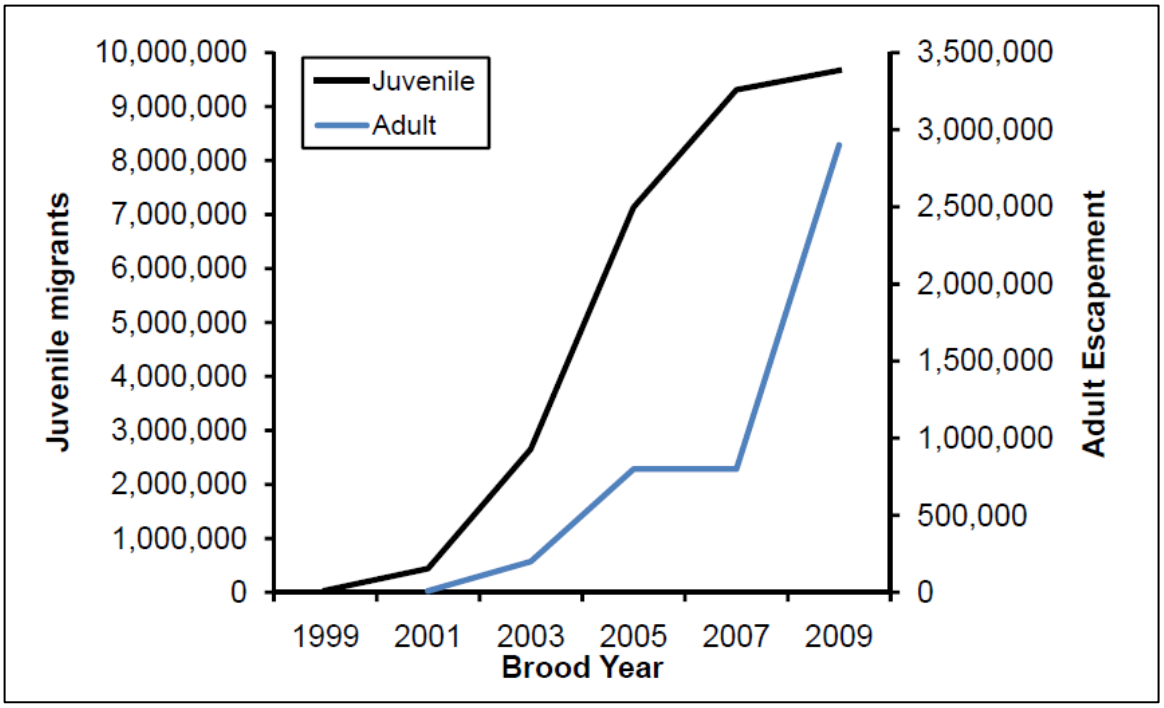

Figure 2. Changes in the number of adults spawners (blue line) and resulting juvenile migrants (black line) of pink salmon in the Green River, migration year 2000-2010 (from Topping and Zimmerman 2011).

Additionally, natural pink production resulting in adult returns in the Green River is estimated to average 870,000 over the last decade (WDFW pink salmon run-reconstruction tables 2013).

c. ***Pages 16-18****. This section indicates that 88% of the wild juveniles have left the Green River system once the hatchery sub-yearlings released, and thus potential for impacts on wild sub-yearlings is low. The statement that the wild fish have left the system is based on the smolt trap data relatively high in the system and not on data from the estuary, which to the contrary, indicates that wild fish are still present in the system in large numbers.*

WDFW Response: See ***Smolt Release Timing***, ***Predation on Chinook Salmon*** , and ***Competition with Chinook Salmon***, pages 5-7.

d. ***Page 18, HGMP Table 1.8.1, page 4 and section 10.7 page 37.*** *The HGMP notes different release strategies that will result depending on if an average of 900 or 1500 NORs are observed on the spawning grounds. In several sections, these are states as actual values vs. a range or as greater or less than, which does not make sense.*

WDFW Response: See ***Biological Phases of Restoration*** on page 1.

Comment 8. ***Section 3.3.1, page 20****. The table notes that a large percentage (28.5%) of returning fish from the Icy Creek yearling program end up on the spawning grounds, pointing to potential genetic issues of a fairly unnatural population of fish that has undergone different selective pressures breeding with wild fish… WDFW should develop and implement strategies to reduce the number of Icy Creek fish on spawning grounds.*

WDFW Response: The data demonstrating this is prior to the installation of the improved adult trap at Icy Creek installed in 2012 which is described in HGMP section 5.1.

