Appendix 1 to Snake River Endangered Salmon White Paper

Snake River Fall Chinook Salmon Return Counts Have Been Inflated Artificially by a Multi-Year Hatchery Surrogate Study

The Endangered Species Act (ESA) requires both survival and recovery of Snake River listed ***wild*** salmon stocks.[1] A plethora of National Marine Fisheries Service ("NMFS," aka NOAA Fisheries Service) and independent research clearly establishes that hatchery produced displacement of wild fish and domestication of the gene pool is detrimental to wild fish production and sustainability. Yet in response to state and tribal hatchery pressure to establish a harvestable allotment of unmarked Snake River fall Chinook, NMFS has allowed an increasingly higher percentage of hatchery produced Snake River fall Chinook to spawn with and displace wild fall Chinook. This not only reduces the wild population numbers, it also dilutes the wild salmon genetics.

Due to hatchery fish breeding with wild fish in the rivers, NMFS is rapidly moving away from using the term "wild" in its documents. Instead, NMFS has replaced "wild" fish with the term "natural," to indicate hatchery and wild cross breeding spawners. The hatchery spawners originate primarily from hatcheries located downstream from Lower Granite Dam.

At this point for ESA viability purposes, researchers cannot adequately calculate how many wild fall Chinook versus hatchery Chinook are produced from the spawning grounds. An educated guess by researchers is that about 10-25% of wild fall Chinook remain. This is not much different than in the early 1990s, when there were as few as 78 spawners passing Lower Granite Dam.

Hatchery Chinook are raised and released for a number of purposes, including for smolt transportation studies, to increase harvest opportunities, and to evaluate the impact of the effects of hatchery fish on the stunted wild population. Hatchery Chinook also are used to develop population models for survival, extinction, and recovery metric estimation for wild Chinook salmon. These studies have taken more than 24 years so far.

The studies using hatchery Chinook have masked the decline of wild Chinook. Most of the so called "record returns" of fall Chinook salmon claimed by the federal agencies consist of hatchery origin fish. There are several significant facts to understand within these touted record runs. First, hatchery fish, with all their inherent problems, are not the threatened and endangered wild Chinook that NMFS is charged with recovering under the ESA. The wild populations are

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[1] The four lower Snake River dams present two equally significant problems. The first is the structures that impede or block fish from migrating through the river. The second is the 140 miles of warm slack water reservoirs created by the dams in place of the natural flowing river. NMFS' initial status review that justified the ESA listings for salmon and steelhead put heavy weight on the significant loss of spawning, rearing, and migratory habitat created by the reservoirs, as a consequence of constructing the federal Snake River dam concrete structures. These were just as significant as the dams themselves (Waples et al 1991). All ESA consultations and ESA management alternatives continue to ignore the ecological requirements that are critical to salmon production and sustainability in the 140 mile Snake River reach that the dams have converted from riverine to reservoir lake.

much more viable, resilient, and self-sustainable. Second, these are not the wild salmon and steelhead that taxpayers are paying to recover under the ESA. Third, and perhaps more important, is the fact that there is an additional artificial group of hatchery fish being counted that inflates the number of fish returning. These are hatchery salmon that started as research samples produced as "surrogates," designed to replicate wild subyearling Chinook size and behaviors. Returning adults from the research surrogate releases have by design increased in-river harvest rates. This detrimentally affects wild Chinook, because increased harvest rates consequentially lead to increased incidental mortality on the wild population.

Around the 2005 timeframe the Corps, BPA and NMFS fisheries scientists began to assess the effects of different forms of juvenile outmigration on fall Chinook run survival and adult returns. The principal migration forms being assessed were barge transport as compared to juvenile fish passage through dams and reservoirs after installation of certain system improvements, such as spillway surface weirs. The point of the study was to estimate the success of wild juvenile outmigrants using in-river migration versus juvenile transport, on adults returning back to Lower Granite Dam. The study was needed due to an increasing amount of biological evidence that indicated that the highest percentage of returning adults were those that outmigrated as juveniles, without being detected. This suggested that non-detected fish migrated totally in-river. They were either spilled hydrosystem-wide, or passed through turbines at some dams and were spilled at other dams, without passing through a juvenile bypass system at any of the dams.

