

Technical Memo 2006-01

WRIA 8 Technical Committee

Purpose

The purpose of this technical memo is to document the rationale for changing the Chinook population structure from three populations (Cedar River, North Lake Washington, and Issaquah) to two populations (Cedar River along with a Sammamish population that combines the North Lake Washington and Issaquah stocks).

Background

One of the fundamental uncertainties identified in the Final WRIA 8 Chinook Salmon Conservation Plan is the identification of independent Chinook populations in WRIA 8. The WRIA 8 Chinook Plan includes a discussion of these uncertainties, the conservation approach adopted by the WRIA 8 Technical Committee (W8TC) in response to this uncertainty, and additional analysis intended to reduce uncertainty. This discussion is summarized on page 7 of Chapter 4 as follows:

While two populations are identified in WRIA 8 by the PSTRT, recent genetic information available at the time the Conservation Strategy was developed indicated that there may be enough difference between the North Lake Washington Chinook and fish returning to the Issaquah Creek Hatchery to consider them separate from one another (Marshall 2000). In addition there are other differences such as run timing (e.g., the North Lake Washington Chinook run starts earlier than Issaquah Hatchery returns, peaks at approximately the same time, and tails off over a longer period) that may reflect genetic differences between North Lake Washington and Issaquah Chinook that should be maintained. After much discussion, the WRIA 8 Technical Committee decided to take a precautionary approach and plan for three populations: the Cedar River population, the North Lake Washington population, and the Issaquah population....The W8TC based their decision to plan for three populations on the desire to adopt a conservative approach to WRIA 8 Chinook populations in light of uncertainties about population structure, and the potential that unique genetic characteristics necessary for the long-term viability of the Issaquah and North Lake Washington populations, if lost, may not be recovered. By identifying three populations, the WRIA placed priority on protecting all Chinook within the watershed, as well as any local adaptations that these fish possess. This approach supports the continued survival of offspring of naturally spawning Issaquah Hatchery Chinook strays which would be protected under the Endangered Species Act. In addition, the three population approach errs on the side of caution to maintain future opportunities for conservation in the Issaquah sub-area...

....The WRIA 8 Technical Committee has initiated a genetic study with Washington Department of Fish and Wildlife (WDFW) to analyze juvenile samples taken from the three assumed populations in WRIA 8, samples from hatcheries known to contribute to adult returns (e.g., University of Washington, Issaquah, Grover's Creek), as well as archived scale and tissue samples from adult spawners. It is expected that this study will help address a number of uncertainties surrounding current genetic differences that exist among wild and hatchery Chinook stocks in WRIA 8. However, it is likely that there will be continued questions regarding the interactions of hatchery and wild Chinook.

The WRIA 8 Technical Committee and participating scientists plan to review the genetic study and provide the information to the PSTRT for consideration in identifying independent populations within WRIA 8.

In addition, the Technical Committee identified potential implications of different Chinook population structures for Chinook conservation efforts in WRIA 8. These

different population scenarios are described on page 47 of Chapter 4 and summarized in Appendix C-5.

New Information

As described in the Plan, a genetics study was conducted by WDFW on behalf of the W8TC with funding from the King Conservation District and Seattle Public Utilities. This study, which looked at the level of genetic diversity among naturally-spawning and hatchery Chinook in WRIA 8, provided the following conclusions:

1. Naturally spawning fish in the Cedar River and Bear Creek are different than hatchery fish from the Issaquah, Grover's Creek, and University of Washington hatcheries.
2. Naturally spawning fish in Issaquah Creek are only weakly differentiated from Issaquah hatchery fish.
3. The Issaquah hatchery is the likely source of the majority of marked (ad-clipped) fish in the Cedar River and Bear Creek.
4. There are some differences among naturally-spawning Chinook from the three locations, but these results are not consistent across years. This does not mean that all Chinook in WRIA 8 are the same; rather, it means that there was not sufficient statistical power between samples to confirm or refute that there are genetic differences among the locations.

While the genetics study was inconclusive, the W8TC recommends (and the Steering Committee has approved) that the Conservation Strategy adopt a 2-population approach that assumes independent Cedar River and Sammamish River Chinook populations. The Sammamish population includes two sub-populations: the naturally spawning Bear Creek sub-population and a hatchery-driven Issaquah Creek sub-population. The W8TC's rationale for this revision to the WRIA 8 Chinook population structure is as follows:

1. Through the genetics study the Technical Committee was unable to prove or disprove the existence of a genetically distinct Chinook stock in Issaquah Creek.
2. Genetics is one of six factors used to identify Chinook populations. The other factors are geography, migration rates, life history patterns and phenotypic characteristics, population dynamics, and environmental and habitat characteristics (Ruckelshaus et al. 2006).
3. Based on the preponderance of evidence (summarized in Table 1), the W8TC is confident that 2 populations is appropriate and defensible, and will not result in a significantly increased risk to Chinook recovery in WRIA 8.
4. The 2-population structure is consistent with TRT recommendations and guidance for salmon recovery in the Puget Sound Evolutionarily Significant Unit (ESU).