Comment 9. ***Section 3.5, page 22****. This section needs a robust discussion of the potential impacts of the hatchery program on ESA-listed species.*

WDFW Response: The science on the interactions between hatchery and natural fish is on-going and the discussion included in the HGMP is considered adequate. See also ***Smolt Release Timing*** , ***Genetic Diversity***, ***Predation on Chinook Salmon*** , and ***Competition with Chinook Salmon***, pages 5-7.

Comment 10. ***Section 4.1, page 23****. The section concludes that winter floods are becoming an increasing occurrence due to continued watershed development. Please cite the source of the conclusion.*

WDFW Response: The text will be edited as follows, "Heavy bed loads ~~are due to extensive watershed development. Winter~~ and winter floods are becoming an increasingly common occurrence. ~~due to continued watershed development~~ (Perry 2005).

Comment 11. ***Section 7.2, page 28****. This section notes that adults are collected throughout the entire run… However, the HGMP does not account the fact that past hatchery practices dramatically shifted run timing 3 weeks earlier than the historic population. Given the recently completed temperature Total Maximum Daily Limit study that shows potentially lethal temperatures in the river when adult Chinook are beginning to enter the river and the general predicted climate change impacts that are only likely to further complicated this problem, it is prudent to consider reestablishing a later run time that more closely matches the historic timing of the Green River population.*

WDFW Response: Our records show consistent spawn timing at the Soos Creek Facility for early-September through late-October over the past 30 years (**Figure 3**).

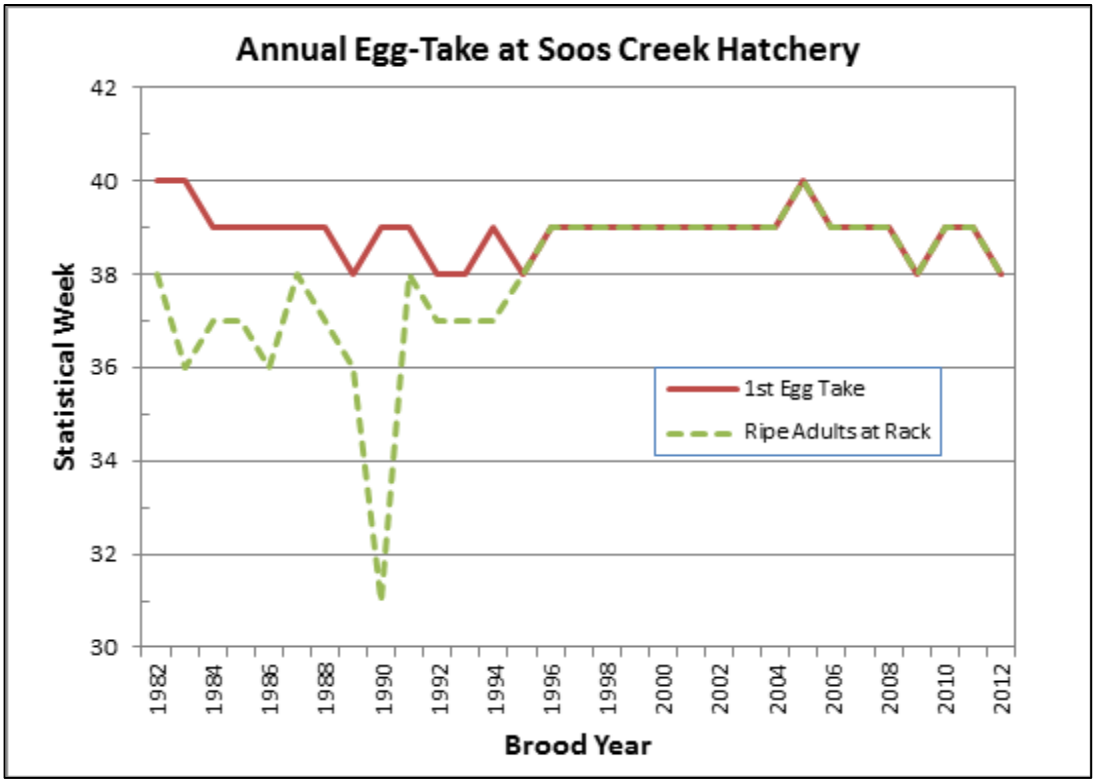

Figure 3. Statistical week in which ripe adults are observed at the rack, and first egg-take, by year, Soos Creek Hatchery Chinook, 1982-2012.