Surrogates produced through hatchery manipulation of growth were necessary because there were not enough wild fall Chinook to risk Passive Integrated Transponder (PIT) tagging. Further, there were an insufficient number of fall Chinook in their parr life-stage in their natural rearing habitat for a viable sample to be tagged. To conduct the study, hatcheries were paid to produce specific surrogates by regulating hatchery water temperatures and feed to produce several million additional juveniles. The surrogates were raised in two ways. Some were "stunt-grown" to represent the smaller sized wild smolts, both in physical condition and assumed wild behavior upon the "surrogate fish's" release. The others were grown according to the more common hatchery practice for fall Chinook. This is to "rapid-grow" the juvenile fall Chinook from their smaller subyearling size into the much larger "production" yearling size class that is typically targeted for harvest. The larger production fish are raised for a combination of *US v Oregon* targets, subsistence and commercial tribal targets, sportfish targets, and a few other minor opportunity targets. The surrogates, along with a paucity of wild fish, and a very large number of the other hatchery-produced run-type samples, were then tagged and released in large enough numbers for evaluation of tagging either above Lower Granite Dam or at the juvenile collection system at Lower Granite Dam.

To detect fish passage through the river, the widely accepted PIT tag detection methodology was used. This method allows tagged juvenile fish to be detected as they pass through most of the dams' bypass routes. Detection estimates for fish passing through turbines or by spill routes must be extrapolated, because those routes do not have PIT tag detectors. Returning adult fish tagged as juveniles are detected passing through each dam's adult fish ladder, except at John Day Dam.

The fall Chinook surrogate tagging portion of the study alone involved hundreds of thousands of surrogates for each of more than five years. The surrogates were added to the two to three million additional hatchery produced study fish released for the same years, in order to have a

statistically viable sample group under various ocean, flow, and temperature regimes. The surrogates constituted approximately 55% of the already increasing total hatchery run of "production" fall Chinook juveniles (for future harvest) for those years.

Of the returning adult fall Chinook that were not harvested in the recent few years of active tribal gill-net harvest directly upstream of the Lower Granite Dam ladder, the surrogates constituted an estimated 75% of returning spawners that constructed redds. Hence, much of the "improved" or "record runs" of the last several years were due in part to a separately funded research program that more than doubled the number of fall Chinook releases for more than five years.

The surrogates were an expensive juvenile to produce. In terms of numbers and the additional hatchery expense, the fall Chinook surrogates and additional sample fish production were supplemented well beyond the ordinary operating funds allocated to Snake River hatcheries for producing subsistence harvestable fish quantity. This was particularly true for state run hatcheries like Lyons Ferry under the Snake River Fish and Wildlife Compensation Plan.

The multi-year in-river versus transport study has established that the size and life history of a wild fish matters. The study disclosed that wild fall Chinook have greater productivity and a better survival rate than hatchery fish, especially since some of the wild Chinook have an artificially ample food supply of several species of introduced shrimp of several size classes. This shows that the wild salmon population can recover and sustain that recovered viability when provided a restored river rich in a higher diversity of riverine food web nutrients. Viability would be enhanced if the wild fish were supported by an increase in mainstem spawning and rearing habitat, both in quantity and quality, sufficient to hold wild produced density dependence to an ecological level that is not limited by the lesser productive genetic polluting hatchery fish.