Implications for the WRIA 8 Conservation Strategy

As described in Chapter 4, the identification of two Chinook populations in WRIA 8 has implications for the WRIA habitat strategy. Under this population scenario the W8TC recommends the following revisions to the Conservation Strategy:

- Emphasis should be placed on reducing the risk to the Cedar River population. The Sammamish population is at a lower risk due to the hatchery support and the expansion of the population with the inclusion of North Lake Washington and Issaquah Chinook.
- By combining North Lake Washington and Issaquah Chinook into one population, the overall spatial distribution of the population is no longer confined to one stream (Bear/Cottage Creeks). However, the W8TC continues to recommend actions that expand the distribution of the naturally-spawning Sammamish sub-population in the North Lake Washington tributaries.
- Restoration in Issaquah Creek is necessary to increase natural production in the Sammamish population, and to provide locally adapted, natural origin broodstock for the Issaquah hatchery.
- Hatchery contributions to natural spawning aggregates continue to be a concern due to the risk to Chinook population diversity. This risk is due to the low numbers of natural origin Chinook in the watershed and the level of hatchery production in the watershed.
- Additional analysis is necessary to determine if natural origin Chinook are sustainable in the absence of hatchery contributions.
- The W8TC will work with the co-managers to integrate habitat, hatchery, and harvest actions to support conservation objectives for the Cedar and Sammamish Chinook populations. This includes discussion of potential tools available to support hatchery objectives for increased natural-origin broodstock and decreased hatchery contribution to natural spawning.

References

Marshall, A. R. 2000. Genetic diversity analysis of Cottage Lake Creek/ Bear Creek and Issaquah Creek naturally spawning fall-run Chinook salmon. Washington Dept. Fish and Wildlife rep., May 2000, Olympia. (Available from Washington Dept. Fish and Wildlife, 600 Capital Way N., Olympia, WA 98501.)

Ruckelshaus, M.H., K.P. Currens, W.H. Graeber, R.R. Fuerstenberg, K. Rawson, N.J. Sands, and J.B. Scott. 2006. Independent populations of Chinook salmon in Puget Sound. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-78, 125 p.

Table 1: Summary of Evidence Supporting Identification of Two Chinook Populations in WRIA 8 (listed in order of relative importance for population determinations by the Puget Sound Technical Recovery Team)

Chinook Population Identification Factors	
Geography	<ol style="list-style-type: none"> 1. WRIA 8 has a unique physical orientation, with multiple streams draining to Lake Washington and a single outlet to Puget Sound 2. Significant distance between Cedar and Sammamish spawning areas
Migration Rates	<ol style="list-style-type: none"> 1. Migration from outside of WRIA 8 is not significant. There is evidence of straying from outside of WRIA 8, but the number of coded-wire tag (CWT) recoveries from out of basin stocks is low. 2. Within WRIA 8, presence of ad-clipped hatchery origin fish on the spawning grounds is significant in both populations,
Genetic Attributes	<ol style="list-style-type: none"> 1. Genetic information is inconclusive, with some differences observed across stocks but inconsistent results from year to year and between statistical tests.
Life History Patterns and Phenotypic Characteristics	<ol style="list-style-type: none"> 1. Lake migration and rearing are unique in Puget Sound. 2. Spawn timing: Cedar starts earlier and extends longer, than Bear and Issaquah. Bear Creek starts earlier than Issaquah but peaks at the same time 3. Age of maturity: While 4-year old are the dominate age class in each spawning area, the average age is older in the Cedar due a higher proportion of 5-year olds. 5-year olds are rarely but consistently seen in Bear, and are rare in Issaquah. 4. Size: differences in size are similar to the differences in age, with larger fish in the Cedar than in Bear and Issaquah. No statistical differences in length at age has been observed between natural and hatchery origin Chinook in WRIA 8. 5. Outmigration life history: Sub-yearling fry and parr migrants are observed in the Cedar River, although the proportion varies from year to year. In Bear Creek, sub-yearling parr migrants make up the majority of juveniles. 6. Outmigration timing: Outmigrating sub-yearling Chinook emigrate from their natal streams from January through July.
Environmental and Habitat Characteristics	<ol style="list-style-type: none"> 1. Sammamish basin area is larger than the smallest Puget Sound watershed containing an independent population 2. Geomorphic differences between Cedar (snow-melt), Bear (groundwater), and Issaquah (highland system).