Comment 12. *A section in the HGMP describing how WDFW will account for and manage expected climate change impacts is needed.*

WDFW Response: The HGMP format was developed by NOAA for their evaluation of impacts to listed populations; that format does not include climate change.

Comment 13. *Section 7.3, page 28. The HGMP does not address error rate with marking – superficially how this may inflate NOR estimates.*

WDFW Response: See ***Mass-marking and Missed Clips***, page 4.

Comment 14. ***Section 11.1.1, page 39****. The HGMP notes that WDFW continues to monitor smolt emigration rates via smolt trapping. However, WDFW has not contributed funding to the trapping of smolts for several years… The HGMP demonstrates the importance of long-term, sustainable funding of smolt trapping in key locations of the river for which WDFW should take significant financial responsibility for.*

WDFW Response: The HGMP is not the place to address funding of Wild Salmon Production Evaluation Unit's Green River mainstem smolt trap.

Comment 15. ***Section 1.10.2, page 7****. One of the goals of the Salmon Habitat Plan is to increase life history diversity of the natural population… Performance Standard 3.4.3 indicates that a goal of the hatchery program is that life history characteristics do not change as a result of the hatchery program. A disproportionate amount of hatchery fish spawning with wild fish is likely causing domestication of the wild Chinook population and limiting the recovery of life history diversity. We strongly encourage WDFW to reduce the percentage of hatchery fish on the spawning grounds to allow life history diversity of the wild population to increase.*

WDFW Response: To evaluate the impact of the proportion of hatchery spawners on the spawning ground (pHOS), it is also important to consider the proportion of natural-origin broodstock used in an integrated hatchery program (pNOB). Both quantities contribute to an overall proportionate natural influence (PNI). The program described in the HGMP, under properly functioning habitat, improves the PNI of the system (**Table 2**, page 3).

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Topping, P. and M. Zimmerman. 2011. Green River juvenile salmonid production evaluation: 2009-2010 Annual Report. Fish Program, Science Division. Washington Department of Fish and Wildlife. FPA 11-01. Olympia, Washington.

WDFW Response to Comments by Wild Fish Conservancy– submitted to WDFW April 24, 2013.

Mr. Gayeski notified WDFW by e-mail on April 24, 2013, that his comments were not included on those posted on WDFW's website. We reviewed our e-mail in-boxes and confirmed that Mr. Gayeski's e-mail was not received. Mr. Gayeski's second e-mail provided evidence that he had sent a comment letter on January 13, 2013, and WDFW moved forward with addressing his comments. Many of Mr. Gayeski's comments have already been addressed in WDFW's initial responses to public comments; this document was added to the original posted responses.

Comment 1. *The proposed HGMP for the Green River Chinook program is not in accord with the recommendations adopted by the PSHAAG, nor do we believe that it is consistent with Washington State Fish and Wildlife Commission's Hatchery and Fishery Reform Policy (C-3619).*

WDFW Response: The Soos Creek HGMP adopts several of the recommendations of the PSHAAC including the implementation of a two-step integration program (Table 7). Furthermore WDFW implemented HSRG recommendations for the Soos Creek Program consistent with the Washington State Fish and Wildlife Commission's Hatchery and Fishery Reform Policy (C-3619) (Table 6). See also response to PSHAAC **Comment 5, Comment 6** (pages 15-17) and HSRG **Comment 8** (page 10).

a. *Most importantly, operation of the program as described in the HGMP has a very high probability of perpetuating and exacerbating the depressed fitness of the remnant wild, naturally spawning, population of Green River Chinook.*

WDFW Response: The HGMP provided for the Soos Creek Chinook program adopts a two-stage broodstock approach as a measure to reduce the potential for fitness loss within the naturally spawning population of Green River Chinook. Modeling of this new program shows a PNI improvement over the next 100 under current habitat conditions, with a great gain in PNI with improved habitat. See also ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4).