Prediction

It seems likely that now that the surrogate research program has ended, artificially inflated fall Chinook returning runs of the last few years will decline substantially. Various factors are at work. Ocean regimes similar to the detrimental ocean temperatures and foraging opportunities (e. g., lower copepod indices) in the early 1990s have developed in recent years. In addition, the hatchery origin dilution of natural spawning salmon upon wild spawning salmon will likely contribute to decreased annual adult returns. These factors likely will lead to diminished total aggregate wild, natural, and hatchery fall Chinook adult returns expressing much wider annual variation of the kind seen prior to 2000. Any crash in the introduced crustacean (shrimp) populations in the lower Snake River reservoirs, such as occurred in Montana lakes when introduced Mysis shrimp ballooned and then crashed, would further limit the fitness of juvenile fall Chinook required for maintaining decent smolt to adult returns.

Further, when returning adult numbers increase, harvest increases on a "sliding scale." Washington DFW and the Nez Perce tribe remove for broodstock an estimated 90% of the adult wild fall Chinook that are trapped in the Lower Granite adult trap. There is about a 10% trapping rate to allow sufficient escapement to upstream tribal gill-net harvest and natural spawning.

Also there is increasing evidence for density dependence regulating factors on production, such as spawning space and rearing opportunity with the increase of hatchery and natural spawner numbers, as well as an increasing proportion of hatchery produced non-productive jacks and

mini-jacks returning to the spawning grounds. These factors, combined with the originally planned termination in surrogate releases that was expanded out to 2012, will likely lead to a large scale decline in the adult fall Chinook returns after 2015 or 2016.

Recommendations

- ***Only ecological restoration through dam breaching can fulfill the critical need for wild fish***.
- In the future the returning fall Chinook wild population required for ESA should not be dependent on long term non-self-sustainable, and increasingly expensive hatchery origin smolts of any size. Instead, it is necessary for the survival and recovery of wild fall Chinook that they are managed on increased spawning and rearing habitat footprints for wild only production.
- The best available science estimates that more than 5000 to 7000 additional wild spawners are needed for sustainable recovery. This requires an additional 32%-70% increase in restored spawning habitat in a normalized river, rather than the habitat that currently is limited to the dam tailraces. Wild progeny of the mainstem river redds would need to use the full channel width and depth of rearing habitat with natural forage resources, that ***with dam breaching*** would be type-converted in form and function back to riverine processes. The recovered and restored habitat would replace the thin patchiness of nonproductive shallow water shoreline rearing that currently exists in the reservoirs.
- The increased number of spawners would need a diversity of over 35 native invertebrate species for forage, and would need to occupy over 38 rapid-pool-run geomorphic complexes. The complexes would be created by ***breaching restoration, which would be necessary, along with wild fish focused hatchery reforms, to recover the single remaining population of the Snake River wild fall Chinook Evolutionary Significant Unit (ESU).*** This would be quite close to creating an additional highly productive and sustainable Hanford Reach within the lower Snake River mainstem, with its spawning and rearing productivity, in both geoform and function.
- Hatchery derived fall Chinook should be limited to that harvest level reasonably and legally allocated to tribal, commercial, and sport harvest. The harvest should be in any combination that removes as close to 100% of the hatchery fish as possible, through focused harvest and reduced broodstock collection.
- In the future, wild fish should not be taken as broodstock for any Compensation Plan hatchery that remains, at least until the recovery level carrying capacity of the wild spawning and rearing habitat is maintained, and the density dependent effects that could limit production are manageable, under any carrying capacity mechanism.
- When there are enough surplus wild fall Chinook returning to the wild spawning grounds to fulfill the broodstock need, then wild fish could replace any broodstock taken for harvest allocations.
- Genetically polluting hatcheries with proven progeny life-stage transferring effects between hatcheries located downstream of wild spawning grounds, such as Lyons Ferry

and Irrigon, should either be terminated or drastically reformed into limited wild-only segregated hatchery operations, instead of their current integrated hatchery operations.

- The Nez Perce National Hatchery located below Dworshak Dam, but upstream of wild spawning grounds, should remain for legally allocated harvest opportunity, but sequentially reformed within a decade into a wild-only segregated hatchery operation to support the legally allocated harvest programs.

If these recommendations are followed, there will be a highly reduced need for competition in objective management between agencies and entities responsible for maintaining viable ESA recovery and legally allocated harvest programs.