Comment 2. *As noted by Mr. Marks in his letter, the HGMP lacks a clear population designation with respect to managing PNI and pHOS. The PSHAAG unanimously recommended the Green River population be designated and managed as a Contributing population. The HGMP, in effect, treats it as a Sustaining population.*

WDFW Response: The HGMP format does not request that a population designation be provided. Additionally PNI and pHOS are monitoring measures and targets that are not requested in the HGMP format. See also response to PSHAAC **Comment 5, Comment 6** (pages 15-17) and HSRG **Comment 8** (page 10).

a. *In this regard, I note that section 1.16 of the HGMP repeatedly references the Puget Sound Salmon Management Plan (PSSMP 1985) and related agreements or mandates as explanations for rejecting alternative scales of production that would facilitate treating the population as a Contributing population (e.g., reduction of the subyearling program to reduce ecological and genetic risks to NOR Chinook would "not meet fisheries enhancement objectives for the program, including treaty Indian fish right entitlements (US v Washington) and the Magnuson/Stevens Act for sustainable fisheries" (page 11)). In point of fact, this issue was discussed rather extensively by the PSHAAG, and the consensus was (as I recall)*

that fishery obligations could be achieved while the sub-yearling program was modified and reduced.

WDFW Response: The *Puget Sound Salmon Management Plan* (PSSMP) is a court-ordered agreement, which guides the current co-management process in both harvest and hatcheries management under the concerns regarding ESA-listed species. Section 4 in the PSSMP explains the Equilibrium Brood Program, which describes hatchery programs and the co-manager process of how changes may be made to those programs. Sections 9 and 10 of the PSSMP discuss harvest and harvest allocation. Although the findings of the PSHAAC do not supersede those court-ordered plans, they do provide recommendations that modifications should be made to the Soos Creek Chinook program. One of these recommendations was the implementation of a two-stage broodstock strategy. The program described in the HGMP implements this recommendation and modeling of the program shows that substantial fitness improvements can be achieved under productive habitat. See also ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4), and response to HSRG **Comment 3** (page 9).

Comment 3. *All members of the PSHAAG were in agreement in strongly emphasizing to Department staff the importance of clearly representing to the public the Department's management policy preferences in negotiations with the tribal co-managers, so that the public could clearly understand what the Department may have been required to negotiate away in order to reach agreement with the co-managers.*

WDFW Response: The recommendations that PSHAAC provided and with which WDFW entered into co-manager negotiations are provided on the WDFW website. The HGMP represents the program on which WDFW and the tribal co-managers were able to reach agreement.

a. *I further believe that it was also the understanding of the PSHAAG that the consensus recommendations of the PSHAAG would be those adopted by the Department when it entered discussions with the co-managers. The HGMP provides no evidence that this was the case.*

WDFW Response: The PSHAAC recommendations to WDFW on acceptable genetic risks and potential wild stock gene banks were part of the Co-manager discussions in developing the HGMPs. On the other hand, the HGMP format was developed by NOAA for their evaluation of impacts to listed populations. Although the HGMP format does not include such a section, the recommendations of PSHAAC to WDFW are available and published on the WDFW website.

b. *I recognize that an HGMP is an ESA permit document, but this should not be an obstacle to including some text indicating what the Department's preferred management scheme for each population is and some brief explanation as to why the specifics of an HGMP do not agree with that preference.*

WDFW Response: As an ESA permit document, the HGMP would not be an appropriate location for such discussion.

Comment 4. *The program as characterized by the HGMP appears to me to pose several significant risks to the naturally-spawning Green River Chinook population. Most important, the scale of releases and the numbers and percentages of F1 hatchery-origin adults permitted to spawn naturally has throughout the history of the program likely depressed the fitness (reproductive success) of the naturally spawning population. The fact that the hatchery*

population is listed under the ESA due to its close genetic relationship to the remnant natural-spawning component of the population bears little relevance to the issue of the need to rebuild and recover the natural spawning fitness of the population to sustainable levels. This genetic relation is an artifact of both the history of the origin and management of the hatchery population – which has resulted in a highly domesticated population largely suited to a segregated (not an integrated) hatchery program -- and the attendant high level of spawning of this domesticated population with natural-origin fish.

WDFW Response: The Soos Creek Hatchery population and the Green River natural population are genetically indistinguishable, and are derived from the same source population (NMFS SHIEER 2005; Ruckelshaus et al. 2006; SSHAG 2003). The Soos Creek Chinook program described in the HGMP is sized and implemented in a manner to allow the Co-managers to meet management targets while improving the fitness of the natural population. The two-stage integration approach is designed to improve the PNI of the system, properly integrating the program with the natural population to reduce genetic risks as the population of natural-origin fish increases. See also ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4), and **Comment 7**, page 31.

a. *Undoubtedly, the vast majority, if not all, of the natural-origin spawners are likely progeny of F1 hatchery fish or the natural spawning progeny of natural-spawning F1's. Perpetuation of this status quo will only maintain the current depressed fitness of NOR Green River Chinook if not further depress it.*

WDFW Response: The current program design for Soos Creek Fall Chinook production does not rely on maintaining the "status quo," but uses the HSRG framework with phases of restoration and a two-stage broodstock integration program to aid in re-seeding under-escaped portions of the watershed and improving the fitness of the natural population. See also ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4).

Comment 5. *The low reproductive success of NOR spawners is commonly explained by Department staff and others as due to the poor quality of spawning and rearing habitat in the Green River. But this is at best a partial explanation.*

WDFW Response: Low reproductive success of NOR spawners in the Green River is exasperated by the poor quality of the habitat. The results of the modeling the two-stage broodstock program show that improvements in habitat along with the hatchery program modifications will provide the greatest benefit to the natural population. See also ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4), and response to PSHAAC **Comment 4.a** (page 15).

a. *The natural spawning population must be relieved of the burden of repeated introgression by F1 and the progeny of naturally spawning F1's if it is to be given an opportunity to respond to the selection pressures imposed by the natural environment.*

WDFW Response: See also ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4), and **Comment 7**, page 31.

b. *This fitness rebuilding needs to occur in parallel with habitat restoration.*

WDFW Response: Modeling of the implementation of a two-stage broodstock program show that greater fitness improvements can be realized with habitat restoration throughout the basin. See response #2 pages 2-4.

c. *The program as described in the HGMP will guarantee that natural spawning fitness remains depressed below sustainable levels – it is a self-fulfilling prophecy. This issue was raised by several PSHAAG members, including members of the HSRG, and discussed at some length. The pHOS levels provided in Table 2.2.2.8 of the HGMP (page 16) demonstrate how high this risk is, though even these levels under-estimate the depressive effect in light of the recent legacy of hatchery-origin genes in most, if not all NOR spawners and their progeny.*

WDFW Response See ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4).

Comment 6. *The high past and current levels of pHOS (which would only be sustained by the program under the HGMP) further indicate that the levels of NOR incorporated into the hatchery broodstock (Table 6.2.3.1, page 28) hardly qualify for characterizing the program as 'integrated' other than on paper.*

WDFW Response: See ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4).

a. *Both the genetic make-up of the majority of NORs and the low level of PNI cannot but result in the spawning of hatchery-origin adults in the wild continuing to have a depressing effect on the fitness of the natural spawning population. This is, of course, in conflict with the purpose of managing an integrated population to meet PNI standards.*

WDFW Response: See ***The Two-Stage Broodstock Strategy*** and ***Performance of Two-Stage Broodstock Strategy*** (pages 1-4), and **Comment 7**, page 31.

Comment 7. *In short, it would seem that the Green River hatchery Chinook stock cries out to be managed as a segregated program. And this would, of course, require significant program reductions and changes to harvest management, especially the advance of selective fishing gears and rules.*

WDFW Response: The hatchery stock was derived from Green River Chinook. Segregation would increase the genetic risk of domestication on the remaining NORs in the system as the phenotypic optimal for each population will begin to drift away from each other. In systems where habitat is considered to be capable of supporting natural production, based on Ford (2002), allowing fitness of naturally-produced fish to drive the adaptation of the composite hatchery-natural population maintains genetic continuity and phenotypic similarity with the natural population (**Figure 4**). It also minimizes potential genetic risks posed by the hatchery population to the natural population. Genetic risks can include: lowered reproductive success (Berejikian and Ford 2004; Araki et al. 2008); lowered genetic diversity and thus the ability to survive catastrophic events; and lowered overall fitness in the natural environment due to domestication effects (Reisenbichler and Rubin 1999; Chilcote 2003; Goodman 2005).

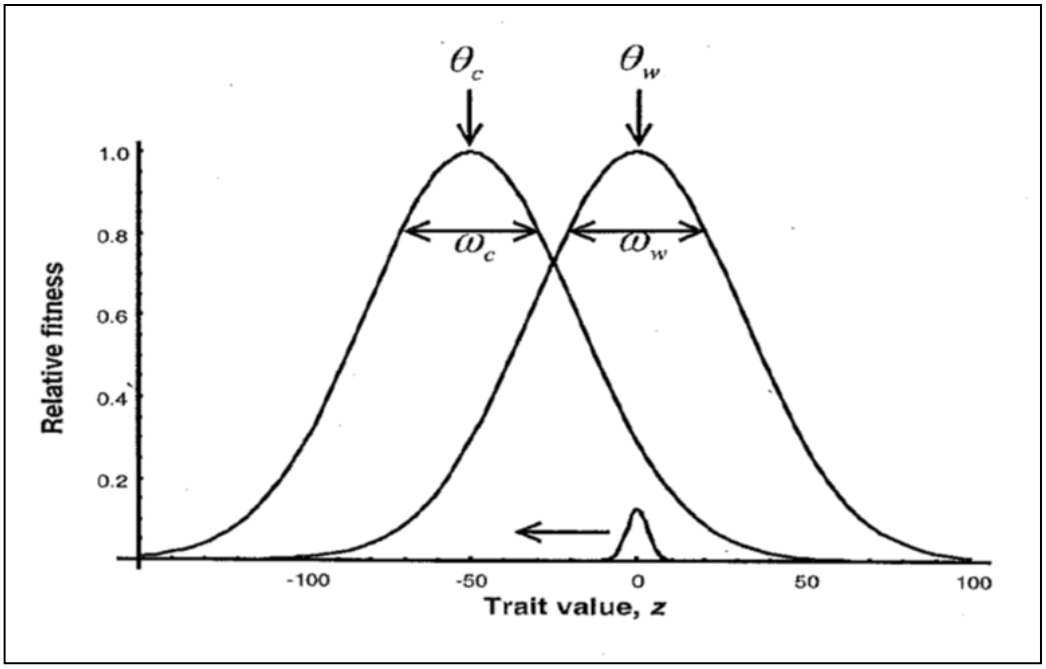

Figure 4. The basic concept of the phenotypic model from Ford 2002. The curve on the right is the function describing the fitness in the wild environment of an individual with trait value z. Fitness in the wild is maximized for individuals with trait value $z = \Theta_w$. The curve on the left is the function describing fitness in the captive environment. The optimal trait value in the captive environment is $z = \Theta_c$. The width of the fitness curves, and hence the strength of selection, is described by the parameters ω_w and ω_c for the wild and captive environments, respectively ($\omega_w^2 = \omega_c^2 = 1000$). The smaller curve under the wild fitness function describes a population that has evolved so that its mean phenotype is equal to the optimal phenotype in the wild. The phenotypic variance in this population, δ^2, is 10, and is assumed to remain constant. If part of the population is taken into captivity and used for supportive breeding, the captive-fitness function slowly moves the trait distribution in the population to the left toward the captive optimum.

Comment 8. *A final concern I wish to note is the proposed releases of 1,000,000 to 2,000,000 subyearlings at Palmer. This is egregious.*

WDFW Response: The Soos Creek HGMP does not represent an increase in production but a tying together of co-manager programs in the watershed in a manner that will aid in the rebuilding of the natural population. The Muckleshoot Indian Tribe (MIT) has maintained a program of 1,000,000 Chinook at Palmer Ponds since 2010. This MIT production was formerly conducted out of the Keta Creek complex.

a. *The odd and largely unexplained manner in which the actual numbers are tied to NOR escapements is also concerning, and at best not well explained.*

WDFW Response: The program triggers that are to be used to transition between phases of restoration are based on the NMFS escapement threshold. See ***Biological Phases of Restoration***, page 1.

b. *Regardless, this represents a significant increase in the size of the program that seems unjustifiable in light of the current condition of the natural spawning population. Again, this concern was raised, I believe, by all members of the PSHAAG who urged the Department to oppose these releases.*

WDFW Response: Releases for the Palmer Ponds portion of the program previously came from MIT's Keta Creek Complex, and represented a 600,000 release group. In 2010, MIT shifted this production to Palmer Ponds, and increased the release number to 1-million. The current program does not expand on this number, which has been in place since 2010. WDFW leases the Palmer Ponds facility to MIT on a year-to-year basis; releases from Palmer Ponds are managed by MIT. See also response to **Comment 8**, page 32.

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WDFW Response to Public Comments on the draft WDFW Soos Creek Chinook HGMP received by e-mail.

Comment 1. *Propose that the fish be released at a larger size than a yearling.*

WDFW Response: The Clear Creek Tribal Hatchery on the Nisqually releases 3.5-million Chinook at 55 fish per pound annually, and the Kalama Creek Tribal Hatchery on the Nisqually releases 600,000 Chinook at 55 fish per pound annually, for a total annual release goal of 4.1-million fish. All Chinook released from these two programs are considered sub-yearling smolts.

The Green River program releases a total of 3.2-million Chinook at 80 fish per pound, and 1,000,000 out of Palmer Ponds at 80 fish per pound, for a total release of 4.2-million sub-yearlings. In addition, 300,000 yearlings are released at Icy Creek Hatchery at 10 fish per pound. While releasing smolts at a larger size can improve survival rates, there are other factors that go into determining size at release, such as hatchery capacity, fish food costs, and interactions with natural-origin fish.

Comment 2. *There is a consistent documented decline in the number of documented returning Chinooks (wild and hatchery) and wild steel-head.*

a. *Why is it not possible to transport and release the adult fish into the upper most section of the water shed near the head works of Howard A. Hanson Dam....near the Icy Creek Hatchery? The fish could spawn naturally on the species appropriate spawning habit in that section of the system, undisturbed by human activity.*

WDFW Response: Traditionally, the highest Chinook spawner densities have occurred in the middle Green River, from Whitney Bridge to Soos Creek. It is believed the best Chinook habitat in the river exists in this stretch. While it would be possible to transport and release fish into the upper river as you suggest, these fish would be less integrated, since the hatchery is taking most of the natural-origin fish for incorporation into the egg-take. For the upper river, the intent of the Palmer program is to release Chinook with the highest natural-origin integration rates; these fish will return to this area in the river to spawn and colonize this area, which has been severely under-escaped in recent years.

The closure of the river from Cristy Creek to Highway 18 was done as a conservation measure to protect naturally spawning Chinook on the most heavily spawned section of river. Poaching, snagging, and harassment of Chinook on the spawning grounds during September in the lower and middle Green River are among the reasons fishing seasons that overlap with Chinook spawning have been closed. A compromise solution of allowing summer steelhead angling from the mouth of Cristy Creek upriver was developed to allow anglers to continue to fish for steelhead returning from the Icy Creek release site.

b. *Allow license-purchasing citizens, who foot part of the bill for the hatchery programs to exist through license fees and taxes, to have a chance to FISH for and RETAIN hatchery marked Chinook in the Green River system WITHOUT limiting our access to the river AND run timing for this and other species (steel-head).*

WDFW Response: The Chinook produced in Green River Hatchery programs can be accessed by license purchasing citizens. Significant numbers are caught in mark-selective marine fisheries in Areas 5, 6, 9, and 10. Although no terminal Green River Chinook sport fisheries have been available in recent years, this is due largely to the need to conserve critically low numbers of natural-origin Chinook, compared to the relatively large numbers of hatchery-origin

Chinook. Poaching, snagging, and harassment of Chinook on the spawning grounds during September in the lower and middle Green River are among the reasons why coho fisheries cannot be opened earlier, since they overlap in timing.

c. *"Non desirable" chum and pink salmon runs....BOTH wild strains.....are quite hardy. The question is why?*

WDFW Response: The pink salmon run on the Green River has increased exponentially during the last 10 years, and it is entirely natural production. The chum, however, are largely produced from the Muckleshoot Tribe's Keta Creek Hatchery, which annually releases up to 5-million chum salmon fry.

d. *Why were the Green River wild coho "proved" out of existence in court citing Tribal Fisheries Biologists research?*

WDFW Response: There are naturally-produced coho in the Green River. The Soos Creek Hatchery makes an effort to integrate the naturally-produced coho into the egg-take annually. The Green River is considered a Hatchery Coho Management Zone, with a substantial hatchery coho program, and intensive harvest rates directed at coho.

Comment 3. *My Grandparents had a hatchery on Soos Creek The State of Washington put a hatchery downstream from their hatchery and put them out of business.*

WDFW Response: Thank you for your comments.

Comment 4. *My biggest concern for the Green River is the native steelhead and Chinook salmon that have vanished in the last 20 years. Why are the rearing ponds in Palmer now used to raise Chinook Salmon when they were built to raise Steelhead?*

WDFW Response: Survival trends for both wild Chinook and steelhead in the Green River have been in a downward trend in the last decade, for a variety of reasons, some known, some unknown. Decreasing survival rates for incubating wild Chinook eggs in the Green River has been linked to both frequency and duration of flood events, which have been occurring more regularly. Wild steelhead return rates have been down throughout Puget Sound, and although the reasons are not fully understood, seem to point toward poor marine survival. WDFW has enacted stringent fishing regulations, and is involved with a hatchery supplementation project in an effort to conserve and rebuild the population.

WDFW closed Palmer Ponds in 2009, as a result of budget cuts. It was re-opened in 2010 by the Muckleshoot Tribe under a lease program; they currently raise and release 1.0-million Chinook out of the facility. The Chinook releases from Palmer Ponds will utilize the most integrated egg-takes, taken from a high proportion of natural-origin fish, to colonize the upper river with fish that will rebuild the population.

Comment 5. *I believe we should take our egg takes just as they are and plant them in selected parts of the river system. No need for the iodine baths and such. let them be wild. Based on evolution, they know how to return and mate by themselves.*

WDFW Response: Since the inception of hatchery production, many different strategies have been utilized to culture and release fish. Egg boxes, spawning channels, and unfed fry releases have all been attempted over time, with mixed results depending on the species. For Chinook, the survival rate of planting eggs into the river, or into egg boxes, did not produce a significant survival advantage to adulthood. Eggs and fry are subject to flooding and scour events during

periods of high water that significantly reduce survival. Hatcheries were built to increase survival rates over what is observed in the wild, to provide fish for harvest, and to mitigate for the effects of altered and damaged habitat.

Comment 6. *I read the subject management plan and had the following comments:*

a. ***Section 4.1, page 23*** *: I don't suppose you have any worries about the huge development being planned for Pacific Raceways. Do you intend to make any comments to a proposed EIS for that development or will you ignore this as you did when the PR development ordinance was before the council?*

WDFW Response: The Washington Department of Fish and Wildlife (WDFW) is always concerned with any development that modifies, alters, or destroys existing fish and wildlife habitat. Unfortunately, the only area where WDFW has any jurisdiction over habitat development is via the Hydraulic Approval Permit (HPA) process. An HPA must be obtained from WDFW before work is conducted that uses, obstructs, diverts, or changes the natural flow or bed of state waters. The conditions of an HPA are designed to protect fish, shellfish, and their habitat. Regulated activities include bank protection, dredging, fish passage corrections, flow control structures, overwater structures and pilings, habitat and shoreline modifications, and other activities that affect waters of the state.

b. ***Section 9.1.4, page 32****: The huge development being planned for Pacific Raceways will undoubtedly cause an increase in summertime water temperatures, and higher flow variations because of the loss of millions of cubic feet of gravel/groundwater storage mined from the PacRac site as well as the huge increase in covered ground area.*

WDFW Response: WDFW is unaware of any environmental impact analysis performed on the proposed development, and how it would potentially affect water quality in Soos Creek.

c. ***Section10.10, page 37****: What happens during feeding and the fry come to the surface?*

WDFW Response: During flood events, fish are not fed due to turbidity.

d. ***Section11.2, page 39****: How is risk aversion accomplished on man-made pollutants when no water quality/contamination testing/reporting is done? Apparently any genetic variation is assumed to be caused by natural pollution, since non-natural pollutants are not tested for. Therefore you have assumed any non-natural pollutants don't cause genetic variation, true? (This will be news to the scientific community.)*

WDFW Response: Incoming Soos Creek water is tested for settleable solids quarterly and temperature data is checked daily. The fish in the hatchery are subject to frequent fish health checks by a pathologist, and if causes of mortality cannot be identified, water quality and/or contaminants may potentially be tested. Contaminants are not checked on a regular basis. Soos Creek is a highly urbanized watershed and has many potential sources of contamination. Water quality and regulatory function falls under the Washington State Department of Ecology.

e. ***Section12.1, page 39****: How is this "Not applicable." when significant sampling and data is produced? This would indicate that nothing is done with the data; that no decisions are made dependent upon the data. Maybe most of the answers for section 12 should be "as previously described".*

WDFW Response: Comment noted.

f. *I didn't see that when target numbers of spawners reaching Soos Creek Hatchery are met, and fish are kept to be sold, that the wild fish aren't transported and reintroduced into the Green at say Flaming Geyser Park.*

WDFW Response: The fish returning to the hatchery are first utilized to meet the hatchery egg-take goals. Once enough fish are secured for the egg-take goal, the second goal is to meet in-river fish transfer goals, which for Chinook is up to 5,800 adults transferred from the hatchery to the spawning grounds, typically at Whitney Bridge and other accessible planting areas. An additional 1,500 Chinook may be passed above the collection weir at the hatchery. Priority for wild fish, up to 20% of the run, is for incorporation into the hatchery broodstock for integration purposes. Excess hatchery fish to egg-take and in-river transfer goals can be sold to a contract fish buyer.